



## A Literature Review on Aligning Curricula with ChatGPT

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The primary function of ChatGPT is to serve as a cognitive artifact that contributes to solving human cognitive tasks. The purpose of this study is to review how generative AI can be aligned with curricula, offering guidance for curriculum designers and practitioners. The study employed the semi-systematic literature review method. The inclusion criteria of the study include research addressing the purpose, content, learning experience, and assessment dimensions of curricula. Aligning curricula with GenAI involves not only encouraging its use but also establishing rules and, when necessary, implementing restrictions. While interaction with GenAI can be intentionally integrated into certain learning outcomes, it may not be required for others. Curriculum designers and teachers, just as they align courses and content, should treat GenAI as a distinct area of focus and ensure proper alignment. In this context, it is recommended that decisions be made on whether GenAI use should be incorporated, restricted, or prohibited depending on the targeted cognitive skills, and that students utilize GenAI as a preparatory tool for idea generation during the process of re-constructing course content. Another suggestion is that the distinction between conversational and learning purposes be clearly established when GenAI is employed as a tool for interaction and learning, and that supervised applications, along with open-use procedures, be developed for assessment and evaluation practices.

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## Introduction

Large language models (LLMs) such as ChatGPT can generate cognitive products upon request—poems, essays, news articles, and academic papers. These developments make LLMs particularly concerning for educators who rely on writing assignments to evaluate students' learning outcomes (Aylsworth & Castro, 2024). The central question is how digital tools such as ChatGPT and other LLMs can be employed without undermining students' cognitive skills and academic growth. Teachers' primary fear is that when confronted with a learning challenge, students may increasingly delegate much of their assignments and tasks to ChatGPT (Cassinadri, 2024). Alongside these concerns, many educators also view artificial intelligence as a supportive tool rather than a threat to their work. Teachers emphasize that generative AI can help reduce their workload and support student learning (Bower et al., 2024). When used transparently and in alignment with school policies and curricula, AI tools can help students develop stronger thinking skills while maintaining academic integrity (Hernholm, 2025).

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When evaluated through the concepts and practices of curriculum studies, the impact of generative AI on curricula brings us to the field's most traditional question. Holmes et al. (2019) provocatively asked; "If you have a cognitive tool that searches and produces, why would you need to learn? What is truly worth learning?" This echoes Spencer's seminal essay "What knowledge is of most worth?" which initiated deep inquiry into what should be taught in education and continues to guide curriculum design. Jongkind et al. (2025) accurately note that GenAI possesses capabilities that overlap with the learning outcomes of many curricula. Therefore, its impact on curriculum learning outcomes, content, and assessment practices must be evaluated. The purpose of this study is to conduct a review on aligning curricula with GenAI and to develop guiding principles for curriculum designers and practitioners. Every educational institution should continuously review its teaching and assessment procedures to respond to the growing power of AI tools and students' increasing proficiency in their use. Each instructional and assessment activity should be stress-tested using the most powerful public AI tools—for example, the paid version of ChatGPT (Freeman, 2025). According to Ng'ambi (2013), the gap between technologies supported and used by teachers and those adopted by students in their everyday learning practices creates constant "catch-up game" pressures. In the long-term scenario, we must consider adapting curricula to meaningfully integrate ChatGPT into education (Mai et al., 2024). For instance, learning objectives should emphasize the development of higher-order skills such as creativity and critical thinking.

On November 30, 2022, with the public release of the beta version of ChatGPT, OpenAI paved the way for generative AI to be used in a wide range of cognitive tasks in everyday life and workplaces, including content creation, translation, answering detailed questions across many fields, programming, report generation, letter drafting, and automating customer service (McKinsey & Company, 2024). The large language models underlying generative AI produce coherent, grammatically correct sentences by learning to predict words based on the statistical representation of simultaneity patterns in human-generated text (Brynjolfsson et al., 2025). Their fluent, coherent, and grammatically accurate sentences evoke human conversational models, creating a compelling illusion of conversing with an intelligent being (Roche et al., 2002). Generative AI's knowledgeable and "wise" demeanor can appear to beginners as if they are using a form of machine wisdom to access, interpret, evaluate, and synthesize collective human knowledge. At the same time, it shapes its responses by drawing inferences from user interactions, learning from the interlocutor as part of the process (Valcea et al., 2024). However, the conversational appearance of wisdom is misleading, LLMs do not actually understand words or context (Weidinger et al., 2021). What makes them so impressive—and simultaneously deceptive—for the human brain is this unassimilated, context-free coherence, fluent output without understanding, values, or meaning (Valcea et al., 2024). The key issue here is the contrast between human cognition—which is based on context, meaning, experience, and values—and the output of LLMs, which generate information and knowledge without understanding or assimilation.

### ***Giving ChatGPT a Cognitive Task as a Cognitive Artifact***

Cognitive artifacts provide us with physical objects created or modified to contribute to the completion of a cognitive task, offering representations that we use to substitute, construct, or complement our cognitive processes. Thus, they change the original cognitive task or create a new one (Fasoli, 2018). ChatGPT can be defined as a multifunctional, computational cognitive artifact that can be used to contribute to the completion of various cognitive tasks by providing textual representations that we can use to substitute, construct, or complement our brain-based cognitive processes and abilities (Cassinadri, 2024). The aim is to help the human



perform a cognitive task better, or to transform that task and enable it to be performed in a different way. Cognitive artifacts not only facilitate the task but also change its nature. Cognitive artifacts, to which we assign the tasks of producing knowledge and cognition, will significantly reduce the cost of thinking processes, both individually and collectively. Just as the internet reduced the cost of transmitting knowledge to zero, GenAI will reduce the cost of cognition to zero (Lakhani & Ignatius, 2023). The reduction of the cost of cognition to zero will have significant effects on curricula based on the transmission and processing of knowledge and information.

We give our students many cognitive tasks such as remembering, interpreting, analyzing, applying, evaluating, and creative thinking. Students should complete these cognitive tasks without transferring them to cognitive artifacts. If ChatGPT completely produces something in your place, then it substitutes your lower-level skills. When used substitutively, it completely takes over and replaces cognitive processes. If the person is using higher-order cognitive abilities and intellectual virtues but employs ChatGPT as a complementary cognitive artifact, then it is being used in a complementary way. If you are thinking and writing, but use ChatGPT only for structuring, checking, correcting, or directing, this means that it supports your process. ChatGPT can be used as a temporary scaffold in the stages of learning as a constructive cognitive artifact (Cassinadri, 2024). Here the basic principle in giving cognitive tasks is that students must still be able to demonstrate that cognitive skill without any technological support. Just as a pilot must still be able to fly an aircraft without technological assistance (Bliszczyk, 2023). Students must be able to perform cognitive tasks such as remembering, interpreting, summarizing, explaining, and applying an idea to a new situation without ChatGPT. This means that as a result of these cognitive artifact assignments, we will accept some cognitive skill loss. The acceptance of some cognitive skill losses will indicate that those learning outcomes have not been achieved in curricula.

### ***Possible Impacts of GenAI on Curricula***

As expressed in Tyler's (2013) rational model, curricula primarily focus on the educational aims to be achieved, on the selection and organization of experiences necessary to reach these aims, and on determining the extent to which the aims have been attained. Generative AI has led to questioning the validity of some of the intended learning outcomes in curricula (Jongkind et al., 2025). It is necessary to investigate the effects of GenAI on the learning outcomes, content, teaching methods, and particularly the assessment practices of all curricula. Such investigations can be considered as checking whether our curricula have sustained damage after an "AI earthquake." The first step is to decide which learning outcomes students should achieve without GenAI. The next step is to determine for which learning outcomes they will be allowed to use it. Teaching students how to use GenAI for their learning goals is the following stage (Jongkind et al., 2025). This would mean that while writing learning outcomes, we will begin to see objectives such as "controls, improves, and evaluates using generative AI." Beyond writing, tasks requiring mathematical foundations, coding assignments, and almost all subject areas are being influenced by the cognitive production capacity of GenAI.

Many institutions and school districts have begun to examine the resilience of their curricula against the shockwaves of AI and their adaptation to this new development. Jongkind et al. (2025) conducted an impact study to determine whether a Medical Informatics undergraduate program was resilient to GenAI. Their study found that 74% of the program's learning outcomes were partially at risk, and 14% were at high risk. Particularly at risk were learning outcomes involving academic reports, business plans, recommendation reports, and take-home

exams. Workshops with faculty members revealed that the majority of learning outcomes consisted of fundamental knowledge (80%), which was considered essential for the field and should continue to be taught. For the remaining 20% of learning outcomes, it was indicated that they could (partially) be modified to include the use of GenAI. A study conducted in our country on the use of GenAI without acquiring basic knowledge showed that students with access to GenAI achieved performance scores 48% to 127% higher than those without access. However, in a subsequent similar task, students who had initially used GenAI scored 17% lower than those who initially had no access once generative AI support was removed (Bastani et al., 2024). A consistent and gradually increasing use of GenAI across programs was recommended. The important point here is to decide which learning outcomes students must achieve without GenAI, and which outcomes they will achieve by using generative AI as a cognitive aid.

In the study conducted by Jeon and Lee (2023) to experimentally examine the educational potential of ChatGPT, the authors found that the chatbot serves several instructional roles, including interlocutor, content provider, teaching assistant, and evaluator. In the interlocutor role, teachers used ChatGPT to conduct language practice with students through role-play activities and interactive games. Teachers also employed the chatbot as a teaching assistant by assigning it tasks such as activating background knowledge and checking grammar. In the content provider role, teachers had the chatbot generate materials including dialogue texts, short stories, and sample words or sentences. In the evaluator role, teachers used the chatbot for preliminary grading of students' writing. The authors emphasized that the materials provided by artificial intelligence do not automatically translate into quality teaching; rather, they gain meaning through teacher expertise and the classroom context. These findings demonstrate that these elements of the curriculum are being influenced by generative AI.

According to Bower et al. (2024), teachers who engage more with GenAI are better able to see the potential changes these technologies can bring to education. Prestridge and colleagues (2025) argue that teachers encountering new technologies in K–12 schools have generally integrated them into existing curricula and teaching practices, rather than fundamentally changing what and how they teach. This approach has, over time, domesticated the “transformative power” of most technologies. In contrast, Healy (2023) argues that technological developments not only support teaching practices but also compel a fundamental reconsideration of curricula and pedagogical approaches. Kim & Koo (2024) found that a syllabus generated by AI for a traditional course was perceived as higher quality than one created by humans. Their findings confirm that AI-generated curricula are more likely to be free from the subjective biases and features that influence human-produced content. UNESCO (2023) has noted that students' commitment to educational content based on human-produced and validated resources, textbooks, and curricula may weaken. It is necessary to re-evaluate which cognitive tasks students should perform with and without generative AI. Many questions remain to be answered, such as the potential impacts on curricula of the reduction of the cost of cognition to zero, and how to integrate content produced by humans and AI. Mai et al. (2024) point out that in a long-term scenario, we must consider adapting curricula to integrate ChatGPT meaningfully into education.

### ***Aligning the Curriculum with GenAI***

Curriculum alignment is defined as a strong connection among goals and assessments, goals and instructional activities and materials, and assessments and instructional activities and materials (Anderson, 2002). Biggs (1996) recommends the constructive alignment approach to make teaching more effective. This alignment encompasses the scope and validity of learning



objectives, the content, and the learning opportunities/activities. Alignment provides potentially useful diagnostic information to teachers who wish to improve curriculum coherence. With a poorly aligned curriculum, teachers may be “teaching their hearts out,” but if what they are teaching is not aligned with state standards, then that instruction is wasted. It is not lawful to award a high school diploma without providing learning opportunities for the topics included in a graduation-required test (Anderson, 2002). Martone and Sireci (2009) define alignment in the education system as a critical process ensuring consistency among curriculum standards, assessment tools, and classroom instruction. The authors emphasize that the alignment of state academic content standards with assessment tools is a legal requirement, otherwise, “a mismatch between what students are taught and what is tested” emerges. Considering GenAI as one of the core components of curricula and aligning it accordingly can expand the learning opportunities provided to students and offer alternative pathways for assessment and evaluation. At the same time, since GenAI will affect the standards of centralized examinations and preparation processes for these tests, alignment becomes necessary. The articles that emerged following the public release of ChatGPT’s free version can be seen as attempts to make curricula compatible with generative artificial intelligence. This alignment and compatibility will either be carried out scientifically and systematically or will emerge implicitly through the practices of teachers, students, and other stakeholders. In this study, a review has been conducted on the alignment of curricula with GenAI, and inferences have been drawn. The aim of the study is to compile research on the current status of GenAI in formal education processes and to provide insights for aligning curricula with GenAI.

## **Method**

The semi-systematic literature review is defined as a method that combines the rigor of systematic reviews with the flexibility of traditional narrative reviews (Snyder, 2019). This approach is used to provide a comprehensive mapping of studies within a particular field, to reveal thematic trends, and to shed light on future research agendas. While it does not claim to cover all relevant studies, the method is based on a systematic data collection process conducted within a defined time frame and subject boundaries. The reviewed literature is analyzed according to pre-defined themes based on research questions, making it possible both to synthesize existing knowledge and to identify conceptual gaps. With these characteristics, the semi-systematic literature review offers an effective research strategy, particularly for interdisciplinary and emerging topics (Snyder, 2019). The findings are expected to contribute to both curriculum designers and practitioners in preserving the quality of teaching activities within formal education institutions and in strengthening the alignment between generative artificial intelligence and curricula. For this purpose, a descriptive, textual narrative synthesis approach was applied. Such descriptive reviews assess the current state of the literature by focusing on specific thematic domains. The predefined thematic areas for examining the possible impacts of ChatGPT on the core elements of curricula and for determining necessary actions include learning objectives, content creation, teaching and learning activities, and assessment and evaluation. The purpose of these predefined themes is to facilitate the organization of the selected literature. Narrative synthesis is characterized by the application of a standardized data extraction format that directs the review toward different features of the literature, such as findings and context (Tillmanns et al., 2025). As a result of this standardized structure, both quantitative and qualitative studies related to each thematic domain were included.

The study covers research conducted between 2023 and June 2025. In this way, it encompasses the experiences, reflections, and interpretive studies that emerged following the introduction of

ChatGPT. Inclusion criteria included research covering the purpose, content, learning experience, and assessment dimensions of curricula. Exclusion criteria were based on publications prior to ChatGPT. Where deemed necessary, studies prior to this timeframe were also utilized in forming the conceptual framework and findings. During the literature search process, databases such as Google Scholar, ERIC, Web of Science and Scopus were used. In addition, searches were conducted in other databases that publish research on GenAI in education/teaching, including H.W. Wilson, Australian Education Index, IEEE Xplore, SpringerLink, LearnTechLib, and EBSCO.

## **Results**

The findings provide recommendations aligned with the predefined thematic domains related to GenAI in the curriculum: (1) learning objectives, (2) content, (3) teaching and learning activities, and (4) assessment and evaluation.

### ***Aligning Learning Outcomes with ChatGPT***

In the new curricula (TYMM) implemented in 2024, twenty cognitive skills that students are expected to develop have been identified. These skills include conflict resolution, observation, summarization, analysis, classification, information gathering, comparison, inquiry, generalization, inference, prediction based on observation, prediction based on existing knowledge/data, structuring, interpretation, reflection, reasoning, evaluation, discussion, logical verification, and synthesis. It is evident that generative AI can largely perform the formal and mechanical aspects of these cognitive tasks, except for reflection and observation skills. We thus face a cognitive tool that can carry out the integrated set of cognitive abilities we aim to cultivate in students through curricula. Moreover, as large language models with human-like responses include affective elements of communication—such as saying “thank you,” using “please,” and employing emoji generative AI can also be expected to influence the affective domain (Akbaş, 2025). Furthermore, with VR-like simulations that enhance and perceive physical skills, its impact is beginning to extend into the psychomotor domain. The key conclusion here is that we are confronted with a cognitive artifact capable of influencing not only cognitive objectives, but also affective and psychomotor objectives, with priority given to the cognitive domain.

The revised Bloom’s taxonomy focuses on hierarchical cognitive processes and thinking skills, remembering, understanding, applying, analyzing, evaluating, and creating. Higher-order cognitive processes are built upon lower-level processes such as remembering, understanding, and applying (Anderson et al., 2001). Bloom’s taxonomy is still widely used at all levels of education for teaching increasingly complex thinking skills such as critical thinking, logical reasoning, and moral reasoning. In the revised taxonomy, four knowledge types are also defined, factual, conceptual, procedural, and metacognitive. For higher-order thinking, stored knowledge must be retained and recalled. Higher-order thinking skills such as creative problem-solving depend on this stored knowledge. According to Valcea et al. (2024), relying on AI tools for rapid and easy access to information instead of retaining and grasping knowledge can diminish creative insights and higher-order thinking. Jamieson et al. (2023) warn that educators may mistakenly assume that teaching students higher-order skills suffices because lower-order skills can easily be learned from tools such as ChatGPT. There is a difference between experts using AI to enhance their skills and students relying on AI in ways that hinder their skill development. The kind of broad and deep information access enabled by generative AI is particularly beneficial for experts in creative problem-solving (Aylsworth & Castro, 2024). In the first three levels of the cognitive domain, knowledge types are interpreted according to



disciplinary terms and made ready for application. Creativity involves inductive reasoning and depends on the student's ability to critically evaluate prior knowledge and integrate it into a new whole (Anderson et al., 2001). AI, which benefits experts, may harm learners who have not yet completed learning processes at the basic knowledge levels. Wiggins and McTighe (2005) propose categorizing desired learning outcomes within a curriculum framework as concepts to be familiar with, concepts to know and be able to do, and enduring understandings representing big ideas. Even a learning objective that seems to involve lower-level thinking (such as basic knowledge) must be mastered if it forms a critical foundation for a given field. Such objectives should be elevated to enduring understanding without reliance on GenAI. Jamieson et al. (2023), in the context of cybersecurity education at the University of Miami, examined how learning outcomes are influenced by the presence of GenAI. One of their conclusions is that concepts requiring recall, understanding, and experiential engagement remain essential for students. Existing knowledge facilitates the learning of new knowledge, and new knowledge often arises from the recombination of existing knowledge (Valcea et al., 2024). Experts can recognize and correct flawed information and cognitive processes presented by AI. With this awareness, they can avoid negative outcomes and benefit from productivity gains in innovative solutions without loss of quality (Valcea et al., 2024). The fact that higher-order cognitive processes build upon foundational skills such as remembering, applying, and transferring knowledge highlights the continuing importance of these basic levels, even in the presence of generative AI as a cognitive tool. While AI benefits experts, it may harm learners who have not yet consolidated foundational knowledge. These research findings must also be considered when aligning curricula with GenAI.

Tillmanns et al. (2025) propose the IDEE framework, which offers a three-step approach for integrating GenAI technologies into curricula. In the first step, learning outcomes should be defined independently of GenAI, specifying what is to be taught and the expected performance level. In the second step, these outcomes should be mapped to competency levels using appropriate pedagogical frameworks (e.g., Bloom). In the third step, integration occurs only if GenAI tools support the outcome. In this way, GenAI becomes a tool that serves pedagogical purposes. For example, in addition to the outcome "The student analyzes and compares learning theories," a GenAI-supported outcome such as "The student uses ChatGPT to compare and interpret theories" may be added. This ensures conscious and purposeful use of GenAI. Given the prerequisite relationships among learning levels, complex skills such as evaluation and creative problem-solving cannot be achieved without first mastering basic remembering and understanding. Thus, the IDEE framework is considered valuable. If a given learning outcome does not require the support of generative AI, it should be stated in that form, and teaching and assessment activities should be selected accordingly. This framework represents a sound example of alignment between curriculum and generative AI. Codes for Aligning Learning Outcomes with GenAI in the GenAI Era

- In the first stage of the IDEE framework, which provides a three-step approach to integrating GenAI technologies into curricula, learning outcomes are defined independently of GenAI, clarifying what is to be taught and at what level of expectation. In the second stage, outcomes are aligned with competency levels using pedagogical frameworks (e.g., Bloom). In the third stage, integration occurs only if GenAI tools have the potential to support the outcome (Tillmanns et al., 2025). For instance, "The student writes the definition of learning as presented in class and explains it in the context of their own learning journal"—an outcome not requiring GenAI, compared with "Drawing on the concept of experience in the definition of learning, the student uses

GenAI to discuss listening and speaking experiences to reach a conclusion”—an outcome requiring ChatGPT support.

- The objectives of curricula must aim to make individuals better than ChatGPT. If people are trained not for what AI does well but for what it cannot do, then they will be equipped with higher-level intelligence (Dede, 2023). Curricula may need to emphasize knowledge integrated with individuals’ life stories, emotions, and values. This requires practical wisdom (Dede, 2023). Just as a pilot must still be able to fly an aircraft without technological assistance (Bliszczyk, 2023), students and graduates should be more competent in tasks such as computation, coding, and report writing. Holmes et al. (2019) stress the importance of focusing on skills such as critical thinking, creativity, and emotional intelligence.
- The widely discussed shift from teaching to learning is also emphasized for GenAI. One cannot realistically return for another master’s degree every time something new must be learned. Instead, one must develop the capacity for self-directed learning (Dede, 2023). Greater emphasis should be placed on self-regulated learning, self-management, and willpower in learning objectives.

In a world where much of today’s schoolwork can be carried out through generative AI, John Dewey’s principle that “the school is primarily a social institution” becomes even more relevant (Healy, 2023). This implies that, beyond being centers of information transfer, schools may increasingly function as social environments where relationships among students, community-building, ethics, and value education take precedence. Such awareness itself represents a step toward alignment. The design and implementation of curricula must employ GenAI strategically, consciously, and in alignment with educational goals.

### ***Content Creation and Aligning Content with ChatGPT***

In traditional educational institutions, content resides in textbooks, assigned readings, and the teacher’s mind. Such content is pre-prepared, focused, and bounded. By contrast, ChatGPT generates content dynamically, through interaction with the user, producing instantaneous, flowing, and boundary-transcending material. AI technologies such as ChatGPT may transform the traditional focus of modern education programs on predefined knowledge and cognitive processes, bounded content, and age-appropriate adaptations of knowledge/cognition. Substantial time is invested in deciding which content will support learning outcomes, what topics curricula will cover, and which textbooks students will have access to. Content constructs the cognitive structure, this structure becomes meaningful when combined with cultural context, values, and personal experiences. Understanding ChatGPT’s output as a cognitive artifact requires context-setting and questioning skills, which themselves demand prior knowledge and content. Individual decisions are shaped by knowledge and cognitive capabilities. To manage knowledge, one must evaluate which content is important and how to access it. Limiting and specifying content sources has traditionally served both to reduce student costs and to ease concentration on a limited set of materials within a course or program. However, open and free access to knowledge on the internet is increasingly being supplanted by free knowledge and cognition generated by AI. In addition to the organized and curated knowledge presented in textbooks, we now face dynamically generated content from GenAI. Unlike textbooks, such instantaneous content may extend beyond carefully curated human knowledge or remain superficial.

The popular expressions “writing is thinking” and “writing is learning” illustrate that writing is more than storing and transmitting knowledge. Written texts are also the student’s way of



reorganizing and producing course content. Unless otherwise specified, learning outcome descriptors such as summarizing, interpreting, and classifying in curricula and syllabi are assumed to be expressed in written form. We often see others' written words as windows into their thinking. The cultural value and prestige attributed to good writing at all school levels and across many academic disciplines reflect this (Zhao et al., 2024). Many writing instructors view writing as a representation of effective thinking (Cardon et al., 2023). From this perspective, those proficient in language and writing are also good thinkers. Writing also plays a central role in activating cognition and transmitting knowledge. Unsurprisingly, language is often regarded as the foundation of complex reasoning (Mahowald et al., 2024). Understanding a sentence, reasoning about its implications, and deciding how to respond all depend on cognitive capacities that go beyond formal proficiency. When writing—long considered the foundation of effective thought and reasoning—is delegated to cognitive tools such as ChatGPT, students' re-interpretation and re-construction of course content is endangered. We must learn to write on our own, a concern reminiscent of our elementary teachers' warnings that we would not always have a calculator at hand (Aylsworth & Castro, 2024). The inference we developed for learning outcomes applies here as well, human-produced content remains foundational, and students must first make sense of this content and then reconstruct it through their own writing. Dynamically generated content from GenAI can be both enriching and distracting for achieving curricular goals. Therefore, guiding principles are required for content intended to be co-produced with GenAI. Codes for Aligning Content with GenAI in the Generative AI Era

- Since topics must be learned in a proper sequence, students need structured content to prevent content from becoming a disorganized collection of unrelated ideas and to focus on enduring understandings (Demeuse & Strauven, 2016). Content prepared to achieve curricular aims must be sequenced, interconnected, and purposeful. ChatGPT-generated content will inevitably include new concepts, relationships, and meanings. While this can stimulate curiosity and new questions, it also risks leading students “deep into the rabbit hole of AI.” Valcea et al. (2024) warn that AI systems may lure users toward interesting but irrelevant pathways rather than target knowledge. Mollick & Mollick (2023) suggest structured prompts and strategies for purposeful classroom use of generative AI in content creation, cautioning against aimless wandering through content. For example, “Continue our learning and discussion process within the framework of the 8th Grade Science Curriculum” is a productive prompt.
- Big ideas are the enduring, essential understandings within a discipline that transcend a single unit, integrate otherwise fragmented knowledge, and serve as foundations for transfer (Wiggins & McTighe, 2005). Students need organized content structures such as curricula, assigned readings, textbooks, and lecture notes. Big ideas and core concepts can make AI-generated content more intelligible. For value- and belief-oriented subjects, big ideas (e.g., freedom has limits, honesty is the best policy) may serve as guiding principles.
- Effective texts, as suggested by the Currere method, are meaningful narratives shaped by personal histories and priorities. As a response to the challenges posed by AI-generated content, students may be guided to focus on their own learning and meaning-making journeys (Henderson & Gornik, 2007), reflecting on life and educational experiences. A currere text contains not only careful analyses and effective syntheses, but also the writer's concerns, efforts at meaning-making, and ideas. What we call “content” here is not merely knowledge processed cognitively, but also a meaningful structure that incorporates cultural, social, and psychological dimensions.

- For generative AI, generative learning may be proposed. Generative learning occurs when students actively construct new knowledge by integrating it with their prior knowledge and experiences (Castro-Alonso et al., 2024). GenAI structurally aligns with the cognitive aims of generative learning because it positions students not as passive recipients of information but as co-producers of knowledge/content. Since re-creating and reinterpreting course content is a desired outcome, this approach aligns with contemporary learning/teaching models.
- During text production, students are not only cognitively active but also physically engaged through typing. Writing also carries an affective dimension, involving interest, attitude, and even love. If writing tasks are outsourced to AI systems, students' touch typing skills may decline, weakening the link between action and cognition and diminishing positive attitudes and affection toward writing.

According to UNESCO (2023), developments in GenAI may weaken students' commitment to human-produced and verified sources, textbooks, and curriculum-based content. As a content producer, GenAI could potentially displace textbooks and scholarly readings. This makes alignment indispensable.

### ***Aligning Learning Experiences with ChatGPT***

Curricula, which explain what, why, how, and when children should learn, aim to achieve goals through learning experiences. A learning experience is defined as an encounter that enables a change in student behavior through interaction with external environmental conditions (Tyler, 2013). Many instructional strategies and approaches—such as Socratic questioning, discovery learning, scaffolding, meaningful learning, and problem-based learning—have been developed to structure such experiences. GenAI is an external digital environment. When interaction through language leads to a conceptual or attitudinal change, engagement with ChatGPT becomes a learning experience. Holmes et al. (2019) emphasize an important distinction between learning about AI or conversing with AI and learning with AI. While every interaction may have some effect on the individual, purposeful use for learning has a clear focus and target, thereby enhancing learning. AI must first be recognized and understood before it can be employed for educational purposes. Although human behavior is classically categorized as cognition, affect, and action, it is at the same time an integrated whole. When learning a cognitive skill, we are not only cognitively but also affectively and physically active. Embodied Cognition posits that learning processes are not limited to mental transmission of information but are shaped by students' bodily experiences and interactions with their environment. From the embodied cognition perspective, learning is defined by the dynamic nature of living beings participating in self-organizing activities triggered by environmental interaction (Walkington, 2014). Walkington (2014), in a study on the role of gestures in learning, designed an experiment using four different strategies. Results showed that participants who neither gestured nor used pencil and paper were least successful (11.5%), while those who used pencil and paper were slightly more successful (27.3%). Students who produced static representational gestures by forming shapes such as a triangle with their hands correctly validated the assumption 34.3% of the time. In contrast, students who made dynamic representational gestures achieved the highest success rate (63.6%). During interactions with GenAI, embodied cognition may manifest in learners who exclaim “wow,” smile, walk, or take notes—thus engaging with learning both mentally and physically. Cognitive skills such as summarizing, inferring, and interpreting involve bodily performances such as speaking, writing, drawing, and manipulating symbols. For instance, in a skilled touch typist, typing speed approaches cognitive processing speed, otherwise, a mismatch between cognitive and physical



skills may occur. To integrate AI-produced cognitive artifacts into an individual's meaning-making world, gestures, mimicry, note-taking, and dialogue—akin to productive peer conversations—should continue alongside engagement with ChatGPT. Generative AI tools can guide, explain, and identify gaps for students in the absence of teachers. This makes alignment imperative.

As a discursive technology, GenAI allows for extended, inquiry-based dialogue similar to the Socratic method, while also being designed to provide quick answers when possible. Pasinetti (2025), CEO of Kira Learning, stated that the aim of their newly established Kira educational initiative is to slow down dialogue with AI, encouraging students to think before arriving at answers—thereby simulating Socratic dialogue. However, Weidinger et al. (2021) warn that dialogue-based interactions may also carry risks. While personalized responses learned from the user can be beneficial, they may also reinforce biases or create manipulation risks during learning. Chatbots can be intentionally placed into scenarios of debate, collective activity, or Socratic dialogue. In such cases, students might use ChatGPT in ways similar to how they rely on peers, to refine ideas, clarify difficult sentences, or re-express their thoughts. When designing learning experiences, teachers also consider national cultural values and beliefs, universal values, sensitivity toward children and youth, and principles of equity and fairness. Generative AI, however, may lack sensitivity in interactions with young learners. Codes for Aligning Learning Experiences with GenAI in the GenAI Era.

- According to OpenAI's usage policies, users under 13 cannot directly access ChatGPT. Access for this age group is only possible under adult supervision. Users aged 13–18 may only use the platform with parental or legal guardian consent. OpenAI explicitly states that the service is not directed at children and that adult supervision is required for safety reasons, particularly for those under 13 (OpenAI, n.d.). These conditions suggest that the curricular impact of GenAI should primarily be considered at secondary and higher education levels.
- Students are expected to use GenAI tools ethically as supportive resources in their learning and assessment processes. In line with the IDEE framework proposed by Su and Yang (2023), students may be required to produce a short reflective report including: (1) their learning objectives, (2) the ways and justifications for using GenAI, (3) ethical constraints, and (4) personal evaluations of process effectiveness. This structure ensures that GenAI tools are employed with not only technical but also pedagogical and ethical integrity (Su & Yang, 2023).
- One risk of learning with GenAI is drifting away from the intended program outcomes and curricular targets. Learning experiences may expand too easily, resulting in temporary recognition of concepts and an illusion of learning without actual integration. The speed of interaction and the abundance of concepts contribute to this risk. A study in Turkey revealed that while students' assignment grades improved when using ChatGPT without guidance, their final exam performance dropped by 17% (Bastani et al., 2024). Applications of GenAI that avoid instant answers and instead encourage reflection, interaction with material, and appropriate difficulty levels may mitigate this risk (Bastani et al., 2024).
- Interfaces and prompts that allow students to structure knowledge should be provided to prevent reduced cognitive effort. In the analogy of reading a book, it is the student who notices, interprets, and evaluates concepts. Interaction with GenAI may resemble listening to a knowledgeable teacher, which risks reducing mental effort. To mitigate this, Bastani et al. (2024) developed a "GPT Tutor" interface incorporating Socratic

questioning, appropriate scaffolding, and discovery-based learning, thereby allowing students opportunities to structure knowledge.

- In one study, AI-supported TV characters engaged children in science-related dialogues, resulting in measurable increases in scientific reasoning and curiosity (Xu, 2025). Findings from meta-analyses further indicate that learning with ChatGPT encourages greater student behavioral, cognitive, and affective engagement compared to learning without ChatGPT (Heung & Chiu, 2025).
- Flipped learning may be employed to ensure that the most critical tasks are completed in the classroom (Tillmanns et al., 2025). This provides opportunities to correct misconceptions and incomplete learning.

There is a fundamental distinction between learning about AI/conversing with AI and learning with AI. Learning with GenAI requires planning, explicit learning outcomes, appropriate content, and suitable instructional methods. Observable active student behaviors—such as expressing surprise at AI responses, questioning outputs, and maintaining gestures, note-taking, and discussion as in productive peer exchanges—must continue to be part of the learning process. The essential components of effective teaching and learning should remain visible even in AI-supported learning.

### ***Aligning Assessment and Evaluation Practices with ChatGPT***

GenAI can generate assessment questions appropriate to subject and level, analyze students' writing for coherence, language use, and structure, and provide teachers with high-quality feedback. It can also process and interpret data regarding students' learning processes, as well as design personalized and adaptive assessments based on students' interests, learning styles, and levels (Swiecki et al., 2022). However, significant challenges arise when generative AI is used unethically by students. Teachers face the risk of not being able to distinguish whether submitted essays and reports genuinely belong to the student (Cotton et al., 2024). To ensure students achieve intended learning outcomes without relying on GenAI, it has been suggested to shift from traditional written assessments to supervised or more interactive forms such as presentations, oral examinations, or process-based projects—formats less susceptible to replication by AI (Bower et al., 2024). The challenge with these forms, however, is that they are often more time-consuming and resource-intensive for faculty, requiring examination rooms or classroom facilities (Jongkind et al., 2025). Jongkind et al. (2025) developed a scale to assess the resilience of their departmental assessment practices against AI effects. Scored items identify assessments that ChatGPT can perform perfectly or very well—tasks considered vulnerable to AI impact. In such low-resilience practices, a prompt to ChatGPT can produce nearly the entire assignment, such as multi-page essays on a topic, summaries, or text-based explanations. By contrast, the most resilient assessment practices are those where ChatGPT cannot be applied—tasks requiring direct physical action, practical skills, or operations within specialized technical systems. As with other curriculum components, assessment practices must either be resilient against AI's influence or explicitly incorporate AI in ways consistent with intended learning outcomes. Codes for Aligning Assessment and Evaluation with GenAI in the Generative AI Era.

- GenAI can be used continuously as a formative assessment tool integrated into the learning process. It can function not only as a knowledge source but also as an active writing partner and study collaborator, producing revision materials. Students can use it to generate writing plans, receive feedback, and restructure their texts (Ziebell & Skeat, 2023). Process documents such as drafts, brainstorming notes, and reflection



journals should be collected, ensuring that evaluation encompasses the entire production process, not just the final product.

- If learning objectives—and therefore assessment practices—are unclear, GenAI can help clarify them. When assessment instructions and criteria are ambiguous, students may use GenAI as a guidance tool to clarify criteria and generate alternative outcomes (Ziebell & Skeat, 2023). In such cases, AI functions like a hidden teacher.
- Even proctored exams such as open-source assessments may be at risk. Closed-book exams are not immune either, since predictable questions can be prepared for in advance using AI tools. Freeman (2025) recommends subjecting such exams to AI stress tests, for example by evaluating them using the paid version of ChatGPT.
- In one study, students were asked to reflect in detail on how they used AI tools, what prompts they entered, how they selected AI-generated content, and how they critiqued it. Such reflective writing is considered resistant to AI imitation, as generative AI struggles to replicate personal and subjective experiences (Loos et al., 2023). Assessment methods should evolve to emphasize higher-order thinking skills such as critical reflection, creativity, and ethical reasoning—areas that AI cannot easily replicate (UNESCO, 2023).

As with other curricular components, planned assessment practices should be subjected to public AI stress tests and redesigned accordingly.

## **Conclusion and Discussion**

Although AI companies prohibit use by children under 13, evidence shows that children and adolescents still access GenAI. This study has highlighted how curricula and teaching practices are influenced by generative AI, and how alignment can be achieved. At its simplest, teaching is a dialogue, thus, it is inevitable that dialogue-based tools such as chatbots will impact curricula. The widespread adoption of ChatGPT indicates that, at the very least, its initial use is straightforward. Bans on ChatGPT in some school districts reveal that students have not been trained to use these tools responsibly—lacking, in effect, a license to drive them (Cassinadri, 2024). Students must be made aware that, although conversations with ChatGPT may appear human-like, it lacks emotions and cannot interpret learners' affective struggles in the way human teachers can (Loos et al., 2023). Zhao et al. (2024) broaden the concept of generative AI literacy to include reflective and social meaning-making. Many participants reported that after using chatbots, they felt less need to seek help from teachers and peers. Similarly, Levine et al. (2025) found that many students viewed ChatGPT as a substitute for teachers and peers. Curriculum designers and educators must consider these findings when aligning teaching with GenAI. If students are not equipped with the necessary skills and literacy, interaction with GenAI may be perceived as an illusion—similar to a student unfamiliar with factorization perceiving a correct solution as mere magic. To prevent AI from being seen as magic, curricula must embed sufficient knowledge and skills, as well as cultivate practical wisdom (Dede, 2023).

We are confronted with a cognitive artifact capable of influencing not only cognitive but also affective and psychomotor objectives of curricula. While AI can benefit experts, it may harm learners who have not yet consolidated foundational knowledge. GenAI must therefore be used consciously and purposefully. If support from generative AI tools such as ChatGPT is required for achieving a particular learning outcome, this must be explicitly stated, and teaching and assessment activities selected accordingly. Alignment must extend beyond cognitive objectives to include affective goals (e.g., positive attitudes, self-discipline, patience) and psychomotor

skills, coordination, gestures, facial expressions, writing, and embodied production. In traditional education, content is pre-prepared, focused, and bounded—residing in textbooks, reading lists, and the teacher’s mind. By contrast, ChatGPT produces dynamic, unlimited, and instantaneous content. This may spark curiosity and foster new connections, but also risks information overload and cognitive fragmentation (Valcea et al., 2024). Written texts are central not only to preserving and transmitting knowledge but also to reorganizing and producing course content. Ethical concerns—such as the risk of AI-generated content conflicting with national or universal values—must also be considered. Human-produced content remains foundational, students must first make sense of this content and then reconstruct it through their own writing. Structured prompts (Mollick & Mollick, 2023), the big ideas approach (Wiggins & McTighe, 2005), and the currere method (Henderson & Gornik, 2007) can support planned instructional activities and facilitate alignment with GenAI.

GenAI holds potential to support Socratic inquiry, collaborative learning, scaffolding, and discovery-based learning. As an external digital environment, interaction with GenAI may become a learning experience when it leads to conceptual or attitudinal change. Yet, risks remain in the form of illusions of learning and reduced cognitive effort (Bastani et al., 2024). A clear distinction must be made between conversing with AI and learning with AI. Purposeful use for learning requires clear objectives, planned methods, and appropriate content. As with embodied cognition, productive student behaviors—such as gestures, mimicry, note-taking, and dialogic engagement—should remain integral to the process. Flipped classroom approaches can support control of the process, providing opportunities to address misconceptions. Ultimately, alignment with GenAI must ensure that learning processes remain thoughtful, deliberate, and student-centered. Programs must preserve human agency and embodied cognition, ensuring students remain active decision-makers. In aligning instructional strategies with generative AI, student agency and active engagement must remain central. GenAI can contribute to formative assessment by offering personalized feedback, clarifying criteria, and providing linguistic support (Ziebell & Skeat, 2023). At the most resilient level, assessment must require physical action, practical skills, or operations within specialized systems. As with all curricular components, assessment practices should be subjected to public AI stress tests and redesigned to ensure proper alignment.

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