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Keywords (separated by '-')	Artificial Intelligence - Modern Education - Chatbots - Education	



# Artificial Intelligence Based Chatbots is Killing Creative Minds: An Effective Discussion on Modern Education

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**Abstract.** Today Artificial Intelligence (AI)-based chatbots have rapidly become more useful in modern smart/digital education, with providing as virtual tutors, assistants, and information providers. While these AI-driven technologies offer efficiency and accessibility, also provide some issues like their impact on nurturing creativity among students/new learners. This research work provides an in-depth discussion on this relationship of AI-based chatbots and creative thinking (in the context of modern education 4.0). Hence, this work critically examines the potential effects of AI chatbots/AI driven tools on students' creativity, with focusing on various factors like reduced human interaction, standardized learning experiences, and the automation of problem-solving processes. By reviewing several articles (published online), this work explains how AI chatbots can either benefit or misuse creative thinking among students. This work also discusses the importance of human-robot collaboration, designing educational content that promotes creative problem-solving, and using AI chatbots as tools for personalized learning.

**Keywords:** Artificial Intelligence · Modern Education · Chatbots · Education

## 1 Introduction – AI Based Chatbots/Tools

Artificial Intelligence (AI) has revolutionized various aspects of our lives, and one of the most notable domains where its major influence is in education. AI-based chatbots and tools have been used across the educational landscape, transforming the way we teach, learn, and interact with information (especially post COVID 19). These intelligent digital assistants are designed to use human conversation, answer questions, provide information, and even use complex tasks (to enhance the educational experience) [1]. The integration of AI-based chatbots and tools into modern education is driven by several factors. Firstly, the advent of machine learning and natural language processing (NLP) algorithms has used these chatbots to engage in efficient, context-aware conversations,

making them valuable tools for both students and educators. Secondly, the increasing demand for personalized learning experiences has made the development of AI tools that adapt to individual learning styles, speed, and needs. Thirdly, the progress in digitalization of education has created a natural environment for AI to succeed, with frequent learners (or educators), i.e., today we become more comfortable when integrate with technology enhanced advancements.

Today AI-driven tools used in various forms in educational ecosystem. From virtual tutors that assist students in understanding complex concepts to intelligent content recommendation systems that tailor learning materials. Then, these tools are not limited to traditional classroom settings; they are also being used in online courses, corporate training, and self-directed learning platforms. But with using AI-based educational tools, we faced several issues/impacts on creativity and critical thinking (of learner). As the use of such tools expand, one question emerges always whether they improve the creative minds of students or degrade it (as they are getting much attentions by learners' community now a days). Hence, this work aims to move towards the complex relationship between AI-based chatbots and the nurturing creative minds (in the context of modern education). We explore several advantages and limitations of these AI based tools, with examining recent research findings, and discusses several used principles to use the benefits of AI while preserving and generating creativity (with explaining their use/misuse in modern education in this smart era).

### 1.1 Organization of the Work

This work is summarized in 8 sections.

## 2 Importance of Creativity in Education

As discussed above, creativity is an essential aspect in education that goes beyond the confines of artistic expression and incorporates innovative thinking, problem-solving, and adaptability [2]. Using creativity in education is not just a component; it is a necessary for future students to make quick, accurate and effective decision in this changing world. Here we will list few important points of creativity which are required in education:

- **Critical Thinking and Problem Solving:** Creative thinking encourages students to question, analyze, and approach problems from various views. It provides the development of critical thinking skills, enabling students to evaluate information critically and provide innovative solutions to complex issues.
- **Adaptability:** In a smart world (which has constant change and uncertainty), creative creative thinkers/learners are better equipped to adapt to new challenges and scenarios. In general, creativity nurtures flexibility and resilience, which enable students to move to an effective situation from an unexpected situation.
- **Innovation and Progress:** Creative minds are using the force behind innovation and progress in every area/application/field (especially from science and technology to the arts and humanities). By focusing on creativity, today education plays an important role in nurturing the next generation society people/innovators and inventors of next decade.

- **Expression and Communication:** Creativity provides a means for creative thinkers/learners to express their thoughts, emotions, and experiences. Through creative expressions like writing, art, music, and performance, students can communicate effectively and connect with others (friends/tutors) on a better level.
- **Motivation and Engagement:** Creative activities in the classroom can improve students' motivation and engagement with other learners. When students are encouraged to explore their interests/passions via making creative projects, they become more invested in their education/circle of learning. Note that creative projects require collaboration and teamwork, which are essential skills in today's smart era. Students who engage in creative group activities learn how to communicate, share ideas, and work together effectively and make thro more creative and productive.
- **Cultural Appreciation and Understanding:** Creativity in education keeps an appreciation for different types of cultures and perspectives. Also, exposure to different forms of creative expression, such as literature, art, and music from around the world, promotes cultural understanding and empathy among the creative thinkers.
- **Personal Growth and Well-being:** Today creativity also play an essential role in personal growth via providing self-discovery and self-expression to this outer world. Note that engaging in creative activities (like playing chess game, etc.,) can reduce stress, boost self-esteem, and enhance overall mental and emotional health which is good sign for each people/who use it. Also, creative thinkers are more curious and motivated to continue learning throughout their entire lives (encourages a lifelong love of learning and exploration).

In today modern job requirement, employers need people with creativity/having a useful skill. Hence, creative thinkers are considered as valuable assets (essential in a world where knowledge is continually evolving) who can come up with unique/novel ideas, innovation, and problem-solving abilities to organizations and help their organization to get profit. In summary, creativity is not an optional component of education but a fundamental aspect that empowers students to become critical thinkers, innovative problem solvers, and adaptable creative thinkers/learners. Cultivating creativity in education is an investment in the future, as creative minds are well-equipped to meet the challenges and opportunities of an ever-changing world. Therefore, educational institutions must prioritize and nurture creativity in their curriculum and teaching practices.

## 2.1 Defining Creativity and Its Significance

Creativity is an effective process which involves the generation of novel, unique and valuable ideas, solutions, or expressions. It is the ability to think throughout the entire universe, breaking away from conventional thinking patterns and exploring new learning connections, views, and possibilities. It has various forms of expression, like; art, music, literature, science, business innovation, problem-solving, and more. We use some key elements of creativity like originality, value, divergent thinking, combining and reimagining, problem-solving, flexibility, and expression.

**The Significance of Creativity:** As discussed above, creativity holds many essential aspects of human life, society, and progress, some are discussed here with a reason as:

- **Innovation and Progress:** Creativity is most essential tool for innovation and progress in all applications. It leads to recent advancements, and the development of new technologies, products, and ideas that enhance the quality of life of living nature.
- **Problem Solving:** Creative thinking is important for solving difficult/complex problems, whether they are scientific, societal, or personal (with innovative solutions and adapt to changing circumstances).
- **Artistic and Cultural Enrichment:** Creativity comes with through art, literature, music, and other forms of expression (with contributing to the diversity of human experiences/living nature).
- **Personal Fulfillment and Development:** Engaging in creative activities (by learners) can bring personal fulfillment and a sense of learning new things (with allowing themselves/express themselves/their passions, and find purpose in their life). It also enhances cognitive skills, boost self-respect, and improve personal growth. It encourages each learner to explore their potential and expand their knowledges or thoughts in a better way.

Creativity plays an important role in education by encouraging critical thinking, problem-solving. It prepares each learners/thinker to be lifelong learners and active learners to the society. In last, creativity also has a major impact on economic growth by driving entrepreneurship, business innovation, and the development of new markets and industries. In summary, creativity is not limited to the arts but extends to various applications used by human being. Note that recognizing and nurturing creativity is most important for unlocking human potential for solving difficult task/scenarios which they face in their life.

## 2.2 The Link Between Creativity and Critical Thinking

Creativity and critical thinking are two cognitive processes that work together to solve problems, make decisions, and generate innovative ideas/solutions. While these both terms have different mental processes, they share a strong connection and complement each other in various ways. Some of the link between creativity and critical thinking can be discussed here as:

- **Questioning and Inquiry:** Both creativity and critical thinking begin with asking new and different questions. As creativity make learners to ask open-ended and any questions that lead to new possibilities, while critical thinking involves asking questions that analyze, evaluate, and assess information or situations. The combination of these question types can lead to a deeper understanding of a problem or topic.
- **Divergent and Convergent Thinking:** Creativity often involves divergent thinking, which is the ability to generate a wide range of new unique ideas/solutions. Whereas, critical thinking uses convergent thinking, which is the process of evaluating and selecting the most appropriate idea or solution from a pool of possibilities. Note that together, they provide a comprehensive problem-solving approach for new learners.
- **Exploration and Evaluation:** Creativity come through various perspectives, unconventional approaches, and novel connections. Whereas, critical thinking comes

when these creative ideas are evaluated for their feasibility, relevance, and effectiveness. Note that the convergence of exploration and evaluation leads to better decision-making solutions.

- **Risk-Taking and Caution:** Creativity often requires risk-taking path to discuss unconventional or uncertain situations. While, critical thinking provides the necessary reason to evaluate high risks, weigh the pros and cons, and make informed/valuable decisions (about whether to use creative ideas or solutions or not).
- **Open-Mindedness and Objectivity:** Creativity works in an open-minded environment where learner/thinkers are few to thinks form different viewpoints and unconventional ideas. And critical thinking ensures that this open-mindedness is balanced with objectivity and a rational evaluation of ideas (based on valid evidence and pure logic).
- **Problem Identification and Solution Generation:** Critical thinking begins by identifying problems, analyzing their causes, and defining clear objectives. Whereas, creativity contributes by generating innovative solutions or approaches to address these identified problems. Note that critical thinking helps to evaluate and refine these creative solutions for new learners/thinkers.
- **Continuous Improvement:** The iterative nature of creativity and critical thinking encourages continuous improvement in new learners/thinkers. Creative ideas are refined through critical evaluation, and critical thinking can lead to the identification of new creative opportunities for enhancement (in this modern equation).

In summary, creativity and critical thinking are complementary aspects of cognitive processes. When these both terms used in conjunction, they provide an effective approach of problem-solving, decision-making, and unique idea generation.

### 3 AI-Based Chatbots and Their Impact on Creativity

Today AI-based chatbots are being used almost in many sectors like generating report, solving questions, modern education, effective and productive workplaces, better customer service, etc. AI based chatbots also offers several advantages in terms of efficiency, accessibility, and automation [3, 4]. However, their impact on creativity can be more dangerous. Here, we will discuss that how AI-based chatbots can influence creativity of new learners, both positively and negatively:

#### Positive Impact on Creativity

- **Resource Availability:** AI chatbots can provide quick access to large information, and enable creative thinkers/learners to explore/grasp new ideas and concepts (a valuable resource for creative thinking).
- **Efficiency and Time-Saving:** By automating repetitive tasks and answering similar questions, AI chatbots saves time and mental energy that can be used in other creative thinking tasks.
- **Assistance in Research and Idea Generation:** As we know, AI based chatbots equipped with natural language processing (NLP) or machine learning techniques for a better recommendation can help new learners in collecting important information and ideas to support their creative projects or problem-solving projects.

- Collaborative Learning: AI chatbots can provide collaborative learning experiences by connecting new learners (i.e., with similar interests or challenges). Hence, this collaborative environment can help creators to do new/healthy discussions and idea exchanges about anything.

AI chatbots provide education and information more accessible to person with disabilities, providing opportunities for differ voices and perspectives to contribute to creative projects. Hence, AI-driven chatbots can provide learning materials and new recommendations to new learners (with effective solutions). This can help new learners and engage them with new content in improving their creativity.

### **Negative Impact on Creativity**

- Overreliance on Answers: Depending on AI chatbots for immediate responses to any questions may discourage new learners/thinkers from engaging in independent research and critical thinking (which are essential components of creativity).
- Reduced Human Interaction: Overdependence on AI chatbots for learning or problem-solving can destroy human interaction and collaborative creativity, as face-to-face or peer interactions, which play an important role in idea generation and refinement/healthy discussion.
- Algorithmic Bias: AI chatbots can be biased in presenting their information like premium and no premium customers. It may affect the diversity and inclusivity of creative ideas and solutions they generate to learners/thinkers.

Some AI-driven educational systems may prioritize standardized content delivery and assessment, potentially stifling the exploration of diverse and unconventional ideas. As we know creativity come from unexpected connections, and useful moments (via getting new thoughts). But relying solely on AI chatbots may limit exposure to these new thoughts. Also, AI chatbots may also recommend safe solutions, and discouraging learners from taking creative/new risks or exploring unconventional ideas that could lead to new innovations.

In summary, the impact of AI-based chatbots on creativity is unexpected and depends on various factors like how they are being used, the context in which they operate, and the balance between automation and human being. Note that AI chatbots can enhance creativity by providing resources, personalization, and efficiency, but they can also provide risk of stifling creativity through overreliance (on technology), standardization, and reduced human interaction. Hence, to maximize the positive impact of AI chatbots on creativity of new thinker/learners, we need to make a balance between automation and human-driven creative process (with using critical thinking, collaboration, and the exploration of new ideas).

### **3.1 Limitations in Nurturing Creative Problem-Solving**

Nurturing creative problem-solving is an important goal in modern education. However, there are several limitations and challenges that can provide new development of required essential skill [5]. These limitations include:



- **Standardized Education Systems:** Many educational systems prioritize standardized testing and curriculum, which can discourage creative problem-solving which leaves lesser space for students to discuss creative solutions to complex problems.
- **Assessment Methods:** Traditional assessment methods, such as multiple-choice exams/MCQ, may not sufficient to encourage creative thinking because, students may focus on memorization/formulaic responses rather than developing creative problem-solving skills.
- **Time Constraints:** Note that in both educational and professional areas, time constraints can provide limit opportunities for deep exploration and experimentation. Creative problem-solving requires a sufficient time to brainstorm, test ideas, and refine solutions, which is not available with tight schedules and deadlines.
- **Fear of Failure:** This can be an important barrier for creative problem-solver. Students and professionals may be hesitant to take risks and discuss new solutions for fear of negative results, such as lower grades, etc.
- **Stifling Hierarchies:** In some organizational cultures, rigid hierarchies and top-down decision-making can discourage employees from contributing creative solutions. When authority figures dominate decision-making, it can deter others from offering innovative ideas.
- **Resistance to Change:** Resistance to change can be a significant barrier to creative problem-solving in both educational and workplace settings. People often prefer familiar routines and established processes, making it challenging to introduce and implement creative approaches.
- **Lak of Resources/Skill:** Without the necessary resources, learners may face new challenges to implement their creative ideas and solutions. Also, many learners may not receive formal training in creative problem-solving techniques. Without proper guidance and exposure to creative thinking methods, they may face a big to develop this skill on their own.

**Groupthink and Conformity:** Group dynamics can sometimes lead to groupthink and conformity, where creative thinkers/learners are reluctant to voice unconventional ideas for fear of rejection or social pressure to conform to the group's thinking. Further, cultural and societal norms can influence the perception of creativity and problem-solving. Note that some cultures may impact how creative thinkers/learners' approach and express their creative ideas. Hence creative problem-solving approach are essential for educators, organizations, and creative thinkers/learners to recognize and actively work. This may involve reevaluating education and assessment methods, providing a better environment and risk-taking, providing training and resources, and with encouraging different perspectives and unconventional ideas.

### 3.2 The Role of Educators and AI-Based Chatbots

In the modern educational era, educators and AI-based chatbots play different role in enhancing the learning experience. These roles are evolving, used to adapt the required changes in the needs of students and the opportunities presented by AI technology [6]. The roles of educators and AI-based chatbots in education are discussed as:

## The Role of Educators

- **Facilitating Learning:** Educators remain at the backbone of the effective teaching and learning process. They design each and every curriculum, create engaging lessons, and guide students through their academic/educational journey.
- **Personalized Instruction:** Educators use their expertise to give instruction to each student needs. They know that each and every student is unique and may require different approaches in new thinking and learning.
- **Mentoring and Guidance:** Educators also serve as mentors, supervisors and guides. They provide students not only academic knowledge but also valuable life skills, (which include critical thinking, problem-solving, and ethical decision-making).
- **Classroom discussions:** Educators also encourage/provide classroom discussions, debates, and collaborative activities that promote active learning and the development of social and communication skills. Also, educators use technology, including AI-based tools, into their teaching methods to enhance the learning experience and prepare students for the modern/digital era.

## The Role of AI-Based Chatbots

Today AI chatbots are available 24/7, which provide students with on-demand access to information and assistance outside of regular classroom hours also.

- **Personalized Learning Support:** AI chatbots can provide personalized support to each and every student, with conducting effective examinations, answering questions, and offering additional resources (to each learner, depends on their learning needs).
- **Supplemental Learning:** Chatbots also offer supplementary materials, practice questions, quizzes, and productive lessons that improve classroom learning and help students in grasping difficult concepts.
- **Data Analysis:** AI chatbots can also analyze student performance behavior or progress to identify areas where students may face difficulties. Note that this information can be shared with other educators to inform their teaching strategies.
- **Accessibility and Inclusivity:** AI chatbots can make education more accessible to students with disabilities, providing accommodations and tailored support.

Today chatbots can provide effective and productive feedback on assignments and assessments, which allow students to track their classroom's progress and make improvements in real time (for their better future/career). Note that AI chatbots are particularly effective for language learning also, which offer conversational practice, vocabulary exercises, and valid and effective feedback to new learners.

In summary, educators and AI-based chatbots each have different roles to play in education. Educators bring their expertise, mentorship, and guidance to the classroom, while AI chatbots provide personalized learning support, accessibility, and data-driven insights. The successful integration of AI chatbots into education involves collaboration between educators and technology, with educators using these tools to enhance the overall learning experience and prepare students for a rapidly evolving digital world/era.

## 4 Nurturing Creativity in the Digital Age

Nurturing creativity in the digital era presents both unique opportunities and challenges to new learners/creative thinkers. As technology continues to evolve with merging technologies through which we learn to live, work, etc. Hence, following strategies for nurturing creativity in the digital age are being used for creative thinkers:

- **Embrace Digital Tools and Platforms:** We encourage the use of digital tools for creative expression, such as graphic design software, video editing apps, and coding platforms. Also, we use online communities and social media platforms that enable sharing and collaboration among creative thinkers/learners.
- **Promote Digital Literacy:** Teaching digital literacy skills, including information evaluation, online research, and digital era, help creative thinkers/learners in navigating the digital era effectively.
- **Balanced Screen Time:** In this, offering for a balanced approach to screen time, it improves the importance of both digital and non-digital creative activities, such as drawing, writing, and hands-on projects.
- **Online Learning and Resources:** Using online learning platforms and resources to provide access to many educational contents like courses, tutorials, and webinars (to enhance creative skills of learners).
- **Encourage curiosity:** Such AI driven tools encourage creative thinkers/learners to learn new topics online (with reading articles, watching educational videos, or participating in webinars and virtual tours). Also, using digital projects, creative thinkers/learners can work together on creative tasks/projects such as creating multimedia presentations, podcasts, or virtual art exhibits. Further, via online communities and forums/platforms, creative thinkers/learners can share ideas, and receive feedback, and collaborate with other learners (from different backgrounds and perspectives).

Hence, we need to encourage digital creative projects, with focusing the importance of continuous improvement in learning/creative thinking. We need to learn from both successes and failures is important in the digital era. In the digital age, nurturing creativity involves leveraging the large number of digital resources and tools (with maintaining an effective approach that values diverse forms of creative expression, critical thinking, and ethical issues).

## 5 Ethical Issues and Challenges Towards AI-Driven Education

As discussed above, AI-driven education provides several benefits like personalized learning experiences, improved accessibility, and enhanced efficiency [7, 8]. However, several ethical issues and challenges are countered which need responsible and effective solution from scientific community (towards use of AI technology in education). Some of the key ethical issues and challenges are discussed here as:

- **Privacy and Data Security:** AI systems in modern era's education collect large amount of student data. But need to ensure the privacy and security of this big data is too difficult, from preventing breaches, misuse, or unauthorized access. Also, ethical

challenges include obtaining informed consent for data collection, protecting student information, and transparently communicating data handling practices.

- **Bias and Fairness:** AI algorithms can provide biases present in their data/training data, i.e., depend on premium and no premium customer (which leads to unfair or discriminatory outcomes in education). We need to address such issue with requiring continuous monitoring, auditing, and efforts to mitigate bias, ensuring that AI systems treat all students equitably.
- **Transparency and Accountability:** “black box” problem of AI algorithms makes it more difficult to understand how these decisions are made. Note that transparency and accountability are more important for educators and students (to trust AI-driven educational systems). Also, ethical challenges contain explainable AI decisions which provide useful information for errors, and ensuring algorithmic accountability.
- **Inclusivity and Accessibility:** While AI has the potential to improve accessibility for person with disabilities. It can also create new barriers if not designed inclusively. Hence, ethical issues should contain information that AI systems are accessible to all students, including those with different needs and abilities.
- **Social and Emotional Learning (SEL):** AI systems may face challenge in understanding and support social and emotional aspects of education (with neglecting the development of empathy, compassion, and interpersonal skills). So, ethical issues include balancing AI-driven academic performance with the rapid/overall development of students/new learners.
- **Digital Divide:** The adoption of AI-driven education can exacerbate the digital divide, leaving some students without access to technology or high-quality educational resources. So, here ethical issues include addressing disparities in access and ensuring that AI benefits reach all students.

Note that AI systems guide or replacing human educators with AI tool may raise questions about the autonomy of teachers and the agency of students. So, ethical challenges involve defining the specific roles of AI and humans in education, preserving teacher creativity, and respecting student choices. Hence, these ethical issues and challenges in AI-driven education require collaboration among educators, policymakers, technology developers, and other stakeholders.

## 6 The Future of AI Based Chatbots in Modern Education

The future of AI-based chatbots (with 24/7 support and accessibility) in modern education holds great promise and is likely to bring about significant changes in how students learn, educators teach, and educational institutions operate [9, 10]. Here are several key trends and possibilities for the future of AI-based chatbots in education:

- **Personalized Learning Experiences:** AI chatbots will continue to evolve, offering highly personalized learning experiences for each and every student (which will adapt content, pace, and resources based on individual learning styles, progress, and preferences).

- **Adaptive Assessment and Feedback:** AI chatbots will play an important role in assessing student performance and providing timely feedback. They can identify areas where students are facing difficulties and suggest required resources for their improvement.
- **Teacher Support and Professional Development:** AI chatbots will support educators by offering resources, meaningful information, and data analytics to improve teaching practices. They will provide personalized recommendations for professional development.
- **Emotional and Mental Health Support:** Future AI chatbots may include emotional intelligence capabilities to detect and address students' emotional well-being. They could provide mental health resources and interventions when necessary.
- **Parent and Guardian Engagement:** AI chatbots can enhance communication between schools and parents or guardians. They can provide updates on student progress, attendance, and important announcements.
- **Integration with Augmented and Virtual Reality (AR/VR):** AI chatbots will integrate with AR/VR technologies to create immersive educational experiences, allowing students to explore complex concepts in three-dimensional environments.

AI chatbots can help new learners/students in enhanced Collaboration and Communication, Assistance for students with disabilities, with providing ai-generated content creation, research and data analysis of each student to make or provide require recommendation of content to learn/follow/read (with language learning and multilingual support). Note that to address ethical issues in AI based chatbots use for education, we need to ensure data privacy, and maintain the balance between technology and human interaction.

## **7 Recommendations for Educators, Institutions, and Policy Makers for AI Driven Education in Today's Smart Era**

In today's smart era, implementing AI-driven education requires careful planning, collaboration, and ethical issues to be addressed. We need to discuss few recommendations for educators, institutions, and policymakers to use the integration of AI in education as:

### **For Educators**

- **Embrace Technology Training:** Educators should get ongoing training in AI tools and educational technologies to effectively integrate them into teaching practices.
- **Blend AI with Pedagogy:** Use AI as a tool to enhance pedagogy, rather than as a replacement for traditional teaching methods (with focusing on personalization, differentiation, and creative instruction).
- **Foster Critical Thinking:** Encourage students to think critically about AI-generated content and results (with teaching them to question related sources).
- **Individualize Learning:** Use AI to create personalized learning experiences that cater to students' diverse needs, learning styles, and progress rates.

- **Promote Ethical AI Use:** Teach students about the ethical use of AI, including data privacy, bias mitigation, and responsible technology use in detail for their better future/career.

### **For Institutions**

- **Invest in Infrastructure:** We need to ensure robust technological infrastructure to support AI-driven education, including high-speed internet, access to devices, and secure data storage.
- **Data Privacy Measures:** We need to implement strict data privacy policies and mechanisms to protect student information and ensure compliance with required regulations (e.g., GDPR or FERPA).
- **Curriculum Integration:** We need to integrate AI in developing the effective (practical based) curriculum to educate students about AI's capabilities, limitations, and ethical issues.
- **Professional Development:** We need to provide ongoing professional development opportunities for educators to keep them informed about AI advancements and how to use AI tools effectively.

### **For Policymakers**

- **Regulatory Frameworks:** We need to establish regulatory frameworks that address data privacy, bias, accountability, and transparency in AI-driven education.
- **Equity and Access:** We need to ensure equitable access to AI-driven education by addressing the digital divide and providing resources to unidentified communities.
- **Transparency and Accountability:** We require educational institutions and technology providers to be transparent about AI algorithms and decision-making processes.
- **Data Ownership and Portability:** We need to develop new effective policies that clarify data ownership, give students control over their data, and enable data portability between educational platforms.
- **Continuous Evaluation:** We need to regularly evaluate the impact of AI-driven education on learning outcomes, student mental health, etc.
- **Teacher Certification:** We need to build/create certification programs for effective educators specializing in AI-driven education to ensure that they have the necessary skills and knowledge.
- **Collaborative Initiatives:** We need to increase collaboration between government agencies, educational institutions, industry stakeholders (including AI researchers) to advance AI in education responsibly.

In the smart era, AI-driven education has the potential to transform learning and teaching. However, responsible implementation, continuous monitoring, and a strong commitment to solve ethical issues, are essential to harness the benefits of AI [11–15] while addressing potential challenges and ensuring equitable access to quality education for all.

## 8 Conclusion

Today AI chatbots have reshaped the educational landscape by offering several useful advantages in terms of accessibility, efficiency, and personalization, but AI driven tools have also raised several issues (towards modern education) about their impact on creativity, critical thinking, and the human aspect of education. Hence, we need to recognize that AI chatbots/AI driven tools are just tools to help in education to make better learning (grasps concepts quickly) but not be replacements for educators entirely (for all time). Note that their use depends on how they are being used into educational systems and how educators and institutions use such tools in their teaching. The importance of creativity in education remains important, as it makes students become innovative thinkers, problem solvers, and adaptable creative thinkers/learners in an ever-evolving world. To make a balance, educators, institutions, and policymakers must work together to ensure that AI-driven education enhances rather than degrades creativity (of learners). The convergence between AI and human educators has the potential to create a transformative learning experience that provides efficiency and personalization of AI (with having convergence with the creativity, mentorship, and ethical guidance, which is provided by motivated educators). By using such a balance, we can utilize the full potential of AI to make modern education and empower students to think better (with more creativity) in this smart and innovative era.

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## Chapter 11

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