Inclusive Intelligence: The Impact of AI on Education for All Learners

Center for Innovation, Design, and Digital Learning
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We invite ongoing conversations and engagement with all stakeholders in our CIDDL Community at https://ciddl.org.

Trey Vasquez and James Basham

The Center for Innovation, Design, and Digital Learning (CIDDL) is the National Center to Improve Faculty Capacity to Use Educational Technology in Special Education, Early Intervention, and Related Services Personnel Preparation and Leadership Personnel Preparation Programs.

Our Mission is to influence change that supports the appropriate use of educational technology in all Early Intervention/Early Childhood Special Education (EI/ECSE), related services, and K-12 learning environments to improve outcomes for all students, especially those with disabilities.

We are housed at the University of Kansas, School of Education and Human Sciences, Department of Special Education. Our lead partners include the Toni Jennings Exceptional Education Institute (TJEI) at the University of Central Florida, CAST, and the Metiri Group.

Learn more at Ciddl.org

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Inclusive Intelligence: The Impact of AI on Education for All Learners Executive Summary

Artificial intelligence (AI) is on the brink of transforming education across all levels, from pre-kindergarten through 12th grade (PreK-12) and higher education. This new technology has the potential to deliver greater efficiency, inclusivity, and adaptability to the modern education system. However, AI will also introduce challenges, including new practices in curriculum development, instruction, and assessment. Furthermore, integrating AI will present new ethical issues to support all students’ needs, including those with disabilities.

This report explores the multifaceted uses of AI in education and special education, underscoring its transformative capabilities while addressing the unique challenges of students with disabilities and other diverse learning needs. We hope this document will initiate conversations around AI in education. Each chapter discusses a different AI topic affecting education, special education, related services, and educational leadership, including the development of future educators, related service personnel, higher education faculty, and researchers.

The Center for Innovation, Design, and Digital Learning (CIDDL) plans to continue and update this report. Here are some primary takeaways from this report.

- AI in education has the potential to revolutionize teaching and learning through personalized education, administrative efficiency, and innovation, particularly benefiting (special) education programs across both K-12 and Higher Education. Key impacts include ethical issues, privacy, bias, and the readiness of students and faculty for AI integration.
- Effective AI implementation requires collaboration, planning, and open dialogue among stakeholders to address challenges and maximize benefits, emphasizing the need for community engagement, job security, and alignment with inclusive educational goals.
- Instructors can leverage AI to support curriculum development, lesson planning, personalized learning, and classroom management. Applying frameworks like Student, Environment, Task, and Technology (SETT) to ensure decisions are student-centered and focused on privacy and fairness. AI offers significant advantages for students with disabilities but requires careful management to avoid overreliance and resistance.
- AI’s impact on special education and education research can be profound, offering new tools for personalized learning and requiring ongoing research to ensure effective and ethical application.
- Collaboration with parents and the community is vital to leverage AI to enhance educational experiences and outcomes.
- Policy and strategic collaboration are essential for integrating AI to support students with disabilities, addressing barriers such as accessibility, ethical considerations, and infrastructure costs. Partnerships with the AI industry can update educational practices and prepare students for future careers.
- Ethical considerations are paramount in leveraging AI in education, requiring measures to ensure fairness, confidentiality and prevention of algorithmic bias. A balanced approach is needed to integrate AI ethically, ensuring it complements rather than replaces human educators while preparing all for a technologically advanced future.
Introduction

Artificial intelligence (AI) has been a disruptive innovation globally for over a decade. Without many knowing it, AI has emerged as an essential component of modern life, influencing technologies such as speech recognition software, navigation applications, autonomous robots, and facial recognition systems. Alan Turing’s influential 1950 paper, ‘Computing Machinery and Intelligence,’ significantly advanced the discussion surrounding artificial intelligence and spurred further research. His paper also proposed the Turing Test, a continued benchmark for machine intelligence. Turing’s paper, among other developments, contributed to the momentum leading up to the 1956 Dartmouth Conference, where AI was officially recognized as a field. Thus began a quest for machines to demonstrate “intelligence,” a pursuit that continues to challenge and redefine our understanding of human and artificial cognition. Until recently, the aspiration of AI was confined to labs and research centers, but now its growth has raised significant ethical and societal questions about the role of AI in our future.

Major advancements in computer processing power, speed, and architecture occurred during the years leading up to 2017 when Ashish Vaswani and colleagues at Google Brain published “Attention is All You Need.” The seminal manuscript introduced a novel transformer architecture that greatly enhanced data analysis and synthesis. This transformative model allowed technology companies to process large-language-model data for innovations like Google’s Gemini, OpenAI, and IBM Watson. Since the public release of ChatGPT3 in November 2022, the world has rapidly learned about the existence of AI and has begun using it in daily life. AI offers unparalleled potential to revolutionize education and special education (Marino et al., 2023).
The variability of all learners encompasses a wide spectrum of learning across behavioral, physical, and cognitive constructs. For students with disabilities, each of these areas presents distinct challenges requiring individualized instructional approaches. Recently developed AI technologies are inherently flexible and adaptable, creating personalized learning experiences and assistive technologies that enable educators to meet the unique instructional needs of this diverse population of students. Moreover, as these technologies continue to develop and integrate within education, they offer the unparalleled potential to revolutionize education with a focus on all students.

Inclusive Intelligence explores the multifaceted applications of AI in education and special education, underscoring its transformative capabilities while addressing the unique challenges of students with disabilities and other diverse learning needs. We hope this document will initiate conversations around AI in education. Each chapter discusses a different AI topic affecting education, special education, related services, and educational leadership, including the development of future higher education faculty and researchers. The Center for Innovation, Design, and Digital Learning (CIDDL) team will continue to update these documents with the help of our colleagues across the nation. We sincerely thank multiple individuals nationwide who contributed to this document.

Inclusive Intelligence First Edition

The adoption and use of AI by educators and their students is just beginning. Given the novelty of AI for many education fields, this first edition is focused on a broad audience across education, from pre-Kindergarten through 12th grade (PreK-12) and higher education, including faculty members and researchers. Additionally, there is an underlying focus on all students, including but not limited to students with disabilities and their parents. We hope Inclusive Intelligence will help educational stakeholders (e.g., educators, education leaders, related service personnel, students, parents, higher education faculty, and researchers) understand the current state of AI in special education. Within each chapter, the authors highlight key focus areas, considerations for successful implementation, and future possibilities for teaching and learning with AI. By sharing our combined understanding of the potential of AI, we aim to begin further conversations, improve educational practices, and foster more inclusive and equitable learning environments for all students in the emerging age of AI.
Terminology

Terms associated with AI are used throughout this document. We use common language to define these terms below.

Artificial Intelligence

Artificial intelligence (AI) refers to the simulation of human intelligence processes by machines. AI enables machines to perform tasks that typically require human intelligence. These tasks include learning, reasoning, pattern recognition, problem-solving, predicting, perceiving, and language understanding. AI can create personalized learning experiences, automate administrative tasks, and provide assistive technologies.

Computer Vision

Computer vision is a field of artificial intelligence that teaches computers to "see" and understand the world through images and videos. Just like our eyes send signals to our brain, computer vision uses cameras and software to process images. This lets computers do things like identify objects, track movement, and even understand the content of a scene.

Generative AI

Generative AI (GenAI) is used to produce new content. It can generate new text, images, videos, etc. Two examples of GenAI are OpenAI’s ChatGPT and Google’s Gemini.

Generative Pre-trained Transformers (GPTs)

GPTs are a type of neural network model that uses transformer architecture to generate human-like text. They are a key advancement in artificial intelligence (AI) that power generative AI applications such as ChatGPT.

Internet of Things

Internet of Things (IoT) connects everyday objects to the Internet. These objects, equipped with tiny sensors and computing power, can collect data and communicate with each other. IoT allows us to create 'smart' environments where devices in the classroom (like lights, thermostats, or attendance systems) can automatically adjust, collect information, and respond to needs.

Machine Learning

Machine learning (ML) enables systems to learn and improve from experience without being explicitly programmed and without humans being actively engaged. It involves algorithms that can learn from and make predictions or decisions based on data. Using ML algorithms can continually improve their performance through experience, similar to how humans can improve with practice, except much faster.

Neural Network

Neural networks are a type of machine learning algorithm modeled loosely after...
the structure of the human brain. They consist of interconnected "artificial neurons" that process information and learn through experience.

**Predictive AI**
*Predictive AI* uses data to forecast the future. This type of AI is often built into systems and is used for financial forecasting, fraud detection, and healthcare. Predictive AI is being integrated into some school information and support systems.

**Robotics**
*Robotics* is a field that combines engineering, computer science, and design to create machines (robots) that can sense their surroundings, make decisions, and perform actions in the real world. Combined with Artificial Intelligence (AI) and Machine Learning (ML), involves creating robots that can learn, adapt, and make intelligent decisions.

**Organization of Inclusive Intelligence: The Impact of AI on Education for All Learners**

Inclusive Intelligence delves into how AI impacts stakeholders across the education landscape. Each chapter explores the implications for educators, special educators, early interventionists, related service professionals, education leaders, personnel preparation faculty, researchers, students, and parents. This report aims to equip them with valuable considerations and prompts for reflection as they envision the future in a more AI-integrated world.

**Chapter 1: Considering Artificial Intelligence in Higher Education**

Artificial Intelligence could revolutionize higher education by enhancing efficiency, inclusivity, and responsiveness to 21st-century challenges across various institutions. Special focus is placed on how AI will impact programs in institutions preparing special educators and related service providers. AI’s potential lies in personalized learning experiences, administrative task automation, and support for critical thinking skills. For instance, AI-driven systems can tailor instruction to individual student needs, automate tasks like grading, and provide opportunities for enhanced critical analysis. Furthermore, AI offers advanced data analytics and automation in research-intensive universities to accelerate discovery and innovation. Liberal arts colleges can utilize AI to support creative work, while community colleges and vocational schools can streamline administrative processes and enhance teaching methodologies through AI-driven simulations. The chapter emphasizes the importance of considering ethical implications, data privacy, and integrating AI into current systems for higher education stakeholders.

To effectively integrate AI into higher education, stakeholders must consider various factors, including ethical concerns, data privacy, teaching methods, and curriculum design changes. Key questions address issues such as bias mitigation, data security, cheating prevention, integration with existing platforms, and the impact on employment roles. There is a need for student preparedness for an AI-driven world, and it is important to evaluate AI adoption’s financial implications, training, and long-term sustainability. The chapter concludes
by advocating for proactive engagement with AI technology, strategic planning, and fostering discussions among faculty, staff, and administrators to ensure a smooth integration process and maximize the benefits of AI in higher education.

**Chapter 2: Teaching Practices and AI Assessment**
The “Teacher Practices and AI Assessment” chapter extends the discussion on Artificial Intelligence in education from higher education to K-12 settings, focusing on its implications for teachers and educators. It addresses the evolving needs of the teacher workforce, where AI has the potential to alleviate pressures contributing to burnout by automating tasks such as grading and lesson planning. However, challenges such as extensive training and concerns about job security must be addressed to ensure AI’s integration supports teaching rather than replacing it. Engaging the community, including parents, in discussions about AI’s role in education is essential for fostering understanding and collaboration. Strategies like hosting informative sessions and involving stakeholders in policy development can build trust and support for AI integration while addressing privacy, equity, and inclusivity concerns. Aligning AI use with guidance provided in the 2024 National Educational Technology Plan and frameworks like Universal Design for Learning can guide educators in maximizing the benefits of AI while mitigating its risks.

In assessment, AI holds significant potential to enhance instructional practices by providing data-driven insights into student learning and teacher effectiveness. AI-powered assessments can analyze academic achievement, learning growth, engagement metrics, skill development, behavioral patterns, and personalization effectiveness. However, challenges such as the complexity of AI models and the need for extensive data to ensure reliability must be considered. Teachers, districts, and states should weigh the benefits and limitations of developing centralized models for assessing student outcomes, considering factors like return on investment and the inclusivity of assessment methods. Additionally, AI’s ability to evaluate behavioral patterns can provide valuable insights into social and emotional factors influencing learning, particularly for neurodiverse learners. Overall, the chapter emphasizes the importance of integrating AI into educational practices, considering its potential to augment teaching effectiveness while preserving the essential human elements of education.

**Chapter 3: Using AI in the Classroom: Considerations for Educator**
Integrating Artificial Intelligence into educational settings presents opportunities and
challenges for educators. By leveraging frameworks like the Student, Environment, Task, and Tool (SETT) model, educators can make informed decisions about effectively incorporating AI into curriculum development, lesson planning, and personalized learning experiences. However, educators must consider the data they provide to AI tools, ensuring they do not share sensitive student information and comply with privacy laws like FERPA. Additionally, educators must be mindful of the potential biases in AI models, which can impact student outcomes, particularly for diverse student populations.

In practice, AI can support various aspects of classroom management, such as automating administrative tasks and providing personalized instruction based on student performance and engagement patterns. AI-driven assistive technologies offer tailored support for students with disabilities, ranging from text-to-speech software for students with visual impairments to real-time transcription services for those with hearing impairments. By applying the principles of the SETT framework, educators can systematically evaluate AI tools' effectiveness in meeting student needs, aligning with learning objectives, and functioning in different instructional settings. However, educators must also address challenges such as resistance to AI adoption and overreliance on technology, emphasizing the importance of ongoing professional development and student instruction on AI tool usage to maximize its benefits responsibly.

Chapter 4: Envisioning AI's Impact on Special Education Research
The chapter explores the profound impact of artificial intelligence on special education research, highlighting its potential to transform learning experiences and outcomes for students with disabilities. Special education encompasses various domains, each presenting unique challenges that require personalized intervention approaches. AI’s flexibility and adaptability offer promising avenues for developing new practices, tools, assessments, and outcomes tailored to the diverse needs of students with disabilities. Despite AI’s recent emergence into the mainstream, additional research is crucial to evaluate its efficacy in enhancing curricular materials for students with unique abilities. The chapter is a valuable resource for educators, researchers, policymakers, and stakeholders committed to improving educational outcomes for all students, particularly those with special needs.

Furthermore, the discussion delves into the current landscape of special education research, emphasizing evidence-based practices, technology integration, inclusive education, behavioral interventions, assessment, professional development, individualized education programs (IEPs), early intervention, and policy and legislation. The research aims to ensure students with special needs receive equitable, high-quality education grounded in evidence-based practices. AI holds immense promise in personalized learning, early detection and intervention, assistive technologies, educator support, inclusive education systems, and ethical considerations. However, it necessitates continued research and ethical scrutiny to ensure responsible integration and maximize its potential benefits for all students, particularly those with disabilities and diverse learning needs.

Chapter 5: Enhancing the School-Home Connection: Empowering Parents with Artificial Intelligence
The chapter emphasizes the pivotal role of parents in integrating artificial intelligence into
their children's educational journey, particularly for students with disabilities. It underscores the importance of collaboration between schools and parents to ensure AI effectively enhances learning experiences in and out of the classroom. By actively engaging in conversations about AI and embracing technological advancements, parents can create a supportive learning environment at home, fostering personalized support and digital literacy among family members. This collaborative approach bridges the gap between home and school, empowering parents to make informed decisions that promote their children’s educational excellence and personal growth.

To maximize the benefits of AI in education, schools are encouraged to foster collaboration with parents through open dialogue and shared decision-making processes. This includes discussions on AI implementation, ethical considerations, and educational benefits, ensuring that AI technologies align with the shared vision for inclusive and empowering educational experiences. Additionally, the chapter provides practical strategies for schools to support AI implementation at home, such as communication about AI usage, provision of resources reflecting diverse family needs, and opportunities for families to observe and experience AI in action. By fostering a collaborative spirit between educators and parents, schools can ensure AI integration enhances educational experiences and prepares students for success in an increasingly technology-driven world.

Chapter 6: Policy and Guidance Considerations for Artificial Intelligence in Supporting Students With Disabilities

Integrating artificial intelligence into special education promises to revolutionize educational practices and improve outcomes for students with disabilities. Various international and national efforts, such as those led by UNESCO and the U.S. Department of Education, aim to provide guidelines and recommendations for AI’s ethical and meaningful use in education. However, challenges persist in ensuring equitable access to AI tools and maximizing their benefits for students with disabilities. Issues such as predictive AI systems disproportionately targeting students with disabilities and the need for inclusive policy frameworks highlight the complexity of integrating AI into special education. To address these challenges, stakeholders must prioritize universal accessibility in AI tools, involve individuals with disabilities in research and development, and establish strict data privacy and ethics policies. Additionally, efforts are needed to provide comprehensive professional development opportunities for educators and researchers, overcome resource constraints, foster interdisciplinary collaboration, and effectively disseminate AI-driven research findings to practitioners and school districts.
While AI holds immense promise for enhancing educational practices, significant challenges hinder its advancement in special education. Limited dedicated funding, the high cost of AI infrastructure, and competing funding priorities within higher education institutions pose barriers to specialized research initiatives. Complex ethical review processes and intricate grant-application processes further exacerbate funding constraints and impede research progress. Addressing these challenges requires a strategic approach that emphasizes collaborative efforts, advocates for the societal benefits of AI research in special education, and showcases the potential impact of research on improving educational outcomes for students with special needs. By navigating these complexities and fostering a collaborative, ethical, and inclusive approach to AI integration, stakeholders can harness AI’s full potential to create more accessible, supportive, and inclusive learning environments for all students, advancing inclusive education practices and upholding the rights of individuals with disabilities.

Chapter 7: Industry Collaboration for Educators and Artificial Intelligence

The collaboration between the education sector and the artificial intelligence industry is important in preparing students for future careers and ensuring they have the skills needed in an evolving job market dominated by AI technologies. With the rapid pace of technological development, schools often struggle to update their curricula to keep pace with industry advancements. Therefore, partnerships between educational institutions and AI companies can bridge this gap by providing students with the latest knowledge and skills required in the AI field. Educators must stay informed about industry trends and collaborate with AI developers to ensure that AI technologies are accessible and beneficial for all learners, especially those with disabilities. Establishing strong relationships with industry partners through regular communication, collaboration, and networking can lead to partnerships, internship opportunities, and curriculum development that aligns with industry needs.

Several strategies can be employed to foster successful collaborations between educators and industry professionals, such as creating advisory boards, organizing guest lectures and workshops, offering meaningful professional development for educators, integrating industry-driven capstone projects into the curriculum, and encouraging networking and collaboration events. These initiatives provide students with real-world experiences and exposure to AI technologies and support educators in staying updated with the latest developments in the field. By engaging in collaborative partnerships with AI companies, educational institutions can better prepare students for AI-related careers, advance educational practice and outcomes, and ensure
the development of more inclusive AI technologies that benefit all learners, including those with disabilities.

Chapter 8: Ethical Considerations for Educators Leveraging Artificial Intelligence

Incorporating artificial intelligence into educational programs raises substantial ethical issues concerning fairness, confidentiality, and algorithmic prejudice. Ensuring equitable access to AI technologies is crucial to prevent exacerbating existing educational inequalities, as students in well-funded schools may have greater access to cutting-edge AI tools. Additionally, the collection and use of vast quantities of personal student data by AI systems raise concerns about privacy rights and the potential for data breaches or misuse. Addressing these concerns requires transparent data practices, stringent data protection measures, and clear data ownership and control policies. Algorithmic bias stemming from biased training data can perpetuate inequalities and unfair assessments, highlighting the importance of designing AI systems that are transparent, explainable, and developed with a critical awareness of potential biases.

Integrating AI in education also presents opportunities to enhance instructional methodologies and personalize learning experiences. However, viewing AI as a tool to augment rather than replace teachers’ roles is essential, emphasizing the importance of soft skills such as emotional intelligence and creativity. Ongoing professional development and support for teachers are crucial to effectively integrate AI tools into their teaching practices and address ethical considerations related to technology use in the classroom. Educators play a vital role in teaching students about the nature of AI, its potential biases, and its impact on society, fostering students’ critical perspective and ethical awareness. Ultimately, navigating the ethical implications of AI integration in education requires a conscientious approach that prioritizes equitable access, ethical awareness, and the cultivation of technical and soft skills to prepare students for a technologically advanced future while upholding shared values of equity, inclusivity, and human dignity.
References


Chapter 1

Considering Artificial Intelligence in Higher Education
Defining Intent and Audience

Artificial intelligence (AI) will fundamentally reshape the landscape of higher education during the next decade, making it more efficient, inclusive, and attuned to the challenges of the 21st century (Michel-Villarreal et al., 2023). This chapter provides an overview of the transformative impacts AI will have on programs in institutions of higher education that prepare special educators and related service providers. This includes research-intensive universities, liberal arts colleges, community colleges, technical institutes, and vocational schools. The primary focus of this chapter is to serve as an initial cornerstone for advancing discussion on the impact of AI in higher education. The intended audience for this chapter includes faculty members, researchers, and higher education leadership that support the development of special educators, early intervention, related service personnel, and leadership or doctoral preparation programs.

AI will Impact Higher Education

Higher education aims primarily to teach the next generation of workforce employees, conduct basic and applied research, and support the regional, national, and international constituents they serve. AI is projected to change how leadership, faculty, and staff conduct business (Wang et al., 2021). One of the most significant impacts of AI in teaching is the enhancement of personalized learning experiences (Crompton & Burke, 2023). AI-driven systems can analyze individual student performance, understand students’ unique learning needs, and adapt instructional materials to meet these needs. This personalized approach not only caters to students’ diverse abilities but also aids in identifying areas in which they struggle, allowing for timely intervention and support.

AI has the potential to automate administrative tasks like grading, writing reports, and
providing students with feedback (Zawacki-Richter et al., 2019). For example, AI can analyze students’ responses to an exam and autograde their performance. This allows instructors to focus more on teaching and less on repetitive administrative duties.

AI also provides opportunities to enhance students’ critical thinking skills. For example, writing a lesson plan is a foundational exercise in many special education teacher preparation programs. This activity is no longer necessary because AI can write a lesson plan in under a minute. It is more beneficial for instructors to show preservice teachers how to generate a lesson plan and then ask them to analyze it in small groups. The discussion allows critical analysis and discourse to enhance students’ understanding of the content.

From a research perspective, AI will revolutionize the methodology and scope of scientific research at research-intensive universities. Advanced data analytics, predictive modeling, and AI automation can significantly enhance the efficiency and accuracy of research processes (Xu et al., 2021). Imagine a conversational AI methodologist for the social sciences who supports and guides researchers as they design new studies or run data analyses. Researchers will be able to receive personalized support from a dedicated team of experts who are AI agents. This technological leap will democratize educational research, accelerate the pace of discovery, and open new avenues for interdisciplinary studies.

In liberal arts colleges, where the focus often lies on arts and humanities, AI introduces new pedagogical approaches to art, video, audio, and the production of creative work. AI-driven tools can provide new methods to support innovative approaches to editing, presenting, and publishing creative works. This technology enables a more inclusive educational environment. The integration of AI in the curriculum of liberal arts colleges ensures students are well-equipped with essential skills and knowledge to navigate and contribute to a rapidly evolving digital world.

Community colleges serve as crucial access points to the community for many students, including those with disabilities. Like other institutions of higher education, these schools can leverage AI to streamline administrative processes and enhance student support services within local school districts. AI-powered platforms can assist with career counseling, course selection, and academic advising tailored to each student’s unique needs and goals. This individualized support is instrumental in improving student outcomes, retention rates, and overall educational quality in community colleges.

Finally, technical institutes and vocational schools focusing on practical and skill-based education can harness AI to refine their teaching methodologies. AI can simulate real-world scenarios, provide interactive learning experiences, and teach complex technical skills. For instance, AI-driven simulations in education, engineering, health care, and information technology can offer students hands-on experience in a controlled yet realistic environment. This approach enhances skill acquisition and prepares students for the demands of the modern workforce in a risk-free environment.

What Should Higher Education Constituents Know?

Institutions of higher education should be proactive as they strategically plan to integrate
instructors gain insight into student performance. However, privacy considerations and transparent use policies are essential for ensuring the ethical adoption of AI algorithms (Bond et al., 2024). Instructors must be knowledgeable about data security, ethics, and the implications of using AI in an educational context. This understanding is crucial for preparing future special education teachers to responsibly navigate the evolving educational landscape.

**Instructors and Professors**
Higher education instructors should be keenly aware of AI’s transformative impact on instruction, particularly regarding the pedagogical transformations associated with its adoption. Adaptive learning systems, AI tutors, and advanced data analytics will help instructors gain insight into student performance.

**Administrators**
Administrators should focus on the strategic implementation of AI to enhance institutional efficiency and effective student outcomes. AI can support data-driven decision-making in areas such as enrollment management, where predictive analytics can forecast student enrollment trends, or facility management, where AI can optimize energy use and reduce operational costs. Additionally, AI can provide targeted recruitment and strategic retention practices by analyzing current students. Administrators must navigate the challenges of integrating AI, including budgeting for new technologies, training staff, and ensuring compliance with privacy and data protection policies.

**Researchers**
Researchers need to understand AI’s profound implications for advancing academic inquiry. AI can process vast data sets much more efficiently than traditional methods, allowing researchers to uncover new insights and patterns. For instance, AI’s ability to analyze complex, large-scale data can lead to groundbreaking discoveries in fields like education. Researchers should also be cognizant of the ethical considerations and potential biases inherent in AI technologies and ensure their work adheres to high standards of integrity and objectivity.

**Staff Members**
Staff members in student services and support roles should be equipped to utilize AI tools to enhance student experiences. AI can be used in personalized learning platforms to tailor educational content to individual student needs or in advising systems to provide customized academic and career advice. Staff should also be prepared for the evolving nature of their roles as AI automates certain administrative tasks.
Students should be informed about how AI can augment their learning experience and prepare them for a workforce increasingly reliant on AI and machine-learning competencies. allowing them to focus more on direct student engagement and support.

Students
Students should be informed about how AI can augment their learning experience and prepare them for a workforce increasingly reliant on AI and machine-learning competencies. They should seek opportunities to gain AI literacy, regardless of their major, as this knowledge will become fundamental across all professions. For example, a speech and language pathology student may learn how AI is used in healthcare data analysis or personalized advertising. Similarly, an occupational therapy student may explore AI’s role in optimizing diagnostic analysis to enhance patient care.

Preparing for AI Integration
Every person in the university can begin to prepare for AI today. This action may start by reviewing the resources on the Center for Innovation, Design, and Digital Learning website and learning about AI. You are encouraged to initiate the discussion with your colleagues. Consider the following ideas.

Play With, Learn, and Use AI Technology
For faculty in higher education, embracing AI can significantly enrich teaching and research, allowing them to integrate AI tools into their teaching methods to create more dynamic and personalized learning experiences. For example, using AI-driven analytics, faculty can track students’ learning progress, identify areas where students struggle, and alter their teaching methods accordingly. In research, AI can be a powerful tool in data analysis, helping process large data sets. For instance, a Science, Technology, Engineering, and Mathematics class could use AI to analyze genetic sequences. In contrast, a history instructor might use natural language processing to sift through vast archives of historical texts with a summary on
the text's most important aspects.

**Begin Planning Strategically**
Administrators in higher education have a pivotal role in overseeing the strategic adoption of AI. They can initiate the implementation of AI systems for campus management, such as using predictive analytics for enrollment planning or AI-driven tools for resource allocation and facility management. Additionally, administrators can focus on establishing partnerships with tech companies to facilitate the integration of AI in educational settings and stay abreast of the latest developments in AI technology.

**Start Discussions Among All Faculty and Staff**
Begin formal and informal conversations within and across groups in higher education. Hosting coffee, lunches, and AI gatherings with colleagues, including faculty and staff, provides a way to talk informally about the potential of AI. Including support staff in these conversations is essential to ensure the institution is prepared to integrate this new technology. Staff members, including those in administrative and support roles, can leverage AI to improve operational efficiency and student services. For instance, AI-powered chatbots can answer student queries, reducing the workload on support staff and providing students with instant assistance. AI can help manage resources and provide better user experiences for disability support services, library staff, and IT services. AI can also assist with personalizing student support to enhance the overall educational experience.

**Considerations for Higher Education Administrators, Faculty, and Staff**
There are several critical questions higher education administrators, faculty, and staff should consider as they navigate the integration of AI into their institutions.

**Ethical Implications**
*How does the AI system address ethical concerns and potential biases?* Understanding how AI algorithms are designed and whether they have been tested for bias is crucial, especially in student admissions, grading, and personalized learning applications. Ensuring fair and unbiased AI tools is key to maintaining ethical standards and inclusivity.

**Data Privacy and Security**
*What measures are in place to protect data privacy and security?* AI systems process vast amounts of personal and academic data, so faculty and administrators must scrutinize their data protection policies. This includes understanding data storage, access controls, and compliance with laws like the General Data Protection Regulation (GDPR) or the Family Educational Rights Protection Act (FERPA). Institutions of higher education must ensure their faculty and staff understand the data privacy and security protocols and the importance of this work, especially when interacting with various AI models.

**Cheating and Plagiarism**
*How did students and educators contend with cheating before the advent of AI?* Professors may consider new ways of assessing student knowledge. Rather than using paper-based assessments, instructors can try integrating task-based or authentic experiences into the course. Another option is to have students leverage AI as an initial development of content and then facilitate a discussion within the class during which students identify incorrect facts, limitations, and positive aspects of AI use. Ethical and proper-use discussions on plagiarism, citing, and using intellectual
property correctly are important.

**Integration With Current Systems**
*How will AI systems integrate with educational and administrative platforms such as learning management systems?* Seamless integration is essential for the practical usability of AI tools. Before investing in technology systems, assess how these tools will work with current systems.

**Impact on Curriculum and Pedagogy**
*How will AI change teaching methods and curriculum design?* Faculty should explore how AI can enhance pedagogy, including supporting greater use of personalized learning or adaptive assessments. Faculty members also should consider how the curriculum may need to evolve to include AI literacy and related skills.

**Student Preparedness for an AI-Driven World**
*Are students adequately prepared for a future in which AI is ubiquitous?* Integrating AI into the learning process enhances students in all fields of study to gain skills in understanding of the benefits and pitfalls of the technology.

**Costs and Return on Investment**
*What are the financial implications of implementing AI?* Administrators need to consider the costs of AI solutions and weigh them against potential benefits, such as improved efficiency, enhanced learning outcomes, and future readiness.

**Training and Support**
*What training and support will faculty and staff need?* The successful adoption of AI technologies requires faculty and staff to be adequately trained to use these tools effectively. Understanding the scope of this training and the support structures needed is crucial.

**Impact on Employment**
*How might AI affect roles and responsibilities within the institution?* It is important to consider how AI can automate certain tasks and the subsequent effects on staff and faculty.

**Long-Term Sustainability**
*How sustainable is the adoption of AI in terms of technological updates and ongoing
Technology evolves rapidly, and administrators need to plan for the long-term sustainability of AI systems, including updates, upgrades, and potential overhauls.

Summary of Questions to Consider

How does the AI system address ethical concerns and potential biases?

What measures are in place to protect data privacy and security?

How did students and educators contend with cheating before the advent of AI?

How will AI systems integrate with educational and administrative platforms such as learning management systems?

How will AI change teaching methods and curriculum design?

Are students adequately prepared for a future in which AI is ubiquitous?

What are the financial implications of implementing AI?

What training and support will faculty and staff need?

How might AI affect roles and responsibilities within the institution?

How sustainable is the adoption of AI in terms of technological updates and ongoing maintenance?

Conclusion

This chapter highlighted a brief overview of the impact of AI on higher education, highlighting its potential to transform educational programs, particularly for special educators and related service providers across various types of institutions. It emphasizes AI’s role in enhancing efficiency, inclusivity, and responsiveness to 21st-century challenges through personalized learning, automation of administrative tasks, and support for critical thinking skills. Additionally, AI’s influence extends to research methodologies, offering advanced analytics and automation to accelerate discovery and innovation. The text addresses the importance of ethical considerations, data privacy, and the integration of AI into current systems, urging educators, researchers, administrators, and students to embrace AI literacy and consider its implications for teaching, learning, and administrative processes. It also outlines practical steps for higher education stakeholders to prepare for AI integration, including strategic planning, engaging with AI technology, and fostering discussions on AI’s potential and challenges.
References


Chapter 2

Teacher Practices and AI Assessment
AI can reduce the workload on teachers by automating tasks such as grading, attendance tracking, and certain aspects of lesson planning.

Preparing for AI Integration

This chapter builds upon Considering Artificial Intelligence in Higher Education by extending the key concepts for K-12 teachers and teacher educators. The aim is to highlight some overarching considerations around the use of AI by leveraging examples to initiate conversation and spur the field to experiment with AI and share both successful and unsuccessful outcomes. We start by addressing the evolving workforce needs in teacher education, engaging the community, including parents, the National Educational Technology Plan (NETP) recommendations, and discussing pedagogical considerations. The chapter then takes a deeper look at the use of AI in assessing content knowledge and behavior.

Evolving Teacher Workforce

AI has the potential to significantly impact teacher attrition rates depending on how the community and leaders implement and integrate AI into the educational environment. AI can positively alleviate pressures and challenges contributing to teacher burnout. AI can reduce the workload on teachers by automating tasks such as grading, attendance tracking, and certain aspects of lesson planning. See our chapter on Using AI in the Classroom: Considerations for Educators for a larger conversation. By increasing the efficiency of teacher tasks, teachers can spend more time focusing on quality teaching and enhancing student skills. AI enhancement could lead to a more satisfying work experience and potentially lower attrition rates, especially in high-need areas such as special education.

Introducing AI into education poses potential challenges that could negatively impact teacher retention. The implementation of AI requires significant training and professional development for teachers. There may be
concerns about AI possibly replacing their jobs. The overreliance on technology can lead to a lack of human agency, inclusion, equity, and cultural and linguistic diversity. Therefore, to mitigate the negative impacts and harness the positive potential of AI in reducing teacher attrition, it is crucial for educational leaders to ensure that AI tools are introduced as supports that enhance teaching rather than replace it. Providing adequate training and professional development, addressing job security concerns, and maintaining a balance between technology and the human touch in education are key strategies to maximize the benefits of AI for teachers and mitigate its risks. By doing so, AI can be a powerful tool in creating a more sustainable and satisfying teaching environment, allowing us to serve the community and its constituents well.

**Engaging the Community**

Engaging the community and parents in using AI in education requires thoughtful communication and participatory approaches. Hosting informative sessions and workshops can be a foundational step, allowing constituents to understand what AI is, how it's being utilized in the educational landscape, and the potential benefits and risks its incorporation brings. Demonstrations of AI platforms in action, particularly in personalized learning and assistive technology, can tangibly showcase its positive impacts. Additionally, creating open channels for feedback, such as consultation meetings, allows parents and the community to voice concerns, ask questions, and contribute to the conversation, fostering a collaborative environment where policies and practices around AI are developed jointly (Roschelle et al., 2024).

Building trust and support for AI in education extends beyond informational meetings. Involving parents and community members in developing and reviewing AI-related policies ensures transparency and directly addresses privacy, ethical use, and inclusivity concerns. Distributing educational resources and newsletters keeps the community informed and engaged with the ongoing developments and successes in AI education, highlighting the tangible benefits of AI through student showcases. These events demonstrate the educational value of AI and allow students to take pride in their achievements, further bridging the gap between technological advancements and community values. Through these efforts, schools can cultivate a supportive ecosystem around AI in education, ensuring its responsible and effective use for enhancing learning outcomes. Several recommendations have been provided by the White House and Office of Education Technology around integrating AI in Education.
National Educational Technology Plan

AI is simply another technology that should be considered in the overall process of preparing future educators. Unlike traditional technologies, AI’s ability to continually learn and support humans in completing tasks, with some level of “intelligence” (see the Introduction Chapter) places it in a distinct category of technology that will drastically change the practice of teaching and learning. The NETP (2024) is a critical guide for integrating any technology, including AI.

This plan considers the needs of all students, including those with disabilities, and frames the use of technology around overcoming three critical divides:

- **The Digital Access Divide** highlights the importance of equitable access to educational technology for students and educators, including internet connectivity, devices, and digital content. It also covers the importance of accessibility, digital health, safety, and citizenship within the context of digital access.

- **The Digital Design Divide** emphasizes the need for educators and education leaders to improve their professional development and capacity to design technologically enabled learning experiences.

- **The Digital Use Divide** focuses on enhancing students’ use of technology to improve learning through engaging and creative applications, promoting critical analysis of content.

A cornerstone of the NETP (2024) is the focus on using a design framework, such as Universal Design for Learning (UDL) (CAST, 2018), to support and consider the variables necessary to overcome the three critical divides. As a framework, UDL provides a framework to anchor this discussion in inclusive instructional practices. It developed as a means to empower student choice throughout the learning experience. The framework advocates for creating curricula and learning environments that provide multiple means of engagement, representation, action, and expression. UDL provides pathways for students to circumvent learning barriers during instruction while promoting student engagement and achievement. For those unfamiliar with the NETP (2024) or UDL (CAST, 2018), you are encouraged to explore those resources as your program considers the future of educator preparation and how AI will impact pedagogical delivery.

Figure 1. The NETP’s Visual Representation of UDL
**Pedagogical Considerations**

Integrating AI into educational practices requires teachers to navigate pedagogical challenges to ensure that technology's role in enhancing learning experiences is positive. One crucial aspect involves aligning AI output with different state educational goals and objectives on standards and benchmarks. AI has strengths in delivering content and immediate feedback, but today's AI also has limitations that it fails to acknowledge, especially in fostering critical thinking skills and making frequent errors.

Engaging students in dialogues about data privacy, algorithmic bias, and issues around diversity, equity, inclusion, and belonging is paramount. Take time to discuss AI's broader societal impacts, fostering a nuanced understanding of responsible technology use. These discussions incorporate critical thinking and reasoning into the learning process, equipping students to navigate the complexities of a digital society.

Teachers can strike a balance between technology and human interaction, underpinning the successful integration of AI in education. Despite AI's instructional capabilities, the irreplaceable value of teacher-student interactions—facilitating discussions, offering emotional support, and cultivating a collaborative learning atmosphere—remains paramount. AI, therefore, should serve as an augmentative tool, enhancing teaching effectiveness while preserving the essential human elements of education.

Continual professional development is a cornerstone for educators leveraging AI, ensuring their pedagogical approaches evolve alongside technological advancements. By applying these pedagogical principles, educators can harness AI's potential to enrich educational outcomes, positioning technology as a conduit to deeper learning and engagement rather than an obstacle. While AI will impact all facets of the learning process, the rest of the chapter will focus on only one aspect, specifically assessment. The assessment process was chosen because so many decisions in (special) education are driven by evidence-based decision-making, and AI is a data-driven technology. You will soon learn that AI has the potential to transform assessment.

**Assessing Knowledge with AI**

A diverse range of assessments are necessary to provide accurate formative and summative evaluations of student learning (Ismail et al., 2022). Formative assessments occur throughout the learning process, including daily quizzes, exit tickets, graphic organizers, student notes, progress on unit-long assignments, etc. Formative assessments provide teachers with data about the efficacy of their instructional practices. They signal the teacher to persevere with planned instruction or pivot and modify instruction to address student needs. A current limitation of formative assessments is the extensive time necessary for teachers to evaluate student performance. AI-enhanced assessments offer a potential solution. Consider how ChatGPT-4 might respond to a prompt about the areas a teacher might evaluate over a year.
Table 1. Chat GPT Output: Metrics of Evaluation Over a Year

<table>
<thead>
<tr>
<th>Human Prompt</th>
<th>ChatGPT-4 Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>What types of metrics might AI assist teachers with evaluating over a year’s time?</td>
<td>In the realm of education, particularly when underpinned by a framework such as UDL, AI can play a pivotal role in evaluating a diverse range of metrics over an academic year. These metrics encompass academic and behavioral dimensions, providing a holistic view of student progress and teacher effectiveness. Here are some key metrics that AI can assist teachers in evaluating:</td>
</tr>
<tr>
<td>Academic Achievement</td>
<td><strong>Academic Achievement</strong></td>
</tr>
<tr>
<td>AI can analyze standardized test scores, quiz and exam results, and class assignments to track academic progress. This analysis can identify patterns and trends in student learning, offering insights into areas where students excel or require additional support.</td>
<td></td>
</tr>
<tr>
<td>Learning Growth</td>
<td><strong>Learning Growth</strong></td>
</tr>
<tr>
<td>AI tools can measure student growth over time, comparing their academic performance at various intervals. This can be particularly beneficial in adaptive learning environments where content is tailored to the learner’s pace and ability.</td>
<td></td>
</tr>
<tr>
<td>Engagement Metrics</td>
<td><strong>Engagement Metrics</strong></td>
</tr>
<tr>
<td>AI can monitor student engagement in digital learning environments. This includes tracking time spent on tasks, participation in discussions, and interaction with educational content. Such data provides valuable insights into how students engage with learning materials and can inform teaching strategies to enhance engagement.</td>
<td></td>
</tr>
<tr>
<td>Skill Development</td>
<td><strong>Skill Development</strong></td>
</tr>
<tr>
<td>For instance, in science, technology, engineering, and mathematics (STEM) education and game-based learning, AI can assess the development of specific skills, such as problem-solving, critical thinking, and computational thinking. It can also track progress in executive-function skills, which are crucial for academic success.</td>
<td></td>
</tr>
</tbody>
</table>
Behavioral Patterns
AI can analyze patterns in student behavior, including attendance, participation in class activities, and social interactions. This can be instrumental in identifying students who might need additional support in areas like social skills or behavioral interventions.

Personalization Effectiveness
For educators employing a UDL approach, AI can evaluate the effectiveness of personalized learning paths. It can analyze how different students respond to various teaching methods and content delivery styles, aiding in the refinement of personalized learning experiences.

Teacher Performance
AI can provide feedback on teaching effectiveness by analyzing student performance data about the teaching methods employed.

Accessibility and Inclusivity
AI can evaluate how accessible and inclusive educational content and practices are, especially for individuals with disabilities. Evaluation includes analyzing how different students interact with technology and educational materials, ensuring that all students have equitable learning opportunities.

Incorporating AI into educational assessment can provide a data-driven approach to instruction, facilitating a more nuanced understanding of student learning and teaching efficacy. This technology can significantly enhance educators’ ability to meet diverse learning needs and optimize educational outcomes when used judiciously.

The scope of AI assessment also extends to behavioral evaluation, where student behavior can provide insights into social and emotional facets influencing how students learn (Zhang et al., 2022). For instance, AI can monitor patterns in student engagement, focus, and social interaction, enhancing targeted instruction for students with autism.

AI’s contribution to data-informed decision-making also permeates into classroom management and behavioral interventions. As Park, Lee, and Cozma (2020) have noted, AI technologies can monitor and analyze the dynamics within the classroom, yielding insights into behavior patterns and social interactions among neurodiverse learners. This information is invaluable for teacher candidates, supporting them in devising strategies that
promote a more inclusive and supportive learning atmosphere. These instances underscore the transformative potential of AI in enhancing the training of special education teachers through a data-oriented, proactive, and individualized educational approach.

Within the output above, ChatGPT-4 did not discuss multimodal data as a means to further personalize instruction. Multimodal data includes physiological data such as eye tracking, galvanic skin response, body temperature, electrodermal activity, heart rate, electrical brain surface activity, and linguistic and prosodic aspects of speech (Molenaar et al., 2023; Sharma & Giannakos, 2020). These data allow AI to interpret cognitive, physiological, and behavioral outcomes from a stimulus. For example, a preservice special education teacher could be working virtually with a student with an emotional disturbance. As the student expresses escalated behavior (e.g., starts yelling and swearing at the preservice teacher), the teacher’s heart rate increases and brain activity changes. Multimodal data allows AI to determine the exact moment when the preservice teacher is no longer learning from the exercise. It also can provide recommendations for future experiences. However, from a neurological stance, the student’s escalation builds internally well before the student acts out (Sapolsky, 2017). Using multimodal data, an AI could identify this change and either warn the pre-service educator or even intervene in adjusting the situation to avoid outward behavioral escalation (Standen et al., 2020). Considerations around the right of an AI to understand and intervene are discussed in both the Research and Ethics Chapters of this document.
AI and Assessment: Considering Outcome for Future Teachers

The list of assessments generated by ChatGPT-4 has tremendous potential to enhance instruction. However, we have yet to get commercially available AI assessments that are reasonably priced. In the short term, teachers need to understand how AI-enhanced assessments function. AI evaluates students based on similarities and differences in their performance when compared to thousands or hundreds of thousands of other cases in the training model.

The complexity of the model (i.e., how many variables the algorithm accounts for) directly influences the number of cases necessary to ensure the reliability of the results. For example, consider a model where engagement equates to learning. If engagement is evaluated at one point during the lesson and engagement at that point leads to a successful demonstration of the learning objective, the model would only need to contain a small number of cases. Unfortunately, assessing engagement at a one-time point during a lesson rarely accurately predicts student learning. Consider the variables contributing to student learning (e.g., hours of sleep, breakfast before school, relationships with peers, relationship with teacher, etc.). It will likely take years of model training before the reliability of the models reaches an acceptable level at which AI accurately predicts outcomes for all learners.

More data leads to better model-analysis outcomes. Teachers, school districts, and states should consider the benefits and limitations of developing centralized models to assess student outcome measures. For example, if all students must meet state standards related to reading by the end of grade 3, a district may choose to develop a predictive screening model for first, second, and the beginning of third grade. The model can be based on video recordings of the students in class. Universal screening tools currently implemented by school districts present predictive analytics based on electronic assessment results. In the future, teachers and districts must determine which cases and models provide the greatest return on investment for their students.

AI can also perform behavioral evaluation, where student behaviors provide insights into social and emotional factors influencing students’ learning. For instance, AI can monitor patterns in student engagement, focus, and social interaction, enhancing targeted instruction for students with autism-spectrum conditions. Tuomi (2018) noted that AI technologies can monitor and analyze the dynamics within the classroom, yielding insights into behavior patterns and social interactions among neurodiverse learners. This information is invaluable for future teachers, supporting them in devising strategies that promote an equitable and inclusive environment.

Summary and Resources

This chapter provides an exploration of AI within the K-12 landscape. The authors encourage educators to consider the impact of these disruptive technologies on teacher attrition, national and local policy development, engaging the community and pedagogical considerations. The next chapter will explore various tools, interventions, and curriculum opportunities AI may be valuable for K-12 teachers.
References


Chapter 3

Using AI in the Classroom: Considerations for Educators
Artificial Intelligence (AI) offers the potential to support curriculum development and personalized lesson plans by analyzing student strengths and challenges during the learning process.

Introduction

Both quality instruction and quality intervention are critical for ensuring all students are fully prepared for success in college and careers. Artificial Intelligence (AI) offers the potential to support curriculum development and personalized lesson plans by analyzing student strengths and challenges during the learning process. One way to think about AI when developing curricula and making intervention decisions is through a framework such as Student, Environment, Task, and Tool (SETT; Zabala, 2020). This chapter provides an overview of what educators can do to use the SETT framework to guide decision-making around the use of AI.

This chapter is focused on in-service educators, administrators, and curriculum specialists in Pre-Kindergarten through 12th grade (PreK-12).

Our goal is to provide PreK-12 educators with guidance on the use of AI and considerations for its integration as it relates to classroom instruction, management, intervention, assistive technology, and supporting students’ development.

Consider the Data You Are Providing the AI

Before using an AI, it is important to know that as you interact with the AI, you often help it learn. While an AI can quickly provide information, data is a two-way street. While AI is trained on model data, similar to humans, AI uses experience via input and output to continually learn. Most of the time, when you use an AI, you are also helping teach it. So, educators must consider the data that they provide the AI. AI tools, such as ChatGPT, are open sources that collect data. As such,
A foundation for effective learning environments is effective planning and evidence-based decision-making. AI can be used to develop lesson plans quickly and efficiently.

educators should refrain from uploading private student data (e.g., medical records, IEPs, cumulative files). Additionally, educators should be aware of federal privacy laws that relate to students (such as FERPA) concerning the sharing of data, which would include AI. For more information on using AI and student data, see the Office of Educational Technology’s recommendations in Artificial Intelligence and the Future of Teaching and Learning.

After recognizing the importance of what not to share with an AI, educators will find that this technology can help accomplish various tasks and support student learning. We can start with the basics of lesson planning.

Lesson Planning and Assessment

A foundation for effective learning environments is effective planning and evidence-based decision-making. AI can be used to develop lesson plans quickly and efficiently. However, the specificity of the prompt used to elicit the plan directly correlates to whether the resulting plan is relevant and appropriate for the student population. Consider two examples of how prompts can change the response. In the first example, the prompt lacks specificity; therefore, ChatGPT determined the lesson length, selected the grade-level standards to be addressed, and provided a generic lesson. In the second example, the prompt was much more specific, resulting in a detailed plan that offers more scaffolding, multiple options for student engagement, and is more likely to meet the diverse needs of students in the 8th grade science class.
**Example 1: Generic Prompt and Response from ChatGPT-4**

<table>
<thead>
<tr>
<th><strong>Human Prompt</strong></th>
<th>Write a lesson plan about cells.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ChatGPT-4 Response</strong></td>
<td>Introduction to Cells</td>
</tr>
</tbody>
</table>

**Objective**
By the end of the lesson, students will be able to define a cell, identify the basic structures of plant and animal cells, and explain the role of cells as the fundamental unit of life.

**Materials**
- Microscopes
- Prepared slides of plant and animal cells
- Diagrams of plant and animal cells
- Worksheets for note-taking and assessments
- Interactive cell models (physical or digital)

**Standards**
Aligns with Next Generation Science Standards (NGSS) for middle school life sciences: MS-LS1-1. (Conduct an investigation to provide evidence that living things are made of cells.)

**Instructional Procedures**
1. *Introduction* (10 minutes)
   - Begin with a probing question to assess prior knowledge: What do you know about cells?
   - Introduce the concept of the cell as the basic unit of life, emphasizing its ubiquity in living organisms.
   - Briefly outline the history of cell discovery and the development of cell theory.

2. *Direct instruction* (15 minutes)
• Use a presentation to introduce the two main types of cells, prokaryotic and eukaryotic, highlighting key differences.
• Focus on eukaryotic cells, distinguishing between plant and animal cells. Utilize diagrams to illustrate cell structures such as the nucleus, cell membrane, cell wall (in plants), mitochondria, and chloroplasts (in plants).
• Discuss the function of each cell component, employing analogies to facilitate understanding (e.g., comparing the cell membrane to a security gate).

3. Guided practice (20 minutes)
• Students observe prepared slides of plant and animal cells under microscopes, identifying structures learned during instruction.
• Facilitate a discussion encouraging students to share their observations and relate them back to the cell diagrams.
• Utilize interactive cell models to reinforce the spatial relationships between cell components.

4. Independent practice (10 minutes)
• Distribute worksheets that require students to label diagrams of plant and animal cells and match cell components with their functions.
• Encourage students to refer to their notes and the textbooks if necessary, fostering self-directed learning.

5. Assessment (5 minutes)
• Conclude with a short quiz or exit ticket that assesses students’ ability to identify cell structures and their functions.
• Questions should cover both plant and animal cells, including comparisons between them.

6. Closure (5 minutes)
• Summarize key points covered in the lesson, emphasizing the significance of cells in biology.
• Encourage students to reflect on the day’s activities and ask any remaining questions.
**Differentiation Strategies**
- Provide visual aids and tactile models for students who benefit from physical manipulation.
- Offer extended time for microscope work to ensure all students can adequately observe cell structures.
- Include digital simulations for students who require alternative methods to understand cell components and their functions.

**Homework**
Assign a project where students create a model of a plant or animal cell, using materials of their choice, to reinforce the structure and function of cell components.

**Reflection**
After the lesson, reflect on student engagement and understanding. Consider adjustments to the lesson plan based on student responses, misconceptions encountered, and the effectiveness of instructional strategies.
Example 2: Specific Prompt and Response from ChatGPT

Human Prompt
Develop a 50-minute lesson plan for an inclusive 8th-grade science class. The lesson is about the structure and functions of cell organelles. Identify the common core science standards I should use. Include scaffolds for students with reading challenges who might not possess grade-level reading abilities. Articulate high-leverage or evidence-based strategies for the teacher in bold or italicized text. Include references for the strategies and cite using American Psychological Association version 7 format.

ChatGPT-4 Response
Lesson Plan: Understanding the Structure and Functions of Cell Organelles
Grade Level: 8th Grade
Subject: Science
Duration: 50 minutes
Common Core Science Standards:
- NGSS MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Objective
Students will identify and describe the structure and functions of cell organelles, including the nucleus, mitochondria, chloroplasts, endoplasmic reticulum, Golgi apparatus, lysosomes, and cell membrane. By the end of the lesson, students will create a visual model of a cell, demonstrating their understanding of each organelle’s role.

Materials
- Diagrams of animal and plant cells
- Accessible texts with simplified language and glossaries
- Multimedia presentation software
- Interactive cell simulation software
- Graphic organizers
- Text-to-speech software
• Audio recordings of content
• Rubric for project assessment

**Instructional Strategies**

*Engagement (10 minutes)*
• Begin with a video that introduces cell organelles in an engaging manner. Use multimedia resources to cater to different learning styles and maintain student engagement (Mayer, 2009).

*Direct instruction (10 minutes)*
• Present information using multimedia presentations that combine visuals with oral explanations, employing the dual coding theory to aid comprehension (Paivio, 1986).
• Explicitly teach vocabulary related to cell organelles, providing definitions, examples, and visuals to enhance understanding (Beck et al., 2013).

*Guided practice (15 minutes)*
• In small groups, have students use interactive cell models on tablets or computers. Offer text-to-speech software and visual aids for students with reading challenges.
• Circulate to provide scaffolding with targeted questions to deepen understanding and clarify misconceptions (Rosenshine, 2012).

*Independent practice (10 minutes)*
Students individually create a simple diagram of a cell, labeling organelles and their functions, using graphic organizers to plan their work. Provide differentiated instructions and resources to support diverse needs (Tomlinson, 2001).

*Assessment (5 minutes)*
• Students share their diagrams with peers. Use a rubric that assesses understanding of organelle functions, accuracy, and completeness.
• Provide feedback that is specific, constructive, and actionable, promoting growth and understanding (Hattie & Timperley, 2007).
**Differentiation and Scaffolding**

- Offer texts at various reading levels, along with audio versions and visual supports, to ensure all students can access the content.
- Use peer tutoring and collaborative learning strategies to support learning among diverse students.

**High-level Strategies**

- Explicit vocabulary instruction: Direct teaching of domain-specific words enhances comprehension of complex texts and concepts.
- Scaffolding: Providing structure and supports during new learning experiences ensures all students can participate meaningfully.
- Formative assessment: Continuous assessment allows for the adjustment of instruction based on student understanding.

**References**


This lesson plan integrates evidence-based instructional strategies to create an inclusive learning environment. By leveraging multimedia resources, scaffolding, explicit vocabulary instruction, and formative assessment, the plan addresses the diverse needs of eighth-grade science students, ensuring all learners can achieve the lesson’s objectives.
Based on the examples, the ability to provide prompts and guide the AI in the specifics of a task is critical to supporting the desired outcome. Educators should also know that AI is only as valid and reliable as the data set on which the model is trained. For example, if a teacher uses an AI to score student essays based on student work from a mostly white, affluent, suburban middle school, analysis in a Title 1 inner-city school serving students from diverse and underserved communities may be inaccurate.

When integrating AI into classrooms, teachers must consider the data set the tools were trained on and how biased data (i.e., hallucinations) may or may not affect student outcomes (Adiguzel et al., 2023). An example of data hallucination includes errors in scoring essays based on the demographics of the training set (Baidoo-Anu & Ansah, 2023). The training data do not consider sociocultural differences. Therefore, the AI will not be able to make those distinctions, which are essential when evaluating student work. Educators should critically consider the findings they obtain when using AI compared to similar evaluative methods. Additionally, educators need to continue to fact-check the information from the AI rather than accept it at face value.

As educators leverage AI to support the distinctive needs of learners in their classrooms, they must consider the diversity and variability of students (National Educational Technology Plan [NETP], 2024). Although AI can be used as supplemental or substitutional support to alter a traditional paper–pencil task, teachers should ask themselves if AI fully prepares their students for the future. Classroom use of AI can potentially transform access for all students, but especially for students with disabilities and students who are culturally and linguistically diverse. Researchers indicate that students who attend schools in socioeconomic-disadvantaged areas use technology for rote memorization-type skills. In contrast, students in affluent schools use technology to create and transform their learning (Herold, 2022). Teachers should intentionally use AI to design their lessons, set high expectations, and support learning outcomes that align with the needs of future careers. The NETP (2024) is a critical guideline with advice for educators and education leaders.

**Classroom Management**

While AI will increase the push for personalized instruction, teachers will continue to play a critical role in developing an effective learning environment. Classroom management encompasses a broad range of skills beyond student behavior management. Teachers will continue to establish classroom rules and routines, develop an inclusive classroom culture, and facilitate interactions that support learning and respect. These skills often require thoughtful planning and continuous adjustment. How can AI support classroom management?

Teachers can integrate AI tools by automating some administrative tasks such as attendance tracking, tracking student progress on content acquisition, and engagement of students by including them in the critical analysis, thinking, and use of these technologies in school and future work life. Researchers have been focused on supporting personalized instruction for decades with intelligent tutoring programs, online course offerings, and simulation/gaming technologies (see Dai et al., 2024). Many of these examples have the capability to personalize content based on the current level of student performance, can detect patterns of engagement or participation, and will provide teachers with a scaffold of recommendations for students, all
leveraging AI. For instance, AI can support translation services for the diversity of languages in schools.

**Providing Translation Services**

One of the more exciting advances in AI support is the development of real-time translation of spoken or written text. Allowing seamless classroom communication during IEP meetings and working with community constituents has become more inclusive. AI allows educators to translate educational content such as textbooks, lectures, and announcements for activities within the school system. By including school district community constituents, we can foster a more equitable educational experience, ensuring all students, regardless of their linguistic background, have the opportunity to succeed. However, like other AI outputs to human prompting, translation services may contain errors or get dialects incorrect. This highlights the need to test various AI translation tools, problem-solve, and critically think through solutions. Identifying tools that work best for translation is a great way to engage parents collaboratively around AI use and decision-making (See the chapter on Enhancing the School-Home Connection).

**Enhancing Critical Thinking and Analysis**

When students are exposed to complex problem-solving scenarios tailored to their learning pace and interests. These scenarios can challenge students to think critically, analyze data, and draw conclusions, thereby fostering a deeper understanding of the subject matter. For example, if a student is interested in superheroes, a teacher can take mathematics content and leverage the student’s interest in superheroes to teach fractions with a simple chatbot.
Example 3: Personalized Lesson with Superheroes Using Chat GPT-4

**Human Prompt**
Create a lesson where you want to teach fractions to a 4th grade student who is interested in superheroes

**ChatGPT-4 Response**
Superhero Fraction Adventures

**Objective**
To understand the basics of fractions and how to compare, add, and subtract them using the exciting world of superheroes as a backdrop.

**Introduction**
Begin the lesson with a short story: "In the city of Fractionville, different superheroes use their unique powers to save the day. However, they've encountered a new challenge that only understanding fractions can solve. The Fraction Force needs your help to restore balance and peace to the city!"

**Activity 1: Superhero Fraction Identification**
- **Materials**: Paper, pencils, and fraction flashcards featuring images of superheroes (e.g., 1/2 Captain Courage, 1/4 Wonder Whiz).
- **Description**: Introduce the concept of fractions by explaining that even superheroes share their powers. Show how a fraction represents a part of a whole, using the flashcards. Students will match fractions to corresponding visuals of superhero powers divided into equal parts.

**Activity 2: Fraction Force Mission - Comparing Powers**
- **Materials**: Superhero mission cards, fraction strips.
- **Description**: Students receive mission cards with fractions that represent the power levels of different superheroes. Using fraction strips, they'll compare the powers to find out which superhero has greater or lesser power, helping them understand the concept of comparing fractions.
Activity 3: Superhero Team-Up - Adding and Subtracting Fractions

- **Materials:** Team-up worksheets featuring superhero scenarios, colored pencils.
- **Description:** Present scenarios where superheroes must combine their powers (add fractions) or transfer some power to others (subtract fractions) to defeat villains. Each scenario requires adding or subtracting fractions with like denominators. For example, "Captain Courage (1/3 power) and Wonder Whiz (1/6 power) must combine forces to create a shield strong enough to deflect the villain's attack."

**Closure: Reflection and Hero Certificate**
Conclude the lesson with a discussion on how fractions are not just numbers but tools that can solve problems, even in superhero adventures. Ask students how they used fractions to help the superheroes and what they learned about fractions in the process. Finally, award each student a "Fraction Hero Certificate" for their successful mission in assisting the Fraction Force.

**Homework: Create Your Superhero Fraction Story**
Encourage students to create a short comic strip or story that involves superheroes solving a problem using fractions. They should incorporate concepts learned in the lesson, such as comparing, adding, and subtracting fractions. This lesson plan uses the engaging theme of superheroes to make the abstract concept of fractions tangible and exciting for 4th graders, encouraging them to explore and understand fractions in a fun and relatable context.
Another example could be to have a class focused on writing develop an essay on the impact of global warming on their community. However, rather than having students immediately go to their computers to write the essay, ask them to use an LLM to create the first draft. Once you have an AI response output, have a class discussion on the quality of the response from the AI tool. What kind of data are accurate? What information needs to be more accurate? Discuss writing style and differences between a scholarly manuscript and one filled with errors or passive language. Then discuss how they would improve the AI output and incorporate those thoughts into their writing.

Educators can also highlight the ability of AI to support some students in leveraging assistive technology.

**Supporting Assistive Technology**

Assistive Technology (AT) is often overlooked as an important tool for supporting students with disabilities. According to recently published guidance by the U.S. Department of Education, educators need to learn more about AT (OSERS, 2024). Educators should review *Myths And Facts Surrounding Assistive Technology Devices And Services* (OSERS, 2024). As schools have recently identified AI as an important technology, the integration of AI within AT will increase over time.

AI can significantly enhance assistive technology for students, offering tailored support addressing a wide range of learning needs and disabilities. For students with visual impairments, AI-powered assistive technology can include text-to-speech software reading aloud digital text from books, documents, and web pages, allowing these students to access the same educational materials as their peers. Advanced AI algorithms can also interpret visual information (e.g., pictures and drawings) and provide verbal descriptions of images, diagrams, and physical objects, thus bridging the gap between visual content and students who cannot see it.

Students with hearing impairments can benefit from AI-driven real-time transcription and captioning services, which convert speech to text during live lessons. LLM technology can also be integrated into video content, ensuring students who are deaf or hard of hearing can access audio information through text. LLMs can also enhance sign language recognition software, translating sign language into spoken language and vice versa, facilitating more effective communication between teachers, hearing-impaired students, and classmates.

For students with learning disabilities, offering personalized learning tools may adapt content to each student’s unique needs. For example, AI can modify text presentation in real time, adjusting readability, font size, spacing, and background color to improve access. It can also suggest alternative learning resources or exercises based on the student’s progress, strengths, and challenges, promoting a more personalized learning experience.
With mobility issues, AI-enabled assistive technology can include voice-controlled interfaces, allowing students to interact with computers, smartboards, and other educational tools without physical manipulation. These systems can be tailored to recognize individual speech patterns and preferences, enhancing usability and independence in the learning environment. AI-driven assistive technologies can also support students with autism and other social-emotional challenges by providing interactive, engaging learning experiences catering to their preferences and needs. For example, AI-powered educational games and social robots can offer practice in social interactions, emotional recognition, and communication skills in a controlled, stress-free environment.

**Using a Trusted Decision Framework with AI: Using the SETT Framework**

The SETT framework (Student, Environment, Task, and Tool) is typically used to guide decision-making in assistive technology for students with disabilities (Zabala, 2020). However, its principles can be adapted to evaluate the instructional use of AI tools.

**Student**

Student characteristics must be considered. Educators would evaluate how well the AI tool can help adapt the curriculum for different learning strengths, needs, speeds, and preferences. Student skill levels should also be considered, including the learner's proficiency in the tasks taught and how the AI tool caters to different skill levels.

**Environment**

Accessibility must also be considered when using AI to support student learning. Educators should consider whether the AI tool is accessible across devices and learning environments and whether the district has access, policies, and permissions for using the AI tools. Another environmental consideration is the culture of collaboration. Educators...
should evaluate how the tool supports teacher collaboration, student collaborative learning, group work, or peer interaction. Finally, consider whether the tool requires effective use of specific resources or infrastructure.

**Task**

When exploring AI technology, educators must consider whether the AI tool aligns with the learning objectives within the curriculum. They must evaluate how the tool engages students and enhances their participation in learning activities. Educators should always consider how the tool facilitates assessment of student skill acquisition and generalization and whether it allows feedback on learning progress.

**Tool**

The functionality of the AI tool itself should also be considered. Educators should evaluate the tool’s functionalities and features relevant to the curriculum and the learning process they hope to evoke. The user-friendliness and ease of implementation of the tool in the instructional setting should also be assessed. In addition, they must measure the tool’s effectiveness in achieving the desired learning outcomes.

By applying the SETT framework to evaluate instructional AI tools, educators and decision-makers can systematically analyze how these tools meet the needs of learners, fit into the learning environment, align with learning objectives, and function effectively in practice. This evaluation process helps make informed decisions about selecting, implementing, and optimizing AI tools for instructional purposes.

**What Can Educators Do to Be Prepared?**

Educators should be prepared to harness the benefits of AI on student learning while acknowledging inherent challenges. Researchers have determined teachers’ attitudes toward AI influence the effectiveness of AI use in education. Resistance to the use of AI may stem from poor professional development (Zhai et al., 2021). Educators must be aware of resources related to the effective use of AI and demand relevant, up-to-date, and ongoing professional development from administrators. Alternatively, educators may find themselves overreliant on AI tools in the classroom. Kessler (2018) suggested teacher overreliance on AI may emerge from focusing on AI technologies instead of student learning. A framework like SETT allows teachers to analyze how AI tools meet student needs. One crucial component of the SETT framework is student instruction on using the tool. As with any technology, educators must teach students how to use AI tools to support their learning instead of using AI to avoid more profound learning experiences (Zhai et al., 2021).
Summary
This chapter explored the integration of AI in education, focusing on PreK-12 settings and emphasizing the importance of collaboration between educators, administrators, and curriculum specialists. Adopting the Student, Environment, Task, and Tool (SETT) framework, it guides decision-making around AI to enhance curriculum development, lesson planning, and personalized learning while addressing data privacy concerns in compliance with laws like FERPA. It highlights the potential of AI in classroom management, assistive technology, and critical thinking, stressing the need for specificity in AI prompts for effective lesson plans. The text advocates for informed and critical use of AI, encouraging ongoing professional development for educators to leverage AI's benefits fully and responsibly, thus preparing students for future success.
References


Chapter 4

Envisioning AI's Impact on Special Education Research
Introduction

The education landscape continually evolves, integrating innovative technologies to enhance student learning experiences and outcomes. Artificial intelligence (AI) is a pivotal tool among these advancements, offering unparalleled potential for revolutionizing special education (Marino et al., 2023). This chapter explores the multifaceted applications of AI in special education research, underscoring its transformative potential for students with disabilities.

The authors recognize special education encompasses a wide spectrum of learning, including behavioral, physical, and cognitive domains. Each of these presents distinct challenges requiring personalized intervention approaches. With its inherent flexibility and adaptability, AI emerges as a powerful entity for encouraging new practices, tools, assessments, and outcomes for students with disabilities.

While AI has existed since the 1950s, it recently emerged into the mainstream. However, additional research is needed to support or refute the efficacy of AI-enhanced curricular materials for students with unique abilities.

This chapter discusses critical considerations and the next steps for the future of special education research. It serves as an initial resource for educators, researchers, policymakers, and stakeholders dedicated to enhancing educational outcomes for all students, particularly students with special needs.

Current Research in Special Education

The current role of research in special education is multifaceted and continually developing. It primarily focuses on developing and evaluating effective instructional strategies, interventions, and technologies to meet the diverse needs of students with disabilities. There are several
Technology research has focused on designing, developing, and supporting students with accessibility, independence, and efficacy in accomplishing goals.

**Evidence-Based Practices (EBPs)**
Research in special education emphasizes identifying, validating, and implementing instructional methods and interventions that have proven effective through rigorous scientific evaluation. Using EBPs in classrooms helps ensure students with special needs receive the most effective instruction possible.

**Technology Integration**
Technology has always supported students in the learning process. For students with disabilities, technology can take on multiple forms, including personal, instructional, and assistive. Technology research has focused on designing, developing, and supporting students with accessibility, independence, and efficacy in accomplishing goals.

**Inclusive Education**
Research explores the best practices for educating students with special needs in general education classrooms. It focuses on how inclusive environments benefit all students and the support structures necessary for their success.

**Behavioral Interventions**
Understanding and managing challenging behaviors by students with special needs is a significant focus for professionals in special education. Research explores strategies for decreasing inappropriate and disruptive behavior rates and implementing proactive interventions for supporting all students.

**Assessment**
Understanding how to measure learning most effectively and efficiently to support and identify student needs is a primary focus of assessment. Research in this area investigates concepts in designing measures, enhancing reliability, validity, and understanding of human learning and behavior data.

**Professional and Personnel Development**
There is an ongoing need for research on how best to prepare and support educators and paraprofessionals working in special education, emphasizing continuous learning and adaptation to new methods and findings.

**Individualized Education Programs (IEPs)**
Research aims to make IEPs more effective and better tailored to individual student needs, exploring how best to assess and monitor student progress to develop a program including specially designed instruction, related services, supplementary aids and services, and any necessary accommodations or modifications for each child with a disability.

**Early Intervention**
It is crucial to identify and address delays or disabilities in physical (e.g., vision, hearing, health) status, cognitive development, communication development, social or emotional development, and adaptive early. Research in this area focuses on early assessment techniques and intervention strategies to improve school readiness and ensure infants and toddlers with disabilities
develop pre-literacy, language, and numeracy skills.

**Policy and Legislation**
Research informs policy-making and legislation related to special education, ensuring laws and regulations are based on the latest scientific knowledge and upholds the civil rights of students with disabilities.

Overall, research in special education is dedicated to ensuring that students with special needs receive a high-quality, equitable education that is responsive to their needs and grounded in evidence-based practices.

**AI in Education for All Students**
AI-enabled personalized learning experiences, intelligent tutoring, and efficient data analysis enhance teaching and administrative tasks, provide intelligent feedback and assessment, and promote access to quality education and lifelong learning opportunities (Ivanashko et al., 2024). The positive impacts of AI in education include personalized and adaptive learning, automated administrative tasks, enhanced support, e-learning facilitation, inclusivity, data-driven decision-making, gamification, increased engagement, predictive analytics, and improved communication. In the next section, the authors discuss three types of technology (i.e., intelligent tutors, videogames, and chatbots) where AI integration has substantive potential for improving learning outcomes for students with disabilities.

**Intelligent Tutor Systems**
Intelligent tutoring systems (ITSs) are computer-based educational systems that use artificial intelligence techniques to provide personalized instruction and support to learners. These systems can adapt learning experiences to each student’s characteristics by providing feedback, generating recommendations, presenting adaptive learning materials, evaluating learner performance, and assisting in decision-making. ITSs can be used across educational fields and implemented using web-based or mobile-based user interfaces (Mousavinasab et al., 2018).

Social experiments are important in evaluating the effectiveness of ITS because they allow for a) evaluation in real educational contexts, b) involvement of end users, c) control of confounding factors, and d) establishment of causal relationships. They also allow for comparison with control groups, employ rigorous study designs, assess generalizability, and provide evidence for educational policy and practice decision-making. Finally, social experiments can help improve the design of ITS and ensure ethical implementation (Wang et al., 2023).
The benefits of ITS include:

1) **Performance prediction**: AI algorithms can accurately predict learners' performance based on their interactions with the system. Instructors can then identify struggling students and provide targeted support and intervention.

2) **Learning behavior analysis**: AI can analyze learners' behaviors and identify different learning patterns. This information can help instructors understand how students engage with the material and adjust their teaching strategies accordingly.

3) **Personalization**: AI can provide personalized learning experiences by adapting the content and pace of instruction to individual students' needs and preferences. This can enhance engagement while improving learning outcomes.

Future research with these systems should focus on privacy, data security, potential biases in algorithms, and transparency of the AI systems. These challenges require collaborative research efforts from stakeholders to find innovative and inclusive solutions (Lin et al., 2023).

**Video Games**

Video games are increasingly integrated into curricular materials to enhance academic skills, social performance, and workforce preparation (U.S. Department of Education, 2023). The benefits of AI in video games include enhanced graphics and realism, improved performance through intelligent game-based assistants, increased efficiency through automation, accessibility for players with disabilities, and personalization based on player behavior (Wu et al., 2023).

Current research on video games, including AI, examines how new algorithms can enhance the management of player's actions during role-playing games (Mi & Gao, 2022). Other research analyzes how players use AI in-game suggestions. For example, Sepúlveda et al. (2023), in an experiment with a new AI tool, found players in the experimental group had a significantly higher appreciation of AI suggestions and greater satisfaction with the game when compared to the control group. The AI allowed the user to edit and create map environments during a biome game, define the area on the map where objects would be placed, and control the number of elements included. Sousa et al. (2022) noted the specific impacts of AI in games may be genre-specific. This finding warrants additional research.

Potential areas for future research in the field of AI gaming include (Yin et al., 2023):

1) Developing more efficient and scalable algorithms for complex real-time games.

2) Investigating the use of transfer learning and continual learning techniques to adapt AI models to changing game environments.

3) Improving the generalization capabilities of AI models to handle a broader range of game types and variations.

4) Exploring meta-learning and adaptive algorithms to enable AI models to adapt and learn quickly from new games or game variations.

5) Investigating multi-agent reinforcement learning and cooperative strategies to improve AI performance in team-based games.

6) Exploring AI's ethical implications and potential societal impacts in human-computer interactions.
gaming, including fairness, transparency, and accountability.

**Chatbots**
Integrating AI chatbots into schools can transform research and education by automating tasks, personalizing learning pathways, and increasing accessibility. A chatbot is a computer program or AI system that simulates human conversation through text or voice interactions. Chatbots are typically used to provide information, answer questions, and engage in conversation with users in a conversational manner. They can be integrated into websites, messaging apps, and virtual assistants (Labadze et al., 2023). Chatbots can be programmed to understand and respond to user inputs, provide recommendations, and perform tasks based on predefined rules or machine learning algorithms. They are often used in customer service, virtual assistants, and educational settings to provide immediate support and assistance.

AI is crucial in chatbot development. It enhances natural language comprehension, learns from user interactions, and provides personalized and intelligent responses (Cerny, 2023). AI allows chatbots to analyze data, make decisions, and adapt to user needs and preferences, making them more interactive and effective in engaging users.

Chatbots can serve as research assistants by collecting and processing data, improving data quality, automating tasks, and facilitating research collaboration. However, using chatbots requires careful consideration of ethical implications, such as data privacy, bias in data, responsibility for accuracy, lack of transparency, and potential for misuse (Kooli, 2023).

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**How might Chatbots influence teaching and learning?**

Consider the following roles it can play for students with disabilities:

1) **Study Assistant**: Chatbots can serve as a study assistant, providing basic knowledge on topics and making complex topics easy to understand. It can provide accurate information and interact with students in an easy and fun manner.

2) **Writing Skills Support**: Chatbots can support the learning and development of writing skills by providing personalized feedback, including syntactic and grammatical corrections. It can also facilitate debates by suggesting discussion structures.

3) **Time-Saving Assistant for Teachers**: Chatbots can assist teachers with routine tasks such as scheduling or grading. It can also help with personalized support for students and tailor content to different students' needs.

4) **Critical Thinking and Reflection**: Teachers can use Chatbots' limitations to encourage students to critically evaluate the output generated by AI technologies. They can also engage students in iterative communications with Chatbots to foster reflection on the relationship between prompts and the AI-generated output.

5) **Knowledge Transfer**: Chatbots can
support learners with knowledge transfer by applying acquired knowledge to different situations. It can also raise awareness of learners' knowledge limitations and encourage critical thinking about the information.

6) Research Support: Chatbots can assist researchers in various aspects of the research process, such as literature reviews, research methods and designs, and collaboration and communication. It can help identify relevant literature, extract and summarize information, and generate hypotheses.

It is important to note while Chatbots can be a valuable tool in teaching and learning processes, there are limitations and ethical concerns associated with its use. These include the need for critical evaluation of the information provided by Chatbots, the potential for plagiarism and cheating, and the lack of reliability and accuracy in the generated output (Milana et al., 2024).

Implications for the Future of Research

The future of AI research in special education holds promising and transformative implications. There are several initial key aspects of this future-oriented research.

Personalized Learning Approaches

AI’s capability to analyze vast amounts of data can lead to more personalized and effective learning strategies for students with special needs (Basham et al., 2016). Future research could focus on how AI can tailor educational content and teaching methods to individual learning needs, thus enhancing engagement and outcomes.

Early Detection and Intervention

AI tools can assist in the early identification of learning disabilities, enabling timely interventions. Research in this area may revolutionize special education, shifting the focus from reaction to prevention and early support.

Assistive Technologies and Accessibility

AI-powered assistive technologies can provide greater autonomy and accessibility to students with disabilities. Future research may explore innovative solutions, such as AI-driven communication aids or mobility devices, thereby expanding the boundaries of what students with special needs can achieve.

Teacher Support

Research can also explore how AI can support educators in special education by offering tools for assessment, adapting teaching strategies, and planning. This could include developing AI systems providing real-time feedback and suggestions based on student performance and engagement.

Inclusive Education Systems

A significant area for future research is the development of AI tools promoting inclusivity, ensuring students with disabilities receive the appropriate support in any educational environment. Integrating AI should focus on creating environments where students of all abilities can learn together effectively.

Ethical Considerations and Policy Development

As AI becomes more entrenched in special education, research must address ethical concerns, such as data privacy and bias in AI algorithms, and ensure equitable access to technology. The policy chapter in this document discusses more in this area; however, research
should include how to inform policy development to guide the responsible use of AI in educational settings.

The future of research in special education, augmented by AI, offers a horizon rich with possibilities for enhanced learning, early and effective interventions, innovative assistive technologies, educator support, inclusive systems, and ethical practices. These advancements may change the landscape of special education and fundamentally elevate educational experiences and outcomes for all students, especially students with disabilities and other diverse learning needs. Researchers must investigate these areas and continually advance the understanding of AI use across the field. Adopting AI in the educational process is complex—adding AI tools does not automatically generate positive learning outcomes or quality instruction for all learners (Xu & Ouyang, 2022). The AI landscape must be continuously monitored, especially for students with disabilities. By supporting continual understanding, professionals in the field can help support the technology’s appropriate integration while mitigating its associated risks.

**Anticipate Continuous Disruptive Innovation**

Rapid technological innovations have continued to increase and shape education since the dawn of the Fourth Industrial Revolution (Basham et al., 2020; Schwab, 2017). For example, in November 2022, OpenAI publicly released a large language model called ChatGPT 3.0. Since then, the model has been updated twice, adding new capabilities, including the ability for users to develop their generative pre-trained transformers (GPTs). Large Language Models (LLM) such as GPTs can transform students' writing processes by reducing the time necessary for initial drafts and allowing students to spend more time critiquing the content.

The continuous expansive growth and change will support interdisciplinary research and innovation across the humanities, social sciences, engineering, and biosciences, directly
impacting the education of all students (Basham et al., 2020). These changes will impact school practices, social interaction, machine interaction, healthcare, business, and commerce. However, systematic, controlled research is necessary to examine the development and implementation of AI to maximize student learning. Educational research should consider how teachers, students, and parents integrate AI into their lives to prepare for the future, including workforce readiness and what it means to be human in an age of AI.

**Increased Focus on Ethics and Basic Research**

Ethics and basic research questions will be increasingly important in education and educational research as AI supports a convergence of disciplines. Understanding in ethics and foundational knowledge is critical as future EBPs intertwine human, machine, and bioscience interventions in schools. For instance, ethical issues emerge as student engagement is measured through biometric devices (Hernandez-de-Menendez et al., 2021), such as smartwatches, and emotions are monitored through cameras (Andrejevic & Selwyn, 2020), and using multimodal learning analytic models (Molenaar et al., 2023). Connecting these analytics to AI with the ability to deploy interventions, such as changing the color of environments, intensifying sound, or changing learning pathways, raises various questions. Questions include when, how, and to what extent interventions are appropriate, especially if the AI can deliver at a specific time and dosage. However, research must first identify the level of engagement ideal for X students in Y environments. Ethically, humans should determine whether an AI can deploy the intervention without human authorization. So, while AI has great potential to transform education, basic research and questions of ethics should be a critical focus of future educational research.

**Human Subjects Research**

Researchers must navigate a complex landscape of ethical, legal, and social challenges when considering the use of AI in human research (Yan et al., 2024). Ethically, it’s paramount to ensure the use of AI respects the autonomy, privacy, and dignity of research participants. Researchers must de-identify their data when sending information through a third-party large language model database unless approved by the institutional review board (Dubljevic, 2024). When obtaining informed consent, it must be communicated how AI will be used during the research and the implications for participants, ownership of data, understanding who may see or benefit from data collection, and providing potential risks and benefits to the participant.
Legally, researchers must comply with data protection laws, which impose strict requirements on the handling of personal data. Ensuring data security and the participants' right to data access and erasure is paramount. Social considerations include the impact of the research on societal norms and values, as well as the potential for AI to introduce biases potentially harmful to certain groups. Researchers must be vigilant in identifying and mitigating these biases to ensure their findings are equitable and representative of diverse populations.

Additionally, there’s a need for transparency in AI methodologies, enabling peer review and public scrutiny to ensure the reliability and validity of research outcomes. One question researchers and higher education leadership should ask is, “Is it time for our organization to form an AI ethics committee juxtaposed to the IRB?” Researchers should reflect on the risks and benefits potentially involved with novel research projects, which can be complex and unpredictable (Friesen et al., 2021).

**Conclusion**

Current research in special education is multidimensional, focusing on evidence-based practices, technology integration, inclusive education, behavioral interventions, assessment, professional development, IEPs, early intervention, and policy and legislation. These efforts aim to develop and evaluate effective strategies, interventions, and technologies tailored to the unique needs of students with disabilities.

Looking toward the future, AI holds promise but requires research in personalized learning approaches, early detection and intervention, assistive technologies, support for educators, inclusive education systems, and ethical considerations. These advancements hold the potential to significantly enhance educational experiences and outcomes for students with disabilities, encouraging a shift from reactive measures to prevention and early support.

Additionally, there is an increased need to support continuous understanding of technological disruptions, exemplified by the rapid developments in AI and machine learning. Basic research and ethical considerations are central to future (special) educational research, particularly as AI facilitates new forms of human, machine, and bioscience interventions. Overall, we advocate for a responsible integration of AI in education, prioritizing the needs and well-being of all students, especially those with disabilities and diverse learning needs. The need for research is central to understanding the use of AI in education.
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Chapter 5

Enhancing the School-Home Connection: Empowering Parents with Artificial Intelligence
Artificial intelligence (AI) seamlessly integrates as a pivotal tool in enriching our children's educational journey in the classroom and at home. Recognizing the power of a robust family and home connection is crucial, especially in ensuring that all students, including those with disabilities, can harness the full potential of AI for learning and everyday activities. By actively participating in their children's education and embracing the advancements in technology, parents and caregivers can significantly boost learning experiences outside the traditional classroom setting. Such engagement fosters a consistent learning environment, provides personalized support, bridges the gap between home and school, and elevates digital literacy among parents—guaranteeing a safer digital world for our children.

This chapter illuminates the vital role of parents in weaving AI into their children's educational fabric, with a special focus on supporting students with disabilities. It underscores the importance of schools inviting parents into conversations about AI, highlighting the indispensable nature of a cooperative relationship between school and home in driving superior educational outcomes. This collaborative approach empowers parents to participate proactively in their children's learning journey, leveraging AI as a transformative tool for educational excellence and personal growth.

**Introduction to AI at Home**

Understanding AI's potential is crucial for families, especially families with children who face educational challenges related to disabilities. AI may level the playing field by removing barriers to full participation in school (Marino et al., 2023). Educators and parents are essential in shaping the educational landscape,
especially when integrating artificial intelligence into individualized education programs (IEPs). This collaboration empowers parents to make informed decisions that enhance accessibility and support their children’s learning journey at home. With a solid understanding of AI, parents can confidently guide their children in utilizing these technologies for academic tasks, fostering independence and ensuring safety in daily activities.

The swift incorporation of AI into our lives has left some families uncertain about its role in education, especially concerning its use at home. Concerns range from fears of facilitating cheating to skepticism and a general lack of awareness about the positive impact of AI tools. Here, educators have a critical opportunity to clarify misconceptions, offer tailored advice on leveraging AI responsibly, and champion inclusivity and respect for cultural and linguistic diversity within AI-enhanced learning environments.

By fostering a collaborative spirit, educators can equip parents, family members, and community stakeholders with the knowledge and resources needed to embrace AI’s evolving role in education. Such an inclusive approach encourages ongoing, open dialogues—crucial for adapting to AI’s expanding influence in educational settings and ensuring that learning seamlessly bridges the gap between school and home. This partnership enriches the educational experience and prepares students and families to navigate the future confidently.

**What Parents and Family Members Should Know**

To unlock AI’s full potential in enhancing learning experiences, it’s crucial that parents are not only informed but actively involved in the decision-making processes. Schools are, therefore, encouraged to foster an environment of collaboration, bringing together a diverse range of stakeholders, particularly parents, to deliberate on how AI can best serve our students.

Areas of collaboration between schools and parents should encompass discussions on AI’s implementation, ethical considerations, and educational benefits. By engaging in open dialogue, we ensure that the deployment of AI technologies aligns with our shared vision for a future where every child can access personalized, empowering, and inclusive educational experiences. Here are six areas where collaboration among educators, education leaders, and parents is critical.

**Privacy and Security Measures**

What measures are in place to protect a child’s...
information (e.g., demographics, performance)? We recognize that AI processes vast amounts of personal and academic data. Schools should proactively communicate their digital privacy policies and information about the systems they have in place. Additionally, proactive steps must be taken to protect data storage, access, and compliance with state and federal policies.

**Access and Accessibility**
How is AI used to support a child’s access, accessibility, and learning? When used appropriately, AI can offer increased opportunities for students with disabilities to access general instruction and curriculum. Specific types of AI aligned to a child’s unique needs, such as word prediction software, can be documented as supplementary aid and service through the child’s IEP.

**Availability of AI**
What types of AI are available to increase a child’s access to and ability to benefit from the general curriculum and other learning opportunities at school? Families should be aware of the types of AI currently used within the school and the different types of AI not in use that may suit a child’s unique needs. Resources to build family awareness are provided later in this chapter in the section titled “Resources for Families.”

**Support for Families**
What types of support can schools offer to families? Schools should consider how AI can support families in tasks like communicating with educators, supporting homework completion, reinforcing lessons from school at home, adjusting the reading level of instructional content, and increasing digital literacy among all family members. For students with disabilities, schools might consider working with families to identify what AI supports are available to support a child’s unique needs. Building specific AI knowledge and skills at home and school may help the IEP team identify available AI tools that will support the implementation of the child’s IEP. Parents/family members can also commit to collaborating with school personnel as they learn about emerging AI that supports their child’s unique needs.

**Shared Understanding of AI Use**
Although AI offers opportunities to increase a child’s independence and access to the general curriculum and instruction, students may misuse it at school and home. For example, if a child uses AI to complete a writing assignment designed to assess a child’s writing skills, the written output created by the AI would not accurately measure the child’s writing skills. This may lead the teacher to believe that the child has mastered specific aspects of writing when they have not. In a case like this, the teacher would not truly measure whether the child has mastered the writing skills taught, which could result in the child missing out on instruction or remediation of core writing skills necessary for high school graduation. Helping parents know when AI is allowed and how to use it can overwhelm families. Schools and parents should develop a shared understanding of what AI is appropriate. Developing a shared understanding of AI use can be done through regular communication among educators, education leaders, and parents.

**Digital Literacy for Parents**
Digital literacy is essential for enabling the effective use of AI in a child’s education and development. It’s also crucial for parents to participate in discussions about AI in the classroom and AI’s extension to the home. Providing parents with continuous training, education, and open forums to learn about and
discuss AI’s possibilities and challenges promotes meaningful collaboration in adopting this technology for the benefit of students.

Questions for Parents to Ask

Parents and family members should ask several important questions when considering the use of AI in a child’s overall growth and development and its implications for the child’s daily life.

*How Can AI Facilitate Inclusion in the General Education Curriculum?*
Parents should consider how AI can improve the content, materials, resources, and overall education practices to provide better access to the general education curriculum. Parents should question educators and education leaders when AI usage decisions directly interfere with students’ ability to access the learning environment or use accessible materials.

*How Can AI Promote a Child’s Independence?*
Parents should ask special and general educators how AI can support their child’s independence. Collaborating with their child’s educators means understanding how to use and structure AI to address common areas of intellectual, adaptive, and social-emotional learning that often interfere with their child’s achieving critical learning and developmental outcomes.

*What Are Appropriate Uses of AI in a Child’s Learning?*
Parents should consider how AI can be used appropriately to complete classroom assignments. Remember, AI policies in the learning environment should be a collaborative discussion among parents, students, and educators. Sometimes, parents or students understand new technologies, such as AI, more than educators.

*How May AI Affect the IEP Process?*
It’s important for IEP team members, which includes parents, to understand the role of AI in developing information essential to the annual IEP. Parents should ask how AI can further
improve the development of an IEP’s essential elements.

How Can AI Empower Parents to Participate Further in Their Child’s Learning?
Parents and schools should help identify the roles and responsibilities expected of parents in using AI at home to promote their child’s learning. Developing such understanding includes basic knowledge of the AI tools in use, the learning purpose for which they are used, and how to use them at home.

How Do You Determine the Effective Use of AI?
Parents and family members should consider how AI tools support their child’s overall growth, development, and participation in the learning process. As with any tool, there are advantages and disadvantages to AI use. Parents should consider engaging AI appropriately to support further learning and independence.

What are the Long-Term Implications for Their Child?
Parents should consider how using AI in their children’s learning will prepare them for the future, particularly regarding the skills they need to succeed in an increasingly technology-driven world.

Strategies Schools Can Use to Support AI Implementation at Home
Educators cannot assume that all families have the same beliefs about and knowledge of AI. In some cases, parents will understand AI better than school personnel. In other cases, parents may have limited understanding. As a result, it will be important for educators and education leaders to assist families in supporting the appropriate use of AI. Given diverse family needs, no strategy will work for all families. Best practices suggest using a multifaceted approach to collaborate with families. Here are some strategies to consider.

- Communicate how and why AI tools should and should not be used at home verbally and in writing.
- To help families have early positive experiences with AI, share just a few common and simple-to-use AI tools.
- Provide resources that reflect families’ cultural and linguistic diversity, different levels of AI readiness and knowledge, and ways families can access information, such as short videos, informational brochures, and visualizations.
- Ensure easy access to information about AI and supporting resources (i.e., a school district web page or a learning management system that parents check frequently).
- Provide families, especially those less familiar with AI, opportunities to observe and experience how AI might be used at home to support their child. For example, educators may host a family-friendly night for AI demonstrations or provide examples of how other families have successfully used AI to support their student’s needs.
Resources for Families

Several resources are available for the general public, educators, and other stakeholders in education. Because AI is constantly growing, the resources described below are just a sample of what is available, and this availability changes weekly, if not daily. Here are some resources that parents and schools have recommended.

1) **AI and Children: AI Guide For Parents.**
https://www.unicef.org/globalinsight/media/2336/file

2) **5 Steps Parents Should Take to Help Kids Use AI Safely.**

3) **Can AI Write A Good IEP? What Special Education Experts Say.**

4) **Empowering individuals with disabilities through AI technology.**

5) **Guide to ChatGPT for Parents and Caregivers.**
https://www.commonsensemedia.org/articles/guide-to-chatgpt-for-parents-and-caregivers

6) **How Robots Can Assist Students With Disabilities.**

7) **Parents Are Open To AI Use In Schools. But They Have A Lot Of Questions.**
https://www.edweek.org/technology/parents-are-open-to-ai-use-in-schools-but-they-have-a-lot-of-questions/2023/10

8) **Parent Guide To AI Tools.**
References


Chapter 6

Policy and Guidance Considerations for Artificial Intelligence in Supporting Students With Disabilities
Integrating artificial intelligence (AI) into special education represents a significant paradigm shift with the potential to revolutionize educational practices and improve outcomes for students with disabilities. By examining the promise of AI in enhancing personalized learning experiences and supporting students with disabilities, as well as the obstacles hindering its effective implementation, we aim to provide insights into how stakeholders can navigate this complex landscape to ensure equitable access and maximize the benefits of AI in special education. Several international and national efforts are being made to develop guidelines and suggestions around AI. To date, UNESCO has taken the lead in supporting a global vision of the future for ethical and meaningful AI use. President Biden recently issued an Executive Order on the Safe, Secure, and Trustworthy Development and Use of AI (Exec. Order No. 14,110, 2023). The Office of Educational Technology (OET; 2024), a division of the U.S. Department of Education, released the 2024 National Educational Technology Plan (NETP, 2024), which aligns all technology use, including AI, in three primary areas: digital access, digital design, and digital use. Additionally, OET (2023) detailed its insights and recommendations in AI and the Future of Teaching and Learning.

Individuals with disabilities are included, to various degrees, across these guidance documents with NETP (2024) being the most inclusive document. This chapter intends to inform stakeholders in the K–12 and higher education disability and special education communities about the current state of AI, offer some considerations for thought, and initiate a conversation for future work. This chapter explores existing policies, funding limitations, and personnel considerations to guide future efforts in leveraging AI’s potential for creating
inclusive learning environments, especially for students with disabilities.

**AI Access and Equity**

AI offers transformative potential in special education, especially in enhancing access, accessibility, and equity for students with disabilities. Early reports indicate that when predictive AI systems, such as activity monitoring systems, are used in schools, these systems disproportionately identify school staff to focus on students with disabilities. Additionally, educators reported students with disabilities have received greater disciplinary action over the use of generative AI as compared to other students (Laird et al., 2023). There is a need for students with disabilities, their families, and the professionals who serve them to be involved in conversations that support the design, development, and integration of AI in schools.

It is critically important that AI implementation guidance ensures equitable access and considers robust policy frameworks that include students with disabilities and practices of special education. Policies should prioritize universal accessibility in AI tools, involving people with disabilities, special education professionals, and stakeholders in research and development. This inclusive approach ensures AI technologies effectively meet the diverse needs of learners with disabilities. Additionally, strict data privacy and ethics policies are crucial to protect vulnerable populations and safeguard the respectful treatment of sensitive information. By prioritizing access, accessibility, equity, data privacy, and ethics in policymaking, stakeholders can create more inclusive learning environments where all students can thrive.

**Personnel Preparation and Professional Development in Special Education**

Personnel issues loom large at the intersection of AI and special education, presenting significant challenges. Few researchers, higher education faculty members, educational leaders, and educators understand AI enough to advance education and special education (Marino et al., 2023). This gap impedes people in the field from integrating AI tools into curricula in an effective and scalable manner. Proactive measures are needed to provide professional development opportunities, overcome resource constraints, foster interdisciplinary collaboration, and effectively disseminate AI-driven research findings. These efforts are crucial for advancing inclusive education and integrating AI into special education.

**Limited Training Opportunities**

Educators, including faculty members
responsible for preparing future special educators, often need access to comprehensive AI-focused training programs. This lack of access to training inhibits faculty members’ ability to effectively use AI tools for students with disabilities and integrate AI-related content into teacher-preparation programs and associated research agendas focused on supporting these students.

**Resource Constraints**
School districts and institutions of higher education need more resources when incorporating AI-related content into their curriculum and research initiatives. These constraints include access to classroom environments and computational resources designed to adequately support AI-enhanced learning. Limited funding and competing priorities hinder efforts to support students, prepare future personnel, conduct AI-focused research, and disseminate findings to practitioners and school districts.

**Shortage of Qualified Researchers & Interdisciplinary Collaboration**
The demand for AI in special education already outstrips the available research talent pool. Institutions should focus on recruiting, preparing, and retaining experts who can successfully compete for AI funding opportunities. The lack of experts affects the field’s ability to understand AI and use research-based practices to support students with disabilities. Another approach to increasing the research base is for institutions to support interdisciplinary collaboration among faculty members. For example, faculty members from different fields, such as special education and computer science, could engage in collaborative research efforts to advance research and training initiatives that support the use of AI in special education. Unfortunately, it is common for faculty members to face barriers to interdisciplinary collaboration. Issues such as departmental silos as well as competing priorities across academic departments exist in most institutions. These issues may hinder faculty engagement and collaboration efforts. Educators, researchers, and professors are encouraged to seek interdisciplinary collaboration in areas around AI and special education.

**Dissemination of Research Findings**
Faculty members conducting AI-related research in special education face challenges in sharing their findings with practitioners and school districts. There is a need to ensure that research findings are accessible and actionable for educators seeking to implement AI-driven interventions in their classrooms. For instance, educators do not often read research journals, so considerations should include communicating with educators effectively and influencing their actions in the classroom. Traditional means of publishing research findings (i.e., journal articles) do not resonate with those educators who this research must reach. Therefore, strategies such as social media should be utilized to disseminate research findings along with these more traditional refereed venues.

**Support AI Research in Special Education with Federal Programs**
AI offers promising avenues for innovation and transformation in educational research and practices. Various funding agencies—including the National Science Foundation, the U.S. Department of Education’s Office of Special Education Programs, and the Institute of Education Sciences (IES)—have funded research and development on technology related to supporting students with disabilities. Given the rapid innovation in AI, the field of special education would benefit from greater
Given the rapid innovation in AI, the field of special education would benefit from greater interdisciplinary collaboration and resources focusing on this new technology.

Established under the Education Sciences Reform Act of 2002 (ESRA), IES prioritizes rigorous research methodologies and evidence-based practices to enhance educational outcomes. Within this framework, the National Center for Special Education Research (NCSER), founded in 2004 as part of IES, is pivotal in advancing special education through its robust funding initiatives. With a dedicated focus on addressing the unique needs of individuals with disabilities and the professionals who support them, NCSER has been at the forefront of fostering innovation and driving meaningful research within special education. NCSER funding has enabled groundbreaking studies on effective instructional strategies, interventions, and assessments tailored to students with disabilities, significantly advancing inclusive education practices.

Integrating AI technologies within NCSER’s initiatives further enhances its capacity to revolutionize research methodologies, improve personalized learning environments, and shape evidence-based policies, which aligns with the overarching goals of ESRA and signals a shift toward more innovative and effective approaches in addressing the complexities of education.

Constraints in Special Education Research

This new technology holds immense promise for enhancing educational practices and improving outcomes for students with disabilities who receive special education services. However, significant challenges hinder the advancement of AI research in this field, including limited dedicated funding and scarcity of funding from entities such as the federal government, private foundations, or non-profit organizations for this type of research. Additionally, the high cost of AI infrastructure and competing priorities within higher education institutions pose barriers to specialized research initiatives. Funders may perceive AI research in special education as high risk, further exacerbating funding constraints. Addressing these challenges is crucial for unlocking the transformative potential of AI to create more inclusive learning environments for students with disabilities. We describe some of these challenges below.

Limited Dedicated Funding

Institutions of higher education often lack dedicated research funding in special education, much less in AI, for supporting students with disabilities and diverse learning needs. Budget limitations can impede the development of cutting-edge AI applications tailored to the unique needs of special education programs.

High Cost of AI Infrastructure

Implementing AI solutions requires sophisticated infrastructure and computational resources. The high upfront costs associated with acquiring and maintaining AI technology may be a barrier, especially for institutions with limited financial flexibility. Connectivity to fast internet speeds for rural and urban locations...
may also limit access.

**Competing Funding Priorities**
Higher education institutions juggle various research priorities, and AI research in special education may face competition for limited funding resources. Prioritization decisions often consider broader institutional objectives, potentially hindering targeted funding for specialized projects.

**Infrastructure in Higher Education and Special Education**
Advancing AI research in special education presents a unique challenge requiring innovative solutions and interdisciplinary collaboration. This endeavor demands bridging the expertise of AI, professionals in AI, and special education professionals to navigate the various AI research, development, and implementation issues associated with its effective and ethical use. Collaborative efforts and strategic funding approaches are paramount to overcome these hurdles and drive effective research forward.

**Need for Interdisciplinary Collaboration**
To reiterate, AI research in special education will require interdisciplinary collaboration involving experts in AI and special education experts. Bridging these disciplines may require additional funding for collaborative efforts that may create challenges in securing support for multifaceted projects. Higher education institutions should consider how to encourage and support interdisciplinary research and programs.

**Limited Industry Partnerships**
Collaborations with industry partners can enhance funding prospects for AI research. However, establishing such partnerships can be challenging, particularly when industries may need to see the immediate commercial applications or benefits of AI research in special education. See the chapter on industry partnership in this document that provides more suggestions for supporting collaboration with industry to support students with disabilities.
Complex Ethical Review Processes
The involvement of AI in special education research necessitates rigorous ethical review processes by institutional review boards (IRBs). These processes can be time-consuming and resource-intensive, leading to delays in project initiation and potentially discouraging funding entities. Although critical for managing research, unneeded technicalities in long IRB processes often hamper rapid research. Therefore, while companies continually gather and analyze vast amounts of data to improve a product, academic researchers, especially in the educational sciences, face long waits to gather small amounts of data. Institutions should ensure IRB processes are streamlined and staff members are prepared to consider the data needs associated with AI research.

Complex Grant-Application Processes
The grant application process for AI research projects, especially those involving special education and IRB approval, can be intricate and demanding. Navigating these processes requires time and expertise, adding to overall resource requirements for securing funding. Addressing these funding constraints requires a strategic approach that emphasizes collaborative efforts, advocates for the societal benefits of AI research in special education, and showcases the potential impact of research on improving educational outcomes for students with special needs. Institutions must actively seek diverse funding sources, foster interdisciplinary collaborations, and streamline administrative processes to enhance their competitiveness in securing funding for AI research in special education.

Considerations for Existing Policy in Special Education
The appropriate use of AI in special education presents a transformative opportunity for students with disabilities, their families, and the professionals who serve them. Foundational pieces of legislation such as the Individuals with Disabilities Education Act (IDEA), Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act (ADA) will eventually be profoundly influenced by AI. These policies ensure equitable access to education for individuals with disabilities. Examining the interaction between AI and these policies illuminates the potential for enhancing educational support. By analyzing such implications, we aim to understand how AI can advance inclusive education and uphold the rights of all learners. We describe a few ways that AI may affect existing special education policy.

Individuals with Disabilities Education Act (IDEA)
AI can influence various aspects of IDEA, including how schools identify students with disabilities, provide individualized education
programs, collaborate with families, and integrate accommodations and assistive technologies. Integrating AI tools could enhance the personalization of educational programs and improve the delivery of special education services.

Section 504 of the Rehabilitation Act of 1973
AI could affect the implementation of Section 504 by influencing reasonable accommodations for students with disabilities. These accommodations can now include leveraging AI-powered technologies to ensure equal access to educational opportunities.

Americans with Disabilities Act (ADA)
The ADA prohibits discrimination based on disability and assures equal opportunities. The use of AI in educational settings must align with ADA principles, considering issues related to accessibility, fair treatment, and the accommodation of diverse learning needs.

Family Educational Rights and Privacy Act (FERPA)
AI applications often involve collecting and analyzing student data. FERPA regulates the use and disclosure of students’ personally identifiable information, and the integration of AI must comply with FERPA guidelines to safeguard student privacy.

21st Century Assistive Technology Act (AT Act)
Assistive Technology (AT) Act Program grants are awarded via a formula to every state, four US territories, and D.C. and Puerto Rico and provide AT information and support to individuals of any age and with any type of disability. AI-driven assistive technologies could fall under the purview of this legislation, impacting how such technologies are developed, funded, and implemented.

Every Student Succeeds Act (ESSA)
As the country's cornerstone education law, ESSA focuses on ensuring all students have access to quality education. AI supports providing quality education in various ways, including enhancing the accessibility of educational materials for students with disabilities. For example, AI-powered applications can convert text to speech for students with visual impairments or provide speech recognition for students with motor impairments.

Conclusion
This new technology holds immense promise for transforming educational practices and improving outcomes for students with disabilities. By leveraging AI’s capacity for personalized learning and adaptive support, special educators can better meet the diverse needs of their students. However, realizing this potential will require a commitment by those in education and special education to address various policy-related challenges, including funding constraints, ethical considerations, and the need for comprehensive professional development. Policies must prioritize equitable access to AI technologies, ensure stakeholder collaboration, and uphold ethical standards to safeguard the rights and privacy of students with disabilities. In navigating these complexities and fostering a collaborative, ethical, and inclusive approach to AI integration, we can harness AI’s full potential to create more accessible, supportive, and inclusive learning environments for all students.
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Chapter 7

Industry Collaboration for Educators and Artificial Intelligence
Introduction

With the recent exponential growth in Artificial Intelligence, students in K-12 programs can expect to enter careers that involve the development and use of AI at some level. The data show that between 1996 and 2017, there was a 26% increase in the number of new jobs posted that included AI skills as a core requirement (Yang & Zhu, 2019), and the growth in this job market is projected to continue. To prepare today’s students for tomorrow’s workforce, collaboration between schools and the AI industry is crucial for preparing students with the skills needed in this rapidly evolving field. The rapid nature of technology development far outpaces the rate at which K-12 programs update and refresh their curricular materials. Therefore, industry and education can work to build partnerships to best prepare students for future career opportunities.

AI developers and K-12 programs must understand the benefits of a collaborative relationship. For example, AI developers can learn how to ensure that their AI is accessible and can enhance a student’s learning experience. Furthermore, educators need to work with developers to devise ways to deter misuses, biases, and discrimination created by AI. This chapter highlights actions K-12 programs and industry partners can take to ensure AI technologies are developed with all learners, especially those with disabilities in mind. While some examples focus more on K–12 education, many of the ideas supported in this chapter also pertain to higher education and educational research.

What Educators Should Know

Educators should stay informed about industry trends to stay abreast of current trends, challenges, and advancements. Education research has yet to catch up with industry
Ensuring AI is built upon sound knowledge can help ensure the school curriculum is responsive to industry needs while preparing students for the latest, innovative developments. Establishing and maintaining strong relationships with industry partners is essential. Regular communication, collaboration, and networking can lead to partnerships, and internship opportunities can support increased understanding.

The technology industry is looking to adopt Industry 4.0, referred to as I4.0, which reflects a leaner and just-in-time production cycle with emerging smart machines (see Bellantuono et al., 2021). Of course, these machines embrace machine learning, AI, and various internet and cloud-computing components (Jan et al., 2023).

Some of these terms are foreign to many education systems. It benefits the industry to support curriculum development and educational resources explaining these concepts. Helping support the education system can better prepare students to enter I4.0 and develop tools that meet their needs. Public–private partnerships among educational stakeholders and developers help ensure the latest technologies are designed with all students in mind.

Educators can use these partnerships to communicate with the industry about student needs and test the usability and efficacy of products while also supporting student learning outcomes. Beyond supporting direct skills, these partnerships also provide perfect opportunities for students, especially students with disabilities, to collaborate and learn about different careers while authentically engaging with companies. These collaborations provide industry partners a means to understand the needs of students in the classroom, which is important for developing the most effective technology. To create this partnership, we must encourage a culture of mutual learning where both parties benefit from the collaboration.

School districts can begin by starting conversations with industry partners about expectations for designing products for all.

advancements in AI technology (Chen et al., 2020; Hinojo-Lucena et al., 2019; Zawacki-Richter et al., 2019). As viewed in this chapter, the technology industry encompasses developers, companies, and commercial entities. As this publication focuses on AI, the chapter primarily focuses on the AI industry. However, this work can be done across the entire Science, Technology, Engineering, and mathematics industry.

Currently, the voices of education leaders, educators, related service personnel, students, parents, and educational researchers are missing in the development of AI (See The White House, 2023). Ensuring AI is built upon sound knowledge can help ensure the school curriculum is responsive to industry needs while preparing students for the latest, innovative developments. Establishing and maintaining strong relationships with industry partners is essential. Regular communication, collaboration, and networking can lead to partnerships, and internship opportunities can support increased understanding.
students. Meeting minimally basic requirements for accessibility. Then, discuss the potential for partnerships in curriculum development, student mentorship, project-based learning experiences, and collaborative projects. Districts (or even states) might consider how they can expect more from their AI industry partners, with the large technology companies giving back to education. For instance, figure out ways these companies might share their knowledge and experiences to enrich student learning experiences and provide a practical perspective on theoretical concepts. Goals, expectations, and clear deliverables within this process should define these collaborative experiences. For instance, to be a vendor for a larger school district, it might be expected that an AI company works with educators, students, and parents through a process of design-based research to design curricular materials, with expectations that all resources will be made available online for smaller districts who might not have the financial leverage as larger districts to use.

Throughout the process, a collaborative partnership should evaluate progress and look for areas of continuous improvement. Ask if the partnership’s objectives are met while ensuring educators can access and use AI technologies. Gather feedback from students, industry partners, and educators and use this information to improve the collaboration over time.

A final critical component of any industry partnership in AI is understanding the privacy and data use of all adopted tools. Discuss AI’s legal and ethical considerations through collaborative partnerships with various stakeholders, including education leaders, educators, related service personnel, students, and parents. Establish and require open, plain language sharing of guidelines and expectations for these legal and ethical considerations. Some of these specifications, especially student-related data, are often identified in a district data privacy agreement (DPA). Still, it’s critical that all parties, including district personnel, students, and parents, understand the DPA expectations. CIDDL researchers and chapter contributors have often found that educators, students, and parents are unaware of a district’s DPA.

**Getting Started with Technology Industry Collaboration**

There are several ways for education leaders, educators, related service personnel, students, parents, and educational researchers to collaborate with the industry. Consider starting small and then growing the collaborative partnership over time. Here are some ideas that might help start the process within your school, district, or university.

**Create Advisory Boards with Representatives from AI Industries**

Having boards or workgroups that can provide insights into industry trends and skill requirements and help shape curricula to align with industry trends. Foster partnerships between educational institutions and AI companies. Establish internship programs that allow students to gain real-world experience and industry exposure while companies benefit from fresh perspectives and potential talent.

**Organize Guest Lectures and Workshops**

Invite industry professionals to deliver guest lectures and conduct workshops. These opportunities directly expose students to real-world applications, challenges, and solutions in the AI industry. Collaborative research projects between educators and experts can address industry challenges, provide solutions, and offer students hands-on experiences with practical
 Ensure these experiences are online and open for the wider education community to attend.

**Consider Meaningful Professional Development for Educators**

Participating in industry conferences, workshops, and training programs helps educators stay updated with the latest developments in AI, helping maintain the relevance of the curriculum and teaching methods. Working closely with industry partners to design curriculum modules that align with current industry needs ensures that students have the most relevant skills upon graduation. Additionally, supporting educators in implementation through instructional coaching is important for ensuring professional development pays off in the classroom.

**Build and Integrate Industry-Driven Capstone Projects**

Integrate industry-driven capstone projects into the curriculum. This practice allows students to work on real-world problems under the guidance of industry mentors and provides industry partners with insight into students' needs. Consider focusing these capstone projects on developing educational tools, simulations, or other resources that can be shared with the broader education community.

**Encourage Networking and Collaboration**

Organize networking events, conferences, and meetups that unite educators, students, and industry professionals. These events provide opportunities for networking, collaboration, and exchanging ideas. Establish continuous feedback loops with industry partners to ensure that the curriculum remains aligned with the evolving needs of the AI industry. Regular input from industry experts helps educators adapt their programs to stay relevant.

In fostering collaborative connections between educators and industry professionals, institutions can better prepare students for careers in AI while advancing educational practice, outcomes, and research.
Questions to Consider When Engaging AI Companies

Here are some questions that education leaders, educators, related service personnel, students, parents, and educational researchers might consider discussing with potential industry partners. Before talking with the potential partner, have an internal meeting to identify what questions are important for your situation and what answers might be expected.

1. What are the industry partner’s objectives and goals?
2. How well does the industry partner understand the methodologies of education in a classroom?
3. Which skills and competencies are in high demand in the industry?
4. How can the industry partner contribute to curriculum development?
5. Are there opportunities for student internships or work placements?
6. Can the industry partner provide access to real-world data and projects?
7. What resources can the industry partner provide?
8. Are collaborative research projects possible?
9. What professional development opportunities can the industry partner offer to educators?
10. What is the industry partner’s commitment to diversity and inclusion?
11. How will intellectual property and data privacy be handled?
12. Which parts of the current education system will most benefit from AI?

Conclusion

Recognizing the rapid pace of technological development compared to the slower curriculum updates in schools, the chapter advocates for a synergistic partnership between the educational sector and the AI industry. Such collaborations are essential for equipping students with the necessary skills to thrive in a future dominated by AI technologies while helping support the development of more inclusive AI.

The chapter elaborates on the mutual benefits of these partnerships, wherein AI developers gain insights into making technology accessible and beneficial for educational purposes. At the same time, educators learn to navigate potential misuses and biases inherent in AI. This reciprocal relationship ensures the development of inclusive AI technologies, especially for learners with disabilities. We provide practical steps for initiating and nurturing collaborations with the AI industry, including setting clear goals and expectations, engaging in joint curriculum development, facilitating internships, and leveraging technology for project-based learning. Ideals are then given for starting collaborations.

Resources

Here are a few resources to support further understanding of some of the topics discussed in this chapter.

- International Society for Automation: Best Practices for Collaboration between Academia and Industry
- inTech: Industry 4.0: Intelligent and flexible production
- Guide to University and Industry Collaboration
References


Chapter 8

Ethical Considerations for Educators
Leveraging Artificial Intelligence
Integrating artificial intelligence (AI) into school curricula evokes a complex array of ethical concerns. Paramount among them are issues of equity, privacy, and the potential for algorithmic bias, especially as it relates to students with disabilities and other diverse learning needs. However, these ethical concerns affect the decisions and uses of AI for all students. These concerns necessitate a nuanced examination from multiple perspectives, including students, teachers, administrators, related service providers, parents, and families.

**Equity and Accessibility**

Equitable access to AI technologies is a fundamental ethical concern. The disparity in school resources can exacerbate existing educational inequalities. For example, students in well-funded schools might have greater access to cutting-edge AI tools than those with fewer resources (Foltynek, 2023). This inequity raises questions about the fairness of educational opportunities and the potential for AI to increase the digital divide (see NETP, 2024).

The use of AI in education necessitates the collection, analysis, and storage of vast quantities of personal student data. A delicate balance must be struck between leveraging data to enhance learning and protecting students’ personal information. The potential for data breaches or misuse poses a risk to students’ privacy rights and requires stringent data-protection measures (Nguyen et al., 2023). At the heart of these concerns is safeguarding students’ personal information while taking advantage of AI’s potential to personalize learning and improve educational outcomes.

AI databases can include student-level data, academic performance, behavioral patterns, and biometric information to effectively support school leaders when making predictive...
decisions. The use of these data sources raises critical questions about consent. A pivotal ethical consideration is how and when consent is obtained, especially from minors. The need for transparency about which data are collected, how they are used, and with whom data are shared is essential. Ensuring teachers, related service professionals, parents, and students are fully informed and agree with data practices is necessary for ethical integrity.

Another concern is safeguarding data against unauthorized access and misuse. Schools and technology providers must implement robust security measures, including encryption, secure data storage solutions, and regular security audits (Mouta et al., 2023). The challenge is heightened by the varying levels of resources among schools, potentially leaving some schools and districts more vulnerable to data breaches.

Questions about data ownership and control are central to the ethical use of AI in schools. It is essential to determine who owns the data (e.g., the student/parent, the school, or the AI service provider) and who controls access to the data (e.g., the student/parent, the school, or the AI service provider). Based on ownership, can students and their families access, amend, or delete their data? The policies governing these aspects should be transparent, fair, and respectful of individuals’ rights. AI tools in education can lead to increased surveillance of students, tracking academic performance and students’ behavior and emotional states. This surveillance raises significant privacy concerns about the potential for AI to misuse information, such as disciplinary actions imposed by a school. To prevent intrusive surveillance, it is critical to delineate clear boundaries on which data can be collected and how the data can be used.

Developers, education leaders, and educators should ensure security measures are equitable and do not disproportionately affect any group of students, especially students with disabilities. Baseline requirements include adherence to legal frameworks and standards, such as the Children’s Online Privacy Protection Act, the Family Educational Rights and Privacy Act in the United States, and the General Data Protection Regulation in Europe. These regulations provide guidelines for protecting personal data. Ethical practices should exceed compliance regulations and actively ensure student welfare.

Algorithmic Bias and Fairness

Algorithmic bias originates from the data on which AI systems are trained. If the training data contain historical biases or do not represent diverse student populations, the AI system can continue these biases (Akung & Greenhow, 2022). For example, an AI-driven educational tool developed predominantly on data from one demographic group may not perform equally...
well for students outside the group, possibly disadvantaging the students in the outside group in assessment, content delivery, and learning opportunities. Biased algorithms also can lead to unfair assessments of students’ abilities and needs. For example, an AI system that recommends academic tracks or specialized programs may inadvertently use skewed data inputs to favor certain groups over others. If used appropriately, AI systems should encourage discourse among educators and students/parents, including those from traditionally marginalized groups. Additionally, the concern over bias underscores the importance of developing AI systems that are transparent, explainable, and designed with a critical awareness of these potential biases. Efforts to audit and adjust algorithms for fairness are essential to prevent the perpetuation of inequalities. Developers, education leaders, and educators are responsible for preventing the perpetuation of inequalities.

A key challenge in addressing algorithmic bias is the often opaque nature of AI decision-making processes (Holmes et al., 2022). Many AI models, especially those based on deep learning, function as black boxes where humans do not easily interpret the decision pathways. This lack of transparency complicates efforts to identify and correct biases. Ensuring AI systems operate logically and rationally is essential for fostering trust and fairness. Combating algorithmic bias requires a proactive approach to designing and developing AI tools. Involving educators, students—including students with disabilities—and communities from diverse backgrounds in the design process can help identify potential biases and ensure that AI tools are equitable and effective for all students.

Addressing algorithmic bias is not a one-time effort—it requires ongoing vigilance. It is essential to monitor and evaluate AI systems continuously for biased outcomes. This process involves regular audits of the algorithms and their decision-making processes and the implementation of feedback loops that allow for the adjustment of AI systems based on real-world performance and impact.

**Impact on Pedagogy**

The advent of AI in public schools has the potential to significantly alter instructional methodologies, teacher-student dynamics, and the broader educational milieu, presenting both opportunities and challenges (Adams et al., 2023). For example, an overreliance on AI may devalue the role of teachers by decreasing human interaction during the learning process. The educational community is encouraged to view AI as a tool to augment, rather than replace, the unique human elements of teaching, such as creating social connections, providing emotional support, offering unprejudiced
guidance, and fostering of creativity and critical thinking skills.

AI can augment traditional teaching methodologies by providing personalized learning experiences. Adaptive learning platforms, powered by AI, can tailor content to meet the unique needs of each student, thereby facilitating differentiated instruction. This capacity for personalization enables educators to address diverse learning profiles and abilities within their classrooms more effectively. However, this shift requires teachers to adapt their pedagogical practices to effectively integrate technology into their classrooms.

Teachers may transition from being the primary source of knowledge to becoming facilitators of learning, guiding students through personalized learning paths provided by AI systems. This shift emphasizes the importance of soft skills such as emotional intelligence, creativity, and critical thinking. AI cannot yet replicate authentic human guidance on these constructs. The challenge lies in ensuring teachers are adequately prepared for the shift through professional development and support frameworks.

Integrating AI into educational settings requires a collaborative approach in which AI tools are partners in the educational process and not replacements for teachers. This collaboration can enhance the learning experience, allowing teachers to devote more time to supporting interactive and higher-order teaching activities. Concurrently, AI can assume administrative tasks such as grading papers, assessments, and provide data-driven insights about student learning (Kumar, 2023). Navigating this partnership requires careful planning to ensure AI supports, rather than undermines, the pedagogical goals and the teacher’s central role in the classroom.

There is a critical need for ongoing professional development and support for teachers as the role of AI in education expands. Educators must have the knowledge and skills to effectively integrate AI tools into their teaching practices. For example, teachers must understand the capabilities and limitations of AI, be able to develop strategies for using AI to enhance learning outcomes, and address ethical considerations related to technology use in the classroom. Support systems, such as training programs and resources, empower teachers to adapt to these changes confidently.

Teachers play a pivotal role in mediating the ethical use of AI in education. They need to be able to teach students about the nature of AI, its potential biases, and its impact on society. Educators are tasked with instilling a critical perspective that encourages students to question and understand the technologies they interact with, including AI.

**Impact**

Exploring the long-term implications and societal effects of AI integration into public schools requires anticipating how these technologies may reshape the educational landscape, societal norms, and future workforce. Students should be prepared for a world where AI plays a central role across numerous sectors. Questions about the evolution of critical thinking, creativity, and social skills arise, as does the broader impact of AI on shaping future citizens’ attitudes toward technology, privacy, and ethics.

The skills required in the workforce are shifting as AI and automation become increasingly prevalent across industries. Integrating AI in...
education can be pivotal in preparing students for this future, emphasizing critical thinking, problem-solving, and adaptability. Education can facilitate the development of digital literacy and technical skills essential for navigating the future job market. However, we should ensure this preparation does not exacerbate existing inequalities, making equitable access to AI education a priority.

The widespread use of AI in schools can influence how future generations perceive and interact with technology. Educating students in environments where AI tools are commonplace may lead to a more technologically adept society, but it also raises questions about the nature of human–machine relationships. It is imperative to foster a critical awareness among students about the implications of these interactions, including privacy, autonomy, and ethics. By engaging with AI technologies, students can be encouraged to consider the ethical dimensions of AI, including bias, fairness, and the societal impact of automation. This awareness is crucial for developing responsible citizens who can contribute to shaping the ethical use of AI in society.

The normalization of AI in educational settings can also influence broader social norms and values, particularly those concerning trust in technology and perceptions of intelligence and learning. As AI becomes a standard part of the educational experience, it may alter conceptions of knowledge acquisition, the role of human educators, and the worth of human-generated versus machine-generated insights. Navigating these changes requires a balanced approach that values technological innovation and ethical judgment.

The long-term societal impact of AI in education hinges significantly on how these technologies are deployed. Ensuring AI tools benefit all students, regardless of their background, is essential for preventing widening digital divides (NETP, 2024). Educators should address disparities in accessing technology, combating algorithmic bias, and ensuring that AI supports diverse learning needs.

Integrating AI in education can be pivotal in preparing students for the future, emphasizing critical thinking, problem-solving, and adaptability.
Conclusion

Integrating AI into public schools has profound long-term implications for society, influencing the skills and competencies of the future workforce, social norms, ethical considerations, and the nature of human–machine interactions. Navigating these implications requires a conscientious approach that prioritizes equitable access, ethical awareness, and the cultivation of technical and soft skills. By thoughtfully integrating AI into education, educators can prepare students to thrive in a technologically advanced future and shape it in ways that reflect shared values of equity, inclusivity, and human dignity. Developing ethical guidelines and regulatory frameworks tailored to AI's use in education can provide a foundation for addressing bias. These frameworks should advocate for equity, fairness, and accountability in AI applications, thus guiding developers, educators, and policymakers in the ethical deployment of AI technologies.
References


