The role of artificial intelligence in co-creation of health professions education

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The role of artificial intelligence in co-creation of health professions education: Integrating innovation into collaboration: AMEE Guide No. 190

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ABSTRACT

Co-creation has emerged as a transformative approach to meaningful collaboration among students, teachers, and other key stakeholders. Although co-creation aims to integrate all stakeholders' diverse perspectives and foster engagement, motivation, and ownership among them, some practical challenges can impact its implementation. The operationalization of co-creation needs a feasible, step-by-step plan to address interpersonal, practical, and institutional challenges, which can undermine co-creation. This guide examines how Artificial Intelligence (AI) can be leveraged across all phases of the co-creation cycle—preparation, conduction, and follow-up. It offers innovative insights into the intentional deployment of AI tools to enhance collaboration while preserving the relational essence of co-creation. We describe how AI can facilitate recruitment of diverse participants, design and planning of co-creation activities, brainstorming, shared decision-making, process evaluation, dissemination of outcomes, and integration of co-created outcomes into the curricula. This guide applies the Substitution, Augmentation, Modification, Redefinition (SAMR) model and the Technology-Organization-Environment (TOE) framework to theoretically examine how AI can enhance or fundamentally reshape co-creation. It also underscores essential ethical considerations for integrating AI into co-creation. After reading this guide with comprehensive and practical guidelines, educators can effectively integrate AI into co-creation initiatives, aiming to enhance both the processes and outcomes of co-creation.

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Introduction

Health professions education (HPE) is undergoing a significant transformation, shifting from traditional, person-centered learning to collaborative knowledge synthesis. This shift reflects a broader change in higher education, where students are no longer seen as passive recipients of information but as active contributors to their own learning. Advances in technology, access to information, and the growing complexity of healthcare have catalyzed the need for more dynamic and participatory learning environments that prepare future professionals to think critically, solve problems collaboratively, and adapt to rapidly evolving knowledge landscapes [1]. Built on values, such as reciprocity, inclusivity, empowerment, and trust [2], co-creation has emerged as a transformative strategy, positioning students as active partners in shaping their education and as a means to democratize education and enhance its relevance [3]. Despite its well-documented advantages, such as enhanced motivation, improved critical thinking, and better learning outcomes [4], the practice of co-creation remains underutilized and inconsistently applied within the HPE context [5]. This underscores the necessity for innovative tools and strategies that can facilitate its broader implementation. Recently,

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Practice points

- AI can facilitate inclusive and diverse stakeholder engagement in co-creation by utilizing adaptive tools to identify and recruit a wide range of participants and promoting equitable representation.
- AI tools can support co-creation by transcribing discussions, extracting and thematically clustering key ideas, and presenting them through visual dashboards and concise summaries to enhance decision-making, transparency, and continuity.
- By monitoring participation metrics and conducting sentiment analysis, AI can provide actionable insights that inform improvements of the co-creation process and encourage the adoption of co-creation practices within institutions.
- It is essential to consider key challenges in integrating AI into co-creation, such as ensuring reliability, addressing bias and equity, and balancing technology with human interaction.

Artificial Intelligence (AI) has emerged as a transformative element in education, presenting unique opportunities to promote co-creation by enhancing personalization, fostering real-time collaboration, and alleviating administrative burdens [6].

Co-creation is associated with a range of educational benefits, including better student engagement, increased satisfaction, deeper learning experiences, and the development of professional competencies [3,4]. By positioning students as active contributors to their learning environments, co-creation cultivates a sense of ownership, empowerment, and mutual respect [7]. In addition, it can boost students' confidence, motivation, and well-being [7,8] while also inspiring faculty to transform their teaching perspectives [9,10]. When done properly, engaging students and faculty in such collaborative initiatives can foster a psychologically safe and collaborative institutional environment [11,12].

Nonetheless, the implementation of co-creation in practice is fraught with some challenges. The Process-Outcome Model [13] explains that many co-creation initiatives focus on the final outcomes (i.e. curricular changes) while neglecting the nuanced interpersonal and institutional dynamics that shape the co-creation process itself. For instance, faculty members may experience discomfort in relinquishing control, while students may feel unprepared or hesitant to engage meaningfully in curriculum design and decision-making processes, stemming from a lack of expertise and resources [9,14]. A recent scoping review highlights that students are often positioned as data sources rather than genuine design partners, resulting in pseudo-partnerships that undermine the goals of inclusion, empowerment, and mutual learning [8]. Furthermore, obstacles, such as time constraints, ambiguous expectations, and limited training in partnership methodologies can hinder the depth and sustainability of co-creation initiatives [3]. Moreover, co-creation often requires significant investment in time, meticulous planning, and logistical support. The utility of co-created content hinges on how effectively it is evaluated, disseminated, and integrated into the curriculum; these processes are both demanding and time-consuming. Collectively, these challenges can compromise not only the quality of the co-creation process but also the relevance of its outcomes.

AI can play a significant role in addressing both process- and outcome-related challenges in the co-creation of education between educational stakeholders. AI could have the potential to be a distinct partner providing input during co-creation initiatives; however, this guide focuses on its role in facilitating co-creation between humans. AI can be a valuable partner here, adept at managing complex tasks while also enhancing essential human qualities, such as creativity and emotional intelligence [15,16]. By fostering an inclusive approach, encouraging human facilitation, and leveraging data-informed practices, AI can improve the utilization and dissemination of co-creation within educational settings. Nevertheless, the integration of AI may raise important concerns, highlighting the need for a thoughtful approach to ensure that technological tools complement—not supplant—the foundational elements of authentic partnerships. This guide explores the potential utility of AI in enhancing co-creation efforts and offers practical recommendations for educators and institutional leaders seeking to leverage AI in the collaborative development of educational practices within their organizations. Furthermore, it discusses crucial considerations for the effective integration of AI into co-creation processes.

Leveraging AI in co-creation

In our recently published *Twelve Tips* article, we outlined a structured and practical approach to co-creation in HPE, organized across three key phases: *preparation*, *conduction*, and *follow-up* [17]. In the following section, we explore how AI can be practically integrated into each of the three phases to enhance both co-creation processes and outcomes. The overarching role of AI in facilitating various phases of

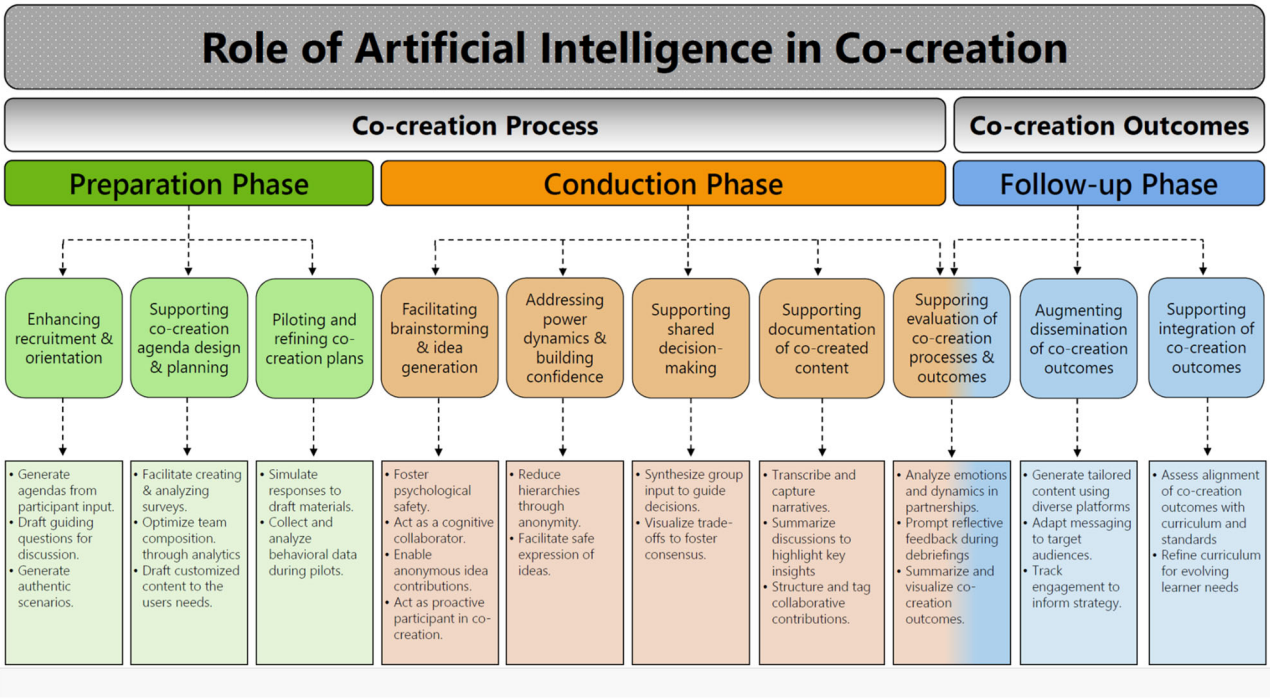

Figure 1. Tips for facilitating roles of AI across the three phases of co-creation (preparation, conduction, follow-up) and supporting examples.

co-creation in HPE is illustrated in Figure 1, accompanied by relevant examples.

Use of AI in the preparation phase

Enhancing recruitment and orientation

Recruiting diverse and suitable participants is essential for a successful co-creation activity. The recruitment process should be voluntary to maximize participation, which can be achieved through a brief online survey to gauge the willingness of potential co-creators and facilitators [17]. AI tools (see Box 1 for a glossary of AI tools) can simplify this process in various ways. For example, they can facilitate the creation of recruitment surveys or forms and automate the analysis of responses using natural language processing (NLP) tools. These systems can also analyse responses received through open or closed-ended questions and identify alignment between applicants' goals and project's objectives [18]. In cases where co-creation initiatives have been previously conducted, machine learning models can analyse historical participation data (e.g. engagement levels, contribution quality) to support evidence-informed recruitment of both participants and facilitators [19]. Upon selecting participants, AI-powered orientation tools—such as adaptive learning modules and intelligent chatbots—can deliver customized onboarding experiences. These technologies evaluate users' prior knowledge, roles, and learning preferences to dynamically tailor the co-created

Box 1. Glossary of AI tools.

AI tools	Definitions
Natural language processing (NLP) tools	Software systems or applications that enable machines to read, understand, interpret, generate, and respond to human language in a way that is both meaningful and useful, facilitating human–computer interaction in various domains [60].
Machine learning model	A mathematical or computational structure that is trained on data to identify patterns or make predictions or decisions without being explicitly programmed for specific tasks [61].
Adaptive learning modules	Instructional systems that dynamically tailor educational content, activities, and pacing to individual learner characteristics (e.g. knowledge level, learning preferences, performance) using machine learning and real-time analytics [62].
Intelligent chatbots	Natural-language-driven systems that are designed to automate conversations by simulating a human conversation partner and provide immediate support by answering questions, offering explanations, and providing additional resources [63].
Generative AI	A group of AI algorithms and models that learn the patterns and structure of the input data and generate new data (i.e. text, images, and/or media) with similar characteristics with human-like creativity and adaptability [64].

content. Furthermore, they provide real-time, interactive guidance to establish a shared foundation for effective collaboration [20]. By adapting to participants' and facilitators' prior knowledge levels and preferences, these AI tools can help create an inclusive onboarding experience for all participating stakeholders [21].

Supporting co-creation agenda design and planning

Creating a detailed and realistic agenda is essential for effective co-creation activities, as spontaneous improvisations can be difficult. A structured plan helps facilitators manage time, assign roles, maintain alignment across groups, and guide meaningful discussions. Custom-designed AI bots can help facilitators prepare inclusive and relevant agendas by analysing preliminary inputs from online surveys (e.g. student evaluations, feedbacks, or reflections) or forum discussion boards *via* AI-integrated Learning Management Systems (LMS). This process ensures that the agendas are grounded in participant interests and concerns [22]. Generative AI tools can also assist in drafting guiding questions, reflection prompts, or preparing documents that help stimulate discussions. Facilitators planning to implement AI assistance could utilize separate prompts and interfaces for the ideation and refinement phases to facilitate better AI feedback [23]. AI can, additionally, contribute to designing collaborative activities by generating realistic case studies, scenario-based prompts, and audiovisual aids. These can be used in face-to-face co-creation sessions or embedded into virtual or hybrid interactive tools, ensuring engagement across modalities [24].

Piloting and refining co-creation plans

Piloting co-creation sessions is a vital step in identifying and addressing potential logistical, technical, or engagement-related issues before the main activity [17]. It enables facilitators to refine session agendas, test digital tools, and clarify instructions, thereby increasing the likelihood of a smooth and productive co-creation process. AI can support this phase by simulating participant responses to draft materials and help detect ambiguities and areas of low engagement. In in-person pilot settings, AI-enhanced tools (e.g. wearable sensors or mobile tracking apps) can gather observational data, such as time-on-task, turn-taking frequency, or speech dynamics. In virtual environments, AI-driven analytics (e.g. clickstream data, engagement heatmaps, and sentiment analysis) can provide insights into user behaviour and interaction quality. These data-driven insights support iterative refinement of agendas, materials, and facilitation strategies, ultimately leading to more seamless and impactful co-creation experiences.

Use of AI in the conduction phase

Facilitating brainstorming and idea generation

Free idea generation is vital in co-creation, and fostering psychological safety encourages participants to share diverse and creative contributions without fear of judgment. This openness not only enriches the quality of outputs but also boosts participants' confidence and motivation, making them feel valued and invested in the co-creation process [25]. In co-creation sessions, AI tools can act as cognitive collaborators. For instance, idea generation platforms, concept mapping tools, and AI-powered writing assistants can help participants organize thoughts and visualize emerging themes [6]. These tools can be screen-projected or printed in a face-to-face setting or integrated into online platforms. Moreover, by enabling anonymous contributions, AI can help in enhancing inclusivity and motivation amongst students during brainstorming sessions in both virtual and face-to-face settings. For instance, students may choose to submit ideas *via* mobile apps or online forms as an alternative to speaking aloud, which can then be clustered, synthesized, and presented without attribution using AI. Furthermore, AI-based dialogue systems can be enhanced with analytics features that monitor and evaluate the quality of the co-creation process in real-time, providing valuable feedback [26,27].

Addressing power dynamics and building confidence

Hierarchical barriers, often stemming from entrenched power dynamics, cultural norms, or perceived differences in expertise, can be daunting for co-creation. They might inhibit equal participation, suppress open communication and creativity, reduce diversity of thoughts, and weaken collective ownership of co-creation outcomes [7,28,29]. According to Healey and Harrington [2], key values from scholarly literature and practice regarding partnership and student engagement include reciprocity, trust, and empowerment. By fostering diverse input within interdisciplinary teams, AI has the potential to help mitigate barriers to collaboration. For instance, in face-to-face settings, anonymous digital polling tools allow students to share their opinions without fear of judgment. In online environments, AI chatbots offer a safe space for students to privately rehearse their contributions, refine their ideas, or seek

clarification without judgment [30]. Moreover, by anonymizing contributions and offering equitable ways to participate, AI can promote psychological safety and empowerment across all formats. Additionally, tools, such as multilingual chatbots and real-time language processing can facilitate cross-linguistic collaboration [31]. Assistive technologies, including speech recognition, text-to-speech, and adaptive interfaces can enhance accessibility for under-represented and disabled students [32].

Supporting shared decision-making

Shared decision-making is essential for co-creation because it fosters a sense of ownership, trust, and mutual respect among all participants in the co-creation process. When decisions are made collaboratively, contributors are more engaged and motivated, resulting in outcomes that are relevant, inclusive, and reflective of diverse perspectives [33]. AI can support collaborative decision-making by synthesizing group input and identifying consensus or divergence. Whether analysing transcripts from in-person discussions or chat threads from online platforms, sentiment analysis and summarization tools provide facilitators with real-time insights into participant perspectives [34]. Moreover, AI-powered visual tools, such as decision-support dashboards can visually map trade-offs, highlight unresolved questions, and present evidence to stimulate discussion and consensus building among participants. Depending on the co-creation modality, these visual aids can be shared on physical boards or digital screens. While generative AI tools offer efficiency and scalability, they may inadvertently oversimplify complex decisions and discussions that arise from co-creation, particularly in contexts that require cultural sensitivity or involve marginalized groups. In such cases, nuanced understanding *via* human oversight remains indispensable. Thus, fostering effective human–AI collaboration is essential to ensure richness and diversity [35].

Supporting documentation of co-created content

Integrating ideas and viewpoints into the educational design is heavily dependent upon how comprehensively participants' narratives are captured and documented during the discussion. Accurate and comprehensive documentation of educational innovations is essential for transparency, iterative development, and knowledge transfer [17]. However, keeping track of multiple discussion threads, decisions, and rationales in real-time can be overwhelming. AI tools can significantly ease this burden during the co-creation process. For instance, AI-powered transcription services can automatically generate transcripts of audio and/or video recordings of the co-creation sessions and field/scribe notes, which can later be summarized using large language models (LLM) to highlight key decisions, emerging themes, and unresolved issues [23]. NLP tools can extract action items or map decisions to design elements, aiding in the structured recording of design processes. Furthermore, AI-integrated platforms can help tag, organize, and store notes on collaboratively developed ideas, making the evolution of ideas traceable. By reducing the manual workload, AI enables facilitators to focus more on engagement and less on administrative tasks, while ensuring the co-creation process is thoroughly and accurately captured [36].

Use of AI in the follow-up phase

Supporting evaluation of co-creation processes and outcomes

Collaborative reflection on student–staff partnership processes is crucial for the success of co-creation [13]. It helps participants adjust to new roles, build trust, and develop a deeper understanding of one another's perspectives [37,38]. Key features of partnership dynamics (i.e. emotions, familiarity, and responses to ideas), captured through facilitators' field notes or discussion transcripts, can be analysed by NLP tools to enhance this reflection. We previously recommended debriefing stakeholders immediately after co-creation sessions to ensure transparency, accuracy, and equity (see Tip 11 in [17]). AI can augment these debriefings by prompting micro-reflections at key moments, automatically summarizing participant ratings on clarity, engagement, or satisfaction. These just-in-time analytics support timely evaluation and adjustment, reinforcing a culture of continuous improvement. Additionally, AI can detect underrepresented voices through interaction pattern analysis (e.g. speaking time, tone, or turn-taking) and alert facilitators in real time. AI can also play a significant role in supporting the evaluation of co-creation outcomes by extracting key themes, sentiments, and consensus points from qualitative data. AI-powered visualization platforms can then be used to generate and present findings through interactive dashboards or summary reports.

Augmenting dissemination of co-creation outcomes

Following the completion of the co-creation process, the next step is to disseminate the outcomes. The dissemination of co-created outcomes (i.e. courses,

learning resources, assessments, policies) is not only aimed at information sharing but also at bringing about attitudinal change among stakeholders who are reluctant to embrace the value of co-creation, thereby fostering more sustainable and long-lasting systemic change [7,9,39]. AI can support the dissemination of co-creation outcomes by automatically generating tailored summaries, visual abstracts, or multimedia content (e.g. short videos, infographics, or podcast scripts) suitable for various formal platforms (i.e. university newsletters, conference contributions, and university/school websites) and informal platforms (i.e. WhatsApp, Twitter, LinkedIn, Facebook, podcasts). Natural language generation tools can further broaden the reach and impact by adapting messaging for different audiences (such as students, faculty, or administrators). AI-powered analytics can also track engagement across platforms and identify which formats or channels are most effective in promoting understanding and uptake of the information about co-creation outcomes.

Supporting integration of co-creation outcomes

Successful integration of co-created ideas into the curriculum is essential to ensure that the collaborative efforts of students and faculty translate into meaningful educational change. Without implementation, co-creation risks becoming a symbolic exercise rather than a driver of educational improvement. Integration of co-creation outcomes often encounters challenges, such as limited faculty buy-in, a lack of resources to support implementation, or misalignment with institutional goals [11]. AI can support this integration process by assessing the alignment of co-created content with predefined curricular goals and comparing it against local or global standards [40]. For example, AI analytics can review co-created content to identify overlaps, gaps, or misalignments with existing curriculum frameworks and suggest revisions to better align with predefined goals or requirements. This AI analytics approach can also be used for the continuous monitoring of curricular alignment with the evolving needs of students. This data-driven approach provides a solid foundation for evidence-based decision-making, adaptability, and sustainability while significantly reducing manual workload [41].

In summary, AI can be effectively integrated into each of the three phases of co-creation initiatives—preparation, conduction, and follow-up—thus enhancing both the co-creation processes and their outcomes. An array of tools exists that can be used in each of these phases. In Table 1, we mention a few examples of AI tools and their applications across all three phases. Although readers may find these

Table 1. Overview of AI tools and their possible applications across the phases of co-creation.

	Co-creation phases		
AI tools	Preparation phase	Conduction phase	Follow-up phase
Natural language processing (NLP) tools (e.g. Qualtrics Text iQ, MonkeyLearn, Google NLP, OpenAI GPT)	• Analyse survey responses to align goals with project objectives • Process forum inputs to inform the agenda	• Sentiment analysis of discussions • Classify contributions for shared decision-making	• Analyse transcripts/field notes for emotions and perspectives • Summarize reflections • Extract themes and sentiments
Machine learning models (e.g. XGBoost, NVivo, MAXQDA, MonkeyLearn, OpenAI GPT)	• Analyse historical data to predict suitable participants and facilitators	—	• Identify underrepresented voices and interaction patterns; detect themes from qualitative data
Adaptive learning modules/ intelligent chatbots (e.g. Knewton Alta, LearnWorlds, Custom GPT Bots)	• Customize onboarding content to knowledge levels and preferences	• Offer safe rehearsal spaces and anonymous support to participants	• Prompt micro-reflections • Support post-session debriefings
Generative AI (e.g. ChatGPT, Claude)	• Draft guiding questions, case studies, and reflection prompts, • Design audiovisual aids for agenda planning	• Act as dialogic co-creators or simulated stakeholders in brainstorming and discussions	• Generate tailored summaries, visual abstracts, and content for dissemination
AI-integrated learning management system survey platforms (e.g. Canvas, Blackboard, Brightspace)	• Analyse preliminary inputs to inform agenda planning	• Collect and synthesize anonymous brainstorming input	• Track engagement and the format efficacy of dissemination
AI-powered writing assistants/ concept mapping tools (e.g. OpenAI GPT, Miro, Notion, MindMeister)	—	• Help participants organize ideas, generate content, and visualize themes	—
AI-powered simulators/analytics dashboards (e.g. Tableau, QualtricsXM, IntelliBoard)	• Simulate responses to identify ambiguities or engagement issues in pilot testing	• Provide real-time feedback and classify the quality of the discussion	• Visualize evaluation findings • Present interactive summaries
AI-driven transcription services (e.g. Otter.ai, MS Teams, Zoom AI)	—	• Document discussion content in real time	• Create transcripts for reflection and reporting • Extract key takeaways
AI-based visual analytics tools (e.g. Tableau, Altmetric, PlumX)	—	• Display decision-support dashboards to show trade-offs and consensus	• Present dissemination metrics and engagement dashboards

examples helpful, we anticipate a rapid evolution and expansion of AI tools over time, which may render the provided examples obsolete in the near future.

Theoretical frameworks of AI in co-creation

In this section, we outline two educational frameworks that can support the understanding of the above described practical approaches for using AI in co-creation: (1) the Substitution, Augmentation, Modification, and Redefinition (SAMR) model, and (2) the Technology-Organization-Environment (TOE) framework. Together, these two theoretical frameworks provide conceptual clarity and support to the previously discussed practical strategies. These frameworks also illustrate that the integration of AI in co-creation must be sensitive to the specific context and grounded in sound theoretical principles.

The SAMR model

The SAMR model offers a practical, task-focused lens for integrating AI into co-creation processes. Originally developed to evaluate the use of technology in education, SAMR outlines four progressive levels of technology integration: Substitution, Augmentation, Modification, and Redefinition [42]. These levels reflect a shift from basic enhancement of learning activities to complete transformation. Below, we briefly describe each level of the SAMR model and illustrate how AI tools can be applied accordingly to support and transform the co-creation process.

At the *Substitution* level, technology functions as a direct replacement for traditional tools, without altering the task itself. In the context of co-creation, AI does not fundamentally change how an activity is performed; it simply replaces a human function with an automated one. For instance, during the conduction phase, AI can serve as a note-taker by transcribing discussions. Similarly, in the follow-up phase, AI-driven transcription tools can replace manual efforts to document co-creation sessions, offering significant gains in speed and efficiency. These examples illustrate how AI can substitute human labor in co-creation activities, resulting in substantial time savings while maintaining the original task structure.

At the *Augmentation* level, technology offers functional improvements. This means that using AI in co-creation allows participants to perform tasks more effectively than they could without AI [43]. AI can support idea generation and refinement by enabling students and faculty to collaboratively brainstorm, synthesize large volumes of input, and refine early drafts. This not only streamlines the co-creation process but also makes it more inclusive by reducing the cognitive and linguistic barriers associated with content development. In addition, AI facilitates real-time feedback on aspects, such as clarity, tone, and logical consistency in co-created materials, allowing participants to iterate more rapidly and confidently without requiring additional intervention. Finally, AI augments accessibility and equity in co-creation by offering tools, such as automated translation, speech-to-text conversion, and content simplification. These features enable broader participation from diverse stakeholders, including those with language barriers or learning difficulties, thereby supporting more equitable and representative collaboration.

At the *Modification* level, AI can support a significant redesign of the co-creation process, enabling users to achieve objectives that are conventionally difficult or impractical. For instance, during orientation sessions, AI can assist co-creators in identifying personalized reading materials aligned with their prior knowledge, interests, or intended contributions [42,43]. This targeted support transforms the preparation process and enhances engagement with content. This targeted scaffolding enhances participants' readiness and deepens engagement. During the conduction phase, real-time clustering and synthesis algorithms can process and organize participant inputs during brainstorming sessions, enabling facilitators to adapt the direction of discussions based on emergent themes. Additionally, AI-driven discourse analytics can identify patterns of engagement, detect potential power imbalances, and highlight underrepresented perspectives, thereby informing more equitable practices. In these ways, AI enables a reconfiguration of the co-creation process that enhances interactivity, inclusivity, and pedagogical relevance.

At the *Redefinition* level, AI enables the creation of entirely new pedagogical practices and collaborative tasks that are often inconceivable or impractical due to time or expertise constraints. For instance, during the conduction phase, generative AI tools can introduce novel perspectives or analogies in real-time, enriching the depth and creativity of co-creation dialogues. By supporting dynamic, context-aware contributions, AI can not only expand the range of inputs but can also reshape the nature of engagement, making the co-creation process more adaptive and inclusive [42].

Although it may be tempting to 'climb the ladder' to reach the redefinition level, co-creators must carefully evaluate whether a given technology serves a meaningful pedagogical purpose. While the SAMR model is often presented as a hierarchy, scholars have argued that it should instead be viewed as a flexible toolbox, where each level is valuable depending on the context [44]. It is not necessary to implement technology at every level or to assume that 'higher' levels are always better. Rather, the model should guide thoughtful decisions about how specific technologies

can enhance distinct phases of the co-creation process. Moreover, the SAMR model does not account for the organizational and contextual factors that influence the adoption of AI in co-creation. Therefore, integrating an additional theoretical lens (i.e. TOE framework) may provide a more comprehensive understanding of the AI implementation in co-creation contexts.

The TOE framework

The Technology-Organization-Environment (TOE) framework provides a lens for analyzing the multifaceted factors that influence the adoption and integration of emerging technologies, such as AI, within co-creation initiatives. This framework asserts that the successful implementation of technology is contingent upon the dynamic interplay among three primary contexts: the technological characteristics of the innovation; the organizational readiness and structural attributes; and the broader external environment in which the organization functions [45,46].

The technological characteristics of AI tools—including their technical feasibility, reliability, and adaptability—must align closely with the objectives of the co-creation process. For example, generative AI systems that support brainstorming or adaptive platforms that provide personalized feedback must be capable of processing complex educational data in real time to dynamically support co-creation activities. This directly aligns with the use of AI-powered brainstorming tools and adaptive platforms, such as concept mapping software and personalized feedback systems, discussed above in the conduction phase. Moreover, compatibility with existing institutional infrastructure and workflows is crucial to ensure maximum efficiency.

Organizational factors play a crucial role in AI adoption. Institutional readiness, encompassing resources, such as funding and technical support, significantly impacts AI integration in co-creation activities. Leadership commitment and attitudes towards AI [47] can either facilitate or hinder co-creation efforts. Furthermore, the external environment also influences AI adoption in co-creation [48]. Regulatory and ethical considerations—such as data protection, transparency, and adherence to relevant institutional policies—ensure the safe and equitable integration of AI. These factors promote psychological safety and trust, which are essential for effective collaboration [49].

Finally, partnerships with external stakeholders, including accrediting bodies and professional organizations, help ensure that AI solutions are responsive to real-world educational needs and are used ethically, judiciously, and responsibly. Therefore, when adopting AI to support co-creation, it is important to carefully consider the characteristics of the AI technology, institutional environment, and external factors to ensure that its application in co-creation is both effective and realistic.

Challenges and opportunities in integrating AI into co-creation from theoretical perspectives

Integrating AI into co-creation initiatives offers both opportunities and challenges. The SAMR model helps conceptualize how ethical and practical complexities increase as AI moves from simple *substitution* to transformative *redefinition*. The TOE framework further reminds us that successful AI integration depends not only on the technology itself, but also on organizational readiness and the broader environment. As AI shifts from automating basic tasks to fundamentally reshaping collaboration, co-creators must anticipate greater implementation challenges and potential disruptions.

Substitution phase: Reliability and security

At the substitution level, AI can replace manual tasks, such as transcription. While this boosts efficiency, it raises concerns about reliability—such as errors with accents or technical language—and data security, especially when sensitive discussions are processed by third-party platforms [50]. As TOE framework highlights, organizational factors, such as secure infrastructure and clear policies, are essential for safeguarding privacy and ensuring trust [6,49,51].

Augmentation phase: Bias and equity

As AI tools become more advanced (i.e. enhancing translation, generating ideas, consensus building) issues of algorithmic bias, data transparency, and equitable participation become more pronounced [52–54]. AI systems can unintentionally marginalize minority voices or reflect cultural biases, especially if training data lack diversity [55]. The TOE framework encourages organizations to ensure that AI tools are contextually relevant and deployed ethically, with robust oversight and clear consent processes. Co-creators should critically evaluate AI outputs and contextualize them to local needs, maintaining fairness and inclusivity.

Modification and redefinition: Balancing technology and human interaction

At higher SAMR levels, AI enables new ways of working (i.e. real-time multilingual collaboration and AI-driven ideation), but also risks reducing interpersonal interaction and exacerbating power

imbalances. The TOE framework emphasizes the significance of organizational culture, leadership, and external regulations in fostering responsible AI use. To preserve the quality of co-creation, it is vital to balance technological input with face-to-face dialogue, ensure human oversight in data interpretation, and provide training on AI capabilities and limitations [56]. Clear guidelines, shared expectations, and opportunities to voice concerns foster psychological safety and trust, helping co-creation groups navigate the ethical and relational complexities of advanced AI integration. It is essential to also acknowledge that AI can misinterpret behaviors, potentially perpetuating stereotypes and infringing on privacy [57]. These issues raise significant ethical concerns, particularly regarding surveillance and privacy risks in sensitive contexts, such as co-creation. This viewpoint aligns with the criticisms in the EU AI Act, which restricts emotion recognition in educational settings due to concerns about accuracy and informed consent [58,59].

Conclusion

Integrating AI into co-creation of educational initiatives necessitates a strategic approach that addresses technological, organizational, and social dimensions. AI can be effectively incorporated into each of the three phases of co-creation—preparation, conduction, and follow-up—to enhance both the processes and outcomes of co-creation efforts. Planners of co-creation initiatives can fully leverage AI's capabilities to improve collaboration, facilitate informed decision-making, and foster a more inclusive and effective co-creation experience. This can be achieved by utilizing frameworks, such as the SAMR model (Substitution, Augmentation, Modification, and Redefinition) and the Technology-Organization-Environment (TOE) framework. Nonetheless, it is imperative to anticipate and mitigate any potential biases and ethical challenges associated with AI utilization, ensuring that its implementation is both effective and responsible.

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