# ChatGPT in Education: Mapping the Landscape and Proposing the PICA Framework for Pedagogical Integration

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*Abstract* - **ChatGPT has thrust itself rapidly into the education landscape, establishing new patterns for how learners and educators will communicate through natural language. From personalized tutoring and writing help, to STEM assistance and feedback generation - the uptake in using ChatGPT in a variety of educational contexts has been widespread. But with this increasing uptake come real concerns. Risks relating to misinformation, cognitive over-reliance, authorship boundary issues, and access inequities challenge the integrity, fairness, and efficacy of educational processes. This paper offers two contributions to the nascent field. First, it offers a systematic mapping of ChatGPT's existing applications to education, focusing on four major domains: Personalized Learning and Tutoring, Writing support and Language development, STEM and Code Assistance, and Assessment and Feedback Design and including common challenges, such as epistemic unreliability, reduced learner agency, issues of academic integrity, and access issues. Second, it offers the PICA Framework, which is a four-phase pedagogical model (Preparation, Interaction, Contextualization, Assessment), to start supporting intentional and responsible integration of ChatGPT into instructional practice. Together this mapping and framework can provide educators, researchers and institutions with a way forward to consider the educational promise of generative AIs, while grappling with pedagogical and ethical implications.**

*Keywords* - *ChatGPT in Education; Generative AI in Education; Personalized learning; Pedagogical framework*

## I. INTRODUCTION

In recent periods, the rapid rise of generative artificial intelligence (AI) has generated a paradigm shift in education [1]. One of the most impactful developments has been ChatGPT, a conversational large language model developed by OpenAI, which has the remarkable ability to conduct natural, contextually relevant, human-like conversations [2]. ChatGPT is able to create, explain, summarize, and rephrase temporally relevant text in multiple domains of inquiry. Already, ChatGPT has established itself as a prominent educational tool and has the potential to reshape education in a multitude of contemporary contexts. ChatGPT functions range from personalized tutoring and writing support to code generation and instructional design; all areas that may lead to changes in how knowledge is accessed, mediated, and constructed in contemporary settings [4]. Therefore, the educational sector is at a crossroads in history: highly capable AI systems are entering learning environments, not simply as background technologies, but rather as direct partners in teaching and learning.

ChatGPT is significant for education in its accessibility and adaptability [4]. Its ability to support differentiated instruction, give immediate feedback, facilitate Socratic dialogue, scaffold language development, or provide code explanations, places it in a unique position to provide engagement, independence, and accessible supports [5]. Moreover, ChatGPT can offer support for teachers by automating routine tasks such as quiz generation, draft comments, or lesson design to free space for more student interactive aspects [6]. In addition, in multilingual and multicultural learning settings can provide scalable, low-friction educational supports across disciplines and student profiles [7]. Unlike previous AI technologies which were domain specific and rule based, ChatGPT offers a multi-purpose adaptive feature that is not only appealing to educators of computer science, but humanities, education, and social science teachers alike.

That said, the use of ChatGPT in education is not without challenges [8-13]. Important issues include the accuracy and reliability of its outputs, including known instances of 'hallucinations,' or fabrications in the form of plausible but false information. There are also issues of academic integrity, as there have been reports of students using ChatGPT to create essays or answers without attribution, furthering the erosion of authorship and original thought. Learners open themselves to cognitive passivity, using ChatGPT to provide them with ready-made answers, without engaging in deeper processing associated with complex learning objectives, that typically require more than repurposing. From an educational perspective, educators have not yet received clear guidance on how to utilize ChatGPT meaningfully and ethically in their practices. From an institutional perspective, there are issues of digital literacy, and uneven access to AI tools that differ across demographic groups, as well as privacy and bias issues related to better guiding the inclusion of generative AI in formal learning contexts. Overall, the promise of ChatGPT is exciting,

but it requires thoughtful pedagogical consideration to avoid unintended consequences.

ChatGPT belongs to a class of large language models (LLMs) that employ transformer-based architectures and large corpus of text training. Unlike traditional educational AI systems – like Intelligent Tutoring Systems (ITS), which operated on fixed rules and domain-specific content – ChatGPT is a generalist model; it generates responses dynamically, based on prior conversation history, across multiple topics with little contextual grounding [14, 15]. When combined with its conversational fluency, this generality has led to its widespread experimental use in classrooms and universities [16]. Previous studies have documented AI-supported applications: coding support, language feedback tools, reflective dialogue partners, and active-learner peer-like participants, etc. [17-27]. Nevertheless, even when documented, instances of implementation are typically ad-hoc and none have been undertaken with an explicit pedagogical framework. In addition to the lack of explicit frameworks, there is also confusion regarding what tools like ChatGTP could mean for learning goals, how they might be scaffolded for critical engagement, and how their potential impact on student outcomes could be evaluated. Thus, there is increasing need for reasons models of integration that can connect the technical affordances of LLMs, with the instructional principles of good teaching and learning.

Given this, this paper has two main purposes. First it is organized overview of the landscape of ChatGPT in education, identifying its unfolding applications, potential advantages, and emerging challenges. Second, it offers a pedagogically grounded model - the PICA framework, made of four phases; Preparation, Interaction, Contextualization, and Assessment - that can assist educators with the ethical and meaningful use of ChatGPT into their own professional practice. By combining conceptual mapping and the structured framework, this paper writes itself into the conversation around generative AI in education, providing educators, researchers, and institutional stakeholders a pathway forward in responsibly leveraging ChatGPT's potentials while better managing its shortcomings.

## II. EDUCATIONAL APPLICATIONS OF CHATGPT

The expanding use of ChatGPT in education shows a demand for adaptive, accessible and scalable learning technologies. ChatGPT is different from mainstream AI-based education technologies as it represents a new environment of fluid conversational based learning, where learning is based on conversation with meeting human interaction, and it opens up possibilities to support learners, educators, and institutions in ways that were previously impossible. This section provides an organized discussion of five central areas of work with ChatGPT in education. Using recent academic literature, reports of practice and theoretical frameworks, we provide a discussion of the pedagogical functions and technological affordances as well as the challenges associated with each application area (Fig. 1).
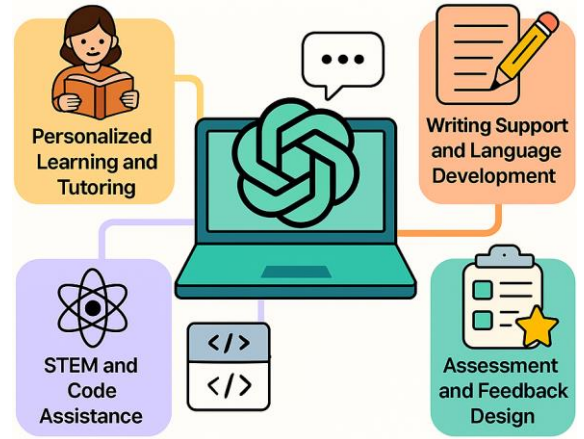


Fig. 1. Main Educational Applications of ChatGPT.

### A. Personalized Learning and Tutoring

ChatGPT offers compelling support for personalized learning and intelligent tutoring, both of which have been long-standing foci of educational theory and are still largely seen as insular to practice [28]. Traditional classroom practices with rigid curricular offerings and teacher-student ratios fail to offer the individualized consideration necessary for tailoring instruction to meet student learning needs. ChatGPT creates a space for scalable, open-ended, and learner-initiated interaction in any subject and level of educational setting. This affordance extends beyond one-to-one instruction; to create a learning environment, ChatGPT maintains a conversational model that allows for tailored explanations, iterative feedback, and redirection based on the learner's experiences through its dynamic modeling of a learning companion.

The underlying dialogic relationship is aligned with socio-constructivist based practice, and particularly Vygotsky's Zone of Proximal Development, which supports a conceptual model of scaffolding through real time response. For example, a learner can start with a general inquiry, such as "What is recursion?"and through sequential interaction prompt deeper and deeper inquiry yielding analogies or a step-by-step example. In many ways, this form of continuous prompting mimics micro-tutoring. It encourages individualistic community construction of knowledge that is unique to their learner experiences. Moreover, the AI tutoring model is independent of time and place, democratizing the availability of tutoring for learners across contexts including under-resourced settings, non-traditional pathways to education, or through lifelong learning programming.

ChatGPT use has been shown to improve student confidence, reduce frustration, and enhance conceptual understanding, especially in STEM contexts. ChatGPT provides almost instantaneous feedback, resolves mistakes, clears up syntax, and reinforces procedural fluency. Unlike static resources, ChatGPT allows for possibilities of iterative exploration and prompts learners to test, adapt, and reflect on their own thinking – all indispensable forms of metacognitive progression.

Challenges remain evident. ChatGPT is not epistemically grounded; it is possible to receive plausible yet incorrect or out-of-date information. Learners may internalize inaccurate ideas without appropriate scaffolding or domain knowledge. If over-utilized, ChatGPT can reinforce cognitive passivity, as learners will be using cognitive effort in return for an immediate answer. This does not facilitate problem-solving stamina and resilience or develop critical thinking.

To responsibly use ChatGPT, educators must incorporate its use in explicit pedagogical frameworks. Assignments could require students to keep track of their prompts, analyze ChatGPT's responses, and reflect on their process of learning. This will create AI literacy and entail the model as a partner for learning not to solutions. Teaching students the underpinnings of prompt engineering- how to elicit better quality responses, refine queries and tone of response- can further shift inactive engagement to active cognition.

The tool also provides meaningful advantages for diverse, multilingual learners. Students can engage with ChatGPT in their own language, seek culturally-relevant examples and vary complexity on the fly. The tool can provide accessible instruction for neurodivergent students including paraphrased instructions, summarize, and provide an iterative platform for learning free of judgment. Used in conjunction with screen readers or speech tools, this becomes an essential aspect of an inclusive education plan.

Despite the advantages this provides, institutional issues remain, particularly in relation to equity, privacy, and ethics. Students do not all have the same level of access to AI tools, and few have a full understanding of how data is used, who is surveilling their use, or what biases are embedded in each tool. Schools and universities must construct explicit usage policies, have a plan for equitable infrastructure, and ensure the planning process is involving stakeholders, educators, technologist and/or policy-makers, to involve guidelines to mitigate this susceptibility.

In conclusion, ChatGPT provides a new model for personalized learning - flexible, dialogic, and scalable - that can support autonomy, differentiated learning and increased access to academic support. However, whether it is effective depends on intentional use, critical engagement and ethical management. If we see ChatGPT as a cognitive partner - not just a generator of content - it can provide a potential enhancement to the educational process while not undermining the central place of human thinking or pedagogical decisions.

## B. *Writing Support and Language Development*

Writing is one of the most challenging cognitively demanding skills in education, because it involves a high level of linguistic competence, rhetorical awareness, disciplinary knowledge, and metacognition. Many students, in both academic and professional contexts, struggle with these cognitive and process demands. ChatGPT, as a generative language model capable of generating fluent, context-aware text, provides a powerful writing assist tool for developing writing and language, regardless of discipline or skill level [29].

ChatGPT assists students at various points in the writing process, ranging from generating outlines from thesis statements, generating ways to structure arguments, and rewriting awkward sentences to suggest stylistic changes on demand. This kind of support in overcoming cognitive barriers, such as writer's block or confusion over definitions, can help students write more fluently and confidently. ChatGPT is an interactive support tool, which may provide real-time interaction that static writing aids do not allow. For example, learners can request a formal version of their writing draft, or request a specific tone or genre in their writing, and also consider drafts iteratively in response to the feedback provided. This type of dialogue provides students with the opportunity to engage in reflective, process-oriented writing as they write drafts whose audience, attention to ethics and dramaturgy, and revision can be improved.

In multilingual learning contexts, ChatGPT can also be a language developmental partner. Learners can ask ChatGPT to translate things into another language, ask questions about grammar, or create a simulation of a conversation in a given language. For example, a non-native English speaker could input a sentence and ask ChatGPT to explain why it is wrong; ChatGPT would provide both the correction and a grammatical explanation (that pertained to the specific answer). ChatGPT is functioning as a translanguaging and feedback tool that is helping to accelerate the process of language acquisition in dynamic contexts.

Finally, this model also exposes students to academic genres, including the discourse norms in that genre. Students can prompt it to produce sample introductions, abstracts, or transitions between paragraphs, and they will learn about the underlying structure, tone, and vocabulary. Teachers can do the same and devise assignments in which students collectively compare or critique things written by ChatGPT or tasks where they would revise the writing for clarity, voice, and strength of argument. This kind of assignment can push the use of AI from a non-revisable generator to a living, active learning and genre exposure experience.

While ChatGPT has many advantages, it also raises important ethical and pedagogical issues. One of the most notable concerns about AI writing assistants is their potential consequence to authorship. When students engage ChatGPT to write substantial chunks of text, the line between legitimate use of assistance and academic misconduct becomes hazy. Institutions will need to develop firm policy concerning the AI-assisted writing, outlining disclosure language for student use and requiring students to demonstrate thoughtful engagement on how AI influenced their writing process. Instead of assessing the final product, assessment practice will need to shift to assessing students' engagement with the writing process and their critical choices while composing.

There is also concern for the potential homogeneity of phrasing. By design, ChatGPT provides general-purpose information, and because it is a combination of information found in broad data sources, it's outputs usually lack originality and nuance. Overreliance on ChatGPT may flatten student

voice, diminishing rhetorical originality. Educators will need to reclaim the importance of revision, ownership, and authenticity in writing. In addition, students will need to be trained to critically evaluate ChatGPT's outputs by recognizing superficial reasoning, mistakes, or uninspired phrasing. Embedded AI literacy in their writing instruction means students will be critical "co-authors" rather than passive participants in the writing process.

Equity is one more consideration. Not all students have equal access to the technology necessary or the digital fluency to employ ChatGPT properly. AI use, and other technologies, that do not have institutional support and direct instruction, will likely exacerbate achievement gaps. In addition, students with learning differences (e.g., dyslexia, or ADHD) could take advantage of ChatGPT's ability to condense, paraphrase instructions, or give alternative writing frameworks. If used effectively and embedded in an equitable fashion, ChatGPT is aligned with the best principles of UDL (universal design for learning) while also increasing accessibility to a writing tool.

ChatGPT does not replace the human aspects of writing instruction. It lacks comprehension, intent, and recognizance of rhetorical context. It cannot mentor the development of critical argument when provided with complicated forms of feedback; it cannot respond to student struggles in an empathetic fashion; and it cannot replace the sociality of writing workshops, peer review, and discussions with instructors – instances that help shape academic identity and also build community.

In conclusion, ChatGPT can provide many opportunities to facilitate writing growth, foster language learning, and provide feedback across a range of learning contexts. Its contribution is contingent on its potential, but only to the extent that educators then utilize those capabilities. When integrated into a practice based on process, reflective thinking, and critical engagement, ChatGPT can influence writing without removing the person and their voice that lends meaning to writing. If used in a meaningful way, it can generate, more inclusive, more adaptive, and more empowering writing contexts within teaching and learning which acknowledge the potential of technology itself and respect and preserve the educational enterprise.

## C. STEM and Code Assistance

The implementation of ChatGPT in STEM teaching represents one of the most important applications of generative AI to learning [30]. STEM subjects, especially math, computer science, and engineering, have abstract concepts, cumulative reasoning, and technical language that can pose significant challenges for students. This can be amplified in contexts where students are independently learning or at a distance, and there are no immediate responses to facilitate students' learning. In this respect, ChatGPT offers students immediate, conversational support that resembles a personalized tutorial experience, including code explanations, mathematical reasoning, and step-by-step problem solving.

One of the key advantages of ChatGPT in STEM is engagement with scaffolded, interactive learning experiences.

For example, a student could input a math problem, or a coding problem, and receive an explanation relative to their inquiry. The model also supports follow-up questions, encourages students to experiment, and supports the concept of multiple representations of the same concept - all of which can help students build conceptual understanding and transfer.

In K-12 programming education, ChatGPT fits into the role of debugger and code explainer. New coders get stuck on logic errors as often as incorrect syntax matters - particularly if they have moved from a visual programming tool to a text-based language. ChatGPT can present a corrected version, and corrections with explanatory modifications as a hint. It may eliminate some technical hurdles while reinforcing learners' understanding of algorithmic thinking (and encouraging them). The same can be said about learners in mathematics: they can test different approaches (many programming languages have extensions for math-related calculations), and receive feedback in ordinary language. This allows learners to construct their own inquiries while ensuring mastery through low-stakes experimentation, which is especially crucial for lowering the anxiety associated with mathematics and supporting the development of confidence.

However, data should not be confused with intelligence, and we should acknowledge the boundaries of the model. ChatGPT is not a symbolic reasoner in the manner of a computer algebra system. Its responses derive from a prediction of language patterns; thus, as reasonable as a response may be, it can still be mathematically incorrect or logically contradictory. Learners who have no firm understanding of the foundational knowledge could misjudge these responses, potentially leading to the entrenchment of incorrectly held beliefs. Furthermore, the convenience of AI models allows learners to easily maintain a dependence on them, perhaps providing an expedient solution in place of experiencing personal struggle associated with productive struggle essential for help with deeper understanding.

In order to minimize these risks, educators must design learning experiences that included the use of ChatGPT with some cognitive demand. While working on assignments, educators should have students include a reflective component, for example, a summary of the prompts they used, an evaluation of the responses from the AI tool, and a discussion of how the solution they used compared with traditional approach. This type of reflective assignment will promote metacognition and allow students to view ChatGPT as a heuristic to use, and not as right or wrong. Educators should help students to develop effective distributed prompt strategy to obtain an answer and encourage students to 'triangulate' with other sources of information to develop a critical AI literacy level.

Assessment practices will need to change as well. Instead of focusing on correctness, educators can examine explanations of processes, decisions made related to design and comparing their ability to critique ChatGPT code or solutions. In group work, students can use ChatGPT collaboratively, whether for brainstorming potential approaches, testing hypotheses, or resolving disagreements, as a way to reflect the real-world problem-solving experiences common in STEM teamwork.

Even as we embrace a number of advantages, equity and access are challenges. Not all students have equal access to the technology, nor do they all have the digital skill development to use ChatGPT effectively. The model may also reflect the biases which are core to its training data and may similarly privilege dominant cultures and standardization of problem formats. Educators should assist students in being critical of not only the answers provided by ChatGPT, but the underlying reasoning behind those answers, particularly in interdisciplinary areas beyond computer science such as engineering ethics or environmental science.

In high stakes situations, clarity from the institution is vital. Policies should define how and whenever permissible, especially as it pertains to exams and/or graded assignments. Consistently communicating the expectations about acceptable use holds students accountable, protects academic integrity and can empower students to responsibly engage with AI tools.

In conclusion, ChatGPT can act as a beneficial support for STEM learning, providing accessible, dialogic understanding and flexible support. It can support demystifying difficult-to-understand concepts, scaffold students' approaches to problem-solving, and foster independent inquiry. However, ChatGPT will only be an effective learning tool for the students when it is thought and used with an educational design framework, critical pedagogical approach, and institutional guidance. When used in ethical and pedagogically sound ways, ChatGPT has the potential to transform STEM education – not by eliminating education as we know it, but by improving on, and creating more constructive engagements in learning.

### D. Assessment and Feedback Design

Assessment and feedback are vital to the teaching and learning process, but they also can be used to add more guidance for future learning through covering essential needs for support, reinforcement and reflection. In the past 10 years, the call for timely feedback, especially in large and online classes, has increased and there is a growing expectation that feedback will be both scalable, timely and formative. In this context, ChatGPT offers an exciting new approach to assessment item authoring and feedback delivery that fundamentally changes assessment design and delivery [31].

One of the most immediate examples of ChatGPT in assessment design which relates to the author's work in education, is found in its capabilities for producing different types of questions and items. For example, the educator can prompt the model to produce multiple choice questions, open ending prompting for discussion, coding exercises or even problem solving tasks focused on specific learning objectives or cognitive level. For example, if I prompt the model with "Generate five conceptual physics questions for high school students about Newton's third law, with one correct and three plausible distractor answers", I can receive instant, usable items for a quiz or a practice exam in a matter of minutes. Similar to being quick, in educational assessment, utilizing ChatGPT supports rapid development of differentiated assessment for teachers, in instances where you want authorship of items to include range of items with different levels of difficulty.

In addition to generation, ChatGPT also affords the personalization of assessment. Instructors can request questions to be re-written for different reading levels, or to correspond with the language proficiency levels of English language learners. And similarly, in higher education, instructors can develop scenario based tasks or mini-case studies embedded in culturally relevant or discipline-specific contexts. This flexibility supports an inclusive assessment design accommodating the diverse needs and experiences of learners.

However, perhaps the more transformational aspect of ChatGPT is to assist in the feedback process, particularly with formative assessment. Students can submit a piece of writing, code, or mathematical solution, and ask ChatGPT for evaluative commentary. The ChatGPT model can flag ambiguous arguments, offer suggestions for improvement, reference syntax error in programming or suggest in alternative styles. For example, a student might enter a paragraph from a reflective essay and ask "how can I clarify coherence?" ChatGPT could return with specific feedback such as "you might consider using transitions between these two ideas" or "you may want to clarify your thesis earlier in the paragraph.".

Traditionally, providing real-time, personalized feedback has been one of the most workforce-intensive tasks for instructors. ChatGPT's ability to facilitate real-time feedback – either as students drafting something they can submit for feedback or model the first draft of teacher feedback – can shorthand how long it takes from first submission to feedback and open more potential to satisfy the iterative loop of writing and feedback. Coupling this with reflective prompts or revision journals, ChatGPT-mediated feedback can also create a positive cycle of self-regulated learning in the act of giving feedback on their work, experience critical deliberation, and take ownership of their improvement.

In peer review contexts, ChatGPT can be used to simulate strong and weak feedback, thereby facilitating the students' ability to give constructive assessments of each other's work. Teachers can also provide students with the tool to produce example comments based on rubric criteria so students can compare their feedback with and refine their evaluative language in comparison to the model. This can inform assessment literacy, as well as evaluative judgment, which are increasingly becoming recognized competencies needed in an educational paradigm around lifelong learning and critical enquiry.

That said, using ChatGPT for assessment and feedback has significant limitations. A major limitation is the issue of validity: ChatGPT may produce questions that are factually inaccurate, conceptually flawed or that do not match the intended learning outcomes. Human review is necessary to eliminate the risk of validity issues affecting the fairness and accuracy of assessments. ChatGPT also does not have any understanding of a learner's stage of development, previous performance or context, all of which are essential for feedback that is meaningful and appropriately differentiated. ChatGPT responses will usually be grammatically correct and appear fluent, but without clear, detailed and specific prompts, the responses may often be generic or lack depth.

There are also significant ethical implications. When students are encouraged – or allowed – to use ChatGPT to reflect on their own work, we run the risk of feedback being removed from the human evaluative process. While this automated process has the potential for efficiency gains, it may lose the relational and emotional aspects of feedback, which have relevance to students' motivation and engagement issues. Moreover, in high-stakes assessment situations, there is an equity and authenticity dimension when it comes to AI-generated feedback. Not all students may have access to such tools, and the line between assistive uses and author's work becomes increasingly difficult to determine, especially in graded contexts when using AI to refine answers.

In order to minimize the risks identified herein, institutions need to take into account the use of generative AI in assessment development and develop policies around this practice. Educators should be open with students on how and when ChatGPT is useful in developing the design of assessments or the feedback process. In addition, tasks should be constructed in such a way that it requires students to reflect on the AI that has contributed to their response. Examples of this could include tasks that require students to rework their response based on the feedback they got, but also to articulate their rationale for the changes they made. This not only allows for students to maintain some agency, but also allows the important learning to remain at the centre of the assessment.

In conclusion, the most significant benefit to the use of ChatGPT in assessment lies in formative, low-stakes, self-directed assessments where students can tinker with ideas and receive further guidance and feedback in a no-stakes, exploratory environment. In situations like these, where ChatGPT can support self-evaluation, facilitate experimentation, and promote timely revision, it can have a considerable impact on learning. However, it must always be considered as part of the larger pedagogical approach with transparence, critical thinking, and reflective practice in mind.

In summary, ChatGPT represents a real possibility for changing the way to think about assessment and feedback in a number of ways. It has the potential to make item generation faster and more efficient, provide more personalized assessments of students, and help students with more feedback and iteration, but it also generates challenges in terms of validity, equity, authorship, and pedagogical ethics. Educators must always balance the improved efficiency that comes when automating tasks with the limitations of human judgment and place-based insight. If educators think carefully and ethically, ChatGPT has the potential to demonstrate to us all and expand the options we have in changes in the way we think about feedback and assessment, as well as provide new opportunities for student-centred assessment practices.

## III. CHALLENGES AND RISKS

Even though ChatGPT creates many exciting possibilities for education, it also requires us to consider significant challenges that we must scrutinize [8-13]. As institutions adopt generative AI, we must consider not only what these tools can do, but what they do not address, pedagogically, ethically, and socially.

A primary concern is mis/disinformation: ChatGPT can produce text that sound – and look – legitimate as factual, but is, in fact, incorrect or logically deficient. Because ChatGPT lacks built-in corroboration, students may unknowingly treat these outputs as legitimate; students are likely to less aware of this risk in technical or scientific disciplines. This raises the need for critical AI literacy, whereby learners can question outputs of AI and corroborate / double-check the AI-provided content.

Academic integrity issues are equally significant. Because ChatGPT produces full essays or problem solutions, it is becoming increasingly difficult to ascertain whether students produced it alone, or with the assistance of generative AI. Academic institutions may not be creating appropriate policies which undermines the value of educational (and authentic) learning.

Cognitive over-reliance is another risk. The efficiency of producing refined content can dissuade students from making an effort to engage cognitively with the task, weakening their problem-solving strategies and self-efficacy. This "cognitive passivity" may not become documented in assessments, but may hurt students' learning in the long run.

Equity and access raise serious issues too. The majority of students do not have access to reliable tools or the digital fluency to use AI systems in a way that provides benefit. This dynamic will exacerbate existing equity issues, and generative models have the potential to replicate cultural biases, or provide meaningless representations of marginalized voices or knowledge in located contexts.

Ethical and privacy concerns also complicate the decision to adopt AI. There is a possibility of students sharing sensitive data unintentionally while chatting with ChatGPT, which raises issues of consent, who owns and gets access to the data, and surveilling students, when consent is not understood and/or institutional policies are vague or non-existent.

On a higher level, ChatGPT calls into question our conceptualization of authorship and intellectual labour. If AI can generate coherent outputs that cannot be distinguished from student outputs, we need to reconsider what it means to "learn" and to "create" when working alongside machines.

Tackling the risks requires collective action. Institutions need to establish policies on how AI can be used appropriately; clarify whether the context is formative or summative; and promote transparency. Educators need to be educated, not only on how to use AI, but also be educated on how to develop tasks that allow for critical thinking, documenting learning, and using AI responsibly. Eventually, students need to know how to engage with AI in a critical way, while maintaining academic integrity.

To sum up, while ChatGPT can potentially help education, its impact must be ethically, intentionally and pedagogically integrated. AI and education provoke thought about the question of whether to use it in education, to what extent, and how can we ethically use AI while considering what support

we give learners beyond their own space, innovation, ideation, and equity.

## IV. THE PICA FRAMEWORK

As generative AI tools like ChatGPT continue to make their way into educational settings, the need for pedagogical models to help educators orient their use quickly grows. While there has been exploratory and disorganized use of ChatGPT in the early stages of adoption, there is a wider recognition of the need for educators to use ChatGPT effectively in teaching and learning requires more than just having access to the tool - it requires an intentional, ethically-informed, and pedagogically-consistent approach. The PICA Framework seeks to respond to the demand for a framework for educators to use ChatGPT in education by providing educators with a four-phase approach for the meaningful use of ChatGPT in their educational practice: Preparation, Interaction, Contextualization and Assessment (Fig. 2).
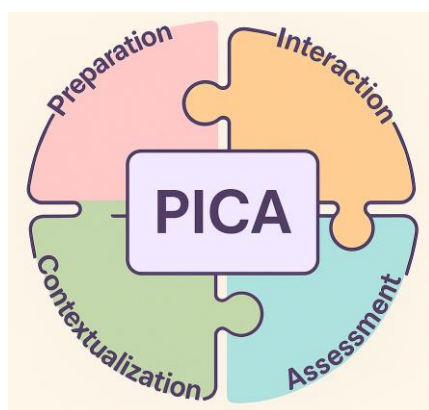


Fig. 2.   PICA framework.

The first phase of Preparation, primarily revolves around targeting precise instructional objectives, clarifying the function and scope of ChatGPT use, and preparing both educators and learners to assume the competencies necessary for the responsible use of generative AI. This framing situation requires educators to first decide the degree to which ChatGPT can serve a purpose in the curriculum, how it may be utilized for certain potentials - if at all - as distinct purposes (for example, a) is it a brainstorming tool, b) is it a language assistant, c) is a STEM explainer, d) is on-the-fly formative feedback generation tool?...). The role of AI ought to be defined in accordance with the educational product description, and the pedagogical fit. Prompt planning will also be critical: educators ought to model and demonstrate prompt structure. Educators should introduce prompt structure where prompts are used to stimulate critical engagement rather than passive consumption.

Importantly, it is our view that the preparation phase also needs to develop AI literacy - which will orient the students to both the unique strengths and limitations of ChatGPT, the nature of large language models, ethical use principles, and data privacy implications. In developing AI literacy, learners

will need to understand that ChatGPT is probabilistic - not authoritative - (it is an aid and not an oracle).

After the knowledge, conceptualization, and foundation phases, learners begin the Interaction phase and engage with ChatGPT in pursuit of a task. This can include asking questions, asking for explanations, testing and trying code, developing outlines, or composing drafts. The level of quality in this phase relies heavily on the ability of the learner to construct clear, specific, and meaningful prompts throughout the process. This skill of prompting is both a skill on its own, but also a process of getting better at expressing intentions clearly and then shape-shifting the queries if the output is "off base." Educators can add value to this phase by emphasizing cycles of iteration and exploration so that rather than taking the first response offered and moving on, students can be supported to ask follow up questions, reframe the question, or ask for responses in different formats, styles, and tone. Exploring the dialogue in this recursive nature not only leads to deeper understanding of content knowledge, but also enhances the idea of responding as a communicative act, digital agency, and self-directed inquiry.

The third phase, Contextualization, is the stage in which learning is solidified and deepened. In this phase, students critically evaluate ChatGPT responses by comparing them against prior knowledge or the ideas of peers or course materials or with other outside sources. While doing so, they are encouraged to examine the coherency, relevance and factual correctness of the AI's output. In the context of schooling, students move away from being passive recipients of information and towards being active constructors of knowledge, making judgments on what to accept, modify, or reject. Educators can support this phase by developing tasks requiring students to annotate ChatGPT outputs, locate potential errors or biases, and/or rewrite ChatGPT responses with added explanation or reasoning. The Contextualization phase also further enables opportunities for metacognitive reflection: students can be asked to describe how they used ChatGPT, what surprised them, and what they learned about the topic – and about the tool itself. The Contextualization phase connects to the aims of critical thinking, triangulation of sources, and epistemic awareness – all foundational pillars for 21st-century education.

The last phase, Assessment, will assess both the final product produced by AI-assisted work and the process the students engaged in during their interaction with ChatGPT. From this point, educators could develop rubrics which outlined dimensions for assessing prompt quality and the quality of iterative revisions, quality assessments of the AI-generated product, and the student's reflection on their interactions with ChatGPT. For example, a writing assignment may involve the need to submit an original draft, along with the prompt used with ChatGPT, the generated text, and a commentary which explains how they edited the text and validated the result. This would help make the entire process transparent and turn the experience with AI into a learning object. Assessment in the PICA framework is not simply for grading outcomes; rather, it allows for accountability, self-regulation, and ethical awareness of digital learning that can be encouraged. In a roundabout way, this phase allows learners to

take a practice of agency in a human–AI relationship, and not a passive consumer of machine-generated output.

To aid understanding and practice, the PICA Framework can be thought of as a circular flow model. Each phase informs and bolsters the others. Preparation lays the groundwork, Interaction helps users to engage the technology, Contextualization raises awareness regarding critical reflection, and Assessment reinforces learning goals while feeding into an improved future Preparation cycle. The cycle is organic in nature. Outcomes from assessment help in recalibrating the next cycle of prompting and goals, promoting a continuous loop of pedagogical development. This representation accentuates the non-linear, cyclical, and dynamic nature of learning with AI - it is not a linear pipe, but an incremental iterative dialogic activity.

The application of PICA in actual classrooms is many and varied. For example, in an advanced university writing course, instructors may ask their students to use ChatGPT to generate a sample thesis statement for an argumentative paper and then critique the thesis statement for clarity, strength of argument, and academic tone. In a secondary school coding course, students can engage ChatGPT to debug a broken Python function to identify coding errors, explain how the structure and logic in its suggestions were restructured, and reflect on how the AI's logical reasoning was different, or similar to, their own coding textbook methods. Likewise, as language learners, students can chat with ChatGPT in their target language and then generate a list of grammar code violations, and then produce a corrected conversation while annotating their changes. Each of these examples illustrate how the four phases can be integrated into authentic learning tasks that not only honour disciplinary objectives but also leverage the affordances of AI.

The PICA Framework relates to the well-established models of instructional technology integration, namely TPACK (Technological Pedagogical Content Knowledge) [32] and SAMR (Substitution, Augmentation, Modification, Redefinition) [33]. In the TPACK model, ChatGPT gets classified under the technological knowledge layer, but its potential educational value is really dependent on pedagogical integration and the disciplinary knowledge. With the PICA Framework, the focus is on operationalizing TPACK as a step-by-step process that privileges teaching purpose, student engagement, and accuracy of content. Regarding the SAMR model, PICA Framework asks educators to think beyond substitution (e.g., ChatGPT as a thesaurus) to higher-order redefinition - where ChatGPT generates opportunities for inquiry, collaborative composition, and scaffolding that would be implausible without ChatGPT.

In addition, the PICA concepts align closely with metacognitive theory of learning, which involves planning, monitoring and evaluating one's own cognitive processes. Each stage of PICA supports a specific element of metacognition: Preparation involves planning learning strategies and the learner's intentions; Interaction supports discourse and meaning making, which relates to monitoring one's cognitive processes; Contextualisation ultimately requires the learner to self-evaluate and reflect; and Assessment requires the student synthesise and make judgements about their outcomes and process. When situated in this way, the use of ChatGPT is more than a means for content delivery; it is a scaffold in building more sustainable learning behaviours and transferable cognitive strategies.

In conclusion, the PICA Framework contributes to a meaningful and pedagogically useful way for educators to incorporate ChatGPT into teaching and learning. The model allows us to create a structured experience to engage with AI across the four interrelated phases of Preparation, Interaction, Contextualisation, and Assessment. The framework allows for more responsible generative AI use as it can support the development of critical thinking, ethical implications and pedagogical alignment of teaching. In addition to being able to structure the engagement of generative AI, it provides us as educators with clarity for transforming a generic yet powerful language model into something personalised, reflective and disciplinary specific. As education continues to shift in the wake of advances in AI technologies, frameworks like PICA will remain necessary to ensure that the promises of innovation are grounded by a larger agenda of purpose and direction.

## V. CONCLUSIONS

The development of generative AI in education signifies one of the key paradigm shifts in modern teaching and learning. In this paper, we've looked at the concatenation of educational support and ChatGPT, a popular large language model, incorporate a new way of teaching and learning from personalized tutoring, academic writing support, to STEM, helping teachers improve productivity, and a new way to think about assessment design. After studying these applications, the pedagogical affordances of ChatGPT are commonplace and educationally valuable: flexible interaction, instant feedback, contextual support, and adaptive scaffolding. These affordances can enhance learner agency, engagement, and inclusion within various educational contexts when deliberately taken advantage of.

However, as shown in this research, these affordances do come with a set of complicated drawbacks. Misinformation, academic integrity, cognitive dependency, access inequities, and the ethical and privacy questions that remain unresolved all complicate the benefits of AI. While ChatGPT's utility is limited to its generativity, it is mainly governed by the educational systems that drive the appropriation of AI. Without governance, ChatGPT may similarly become appropriation of convenience that adds to the inequitable systems or potentially distracts from deep learning.

In light of these realities, the paper introduces the PICA Framework (Preparation, Interaction, Contextualization, and Assessment), a four-phase model designed to integrate ChatGPT into instructional practices in a systematic, contextual, and pedagogically sound manner. The PICA Framework offers an approach that is structured yet flexible allowing educators to ensure the use of AI technology is aligned with learning outcomes while also engaging students in critical thought about AI-generated content as well as live experimental, transparent, and reflective, ethical use. PICA offers a pedagogical cycle that everyone can repeat and be use

to suit their contexts, students, and discipline opposed to random experimentation.

By mapping the educational landscape of ChatGPT use and offering the PICA Framework as a conceptual and in-practice framework, both the topic and the PICA Framework contribute to the emerging conversation on human-AI collaboration within educational contexts. In educational contexts this paper highlights that effective integration is not a technical integration matter, it is a pedagogical issue that illustrates the difficulty of rethinking almost everything we do in terms of instructional design, assessment literacy, and AI supported digital agency to foster this new digital agency together with students and educators.

Future studies will investigate longer lasting effects on learning performance, affective involvement and skills transfer; the PICA framework also lends itself to empirical proof, via studies that used the PICA framework in classrooms, and collaborations between institutions. Additionally, institutional leaders and planners should develop more coherent strategies across institutional boundaries regarding AI literacy, access equity programs, and ethical governance frameworks that keep pace with humanity's creativity and stakeholder governance that encourages human and technological development.

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