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Revolutionizing Higher Education: The Impact of Artificial Intelligence Agents and Agentic Artificial Intelligence on Teaching and Operations

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This article explores the transformative impact of artificial intelligence (AI) agents and agentic AI solutions on higher education, highlighting their role in revolutionizing teaching, student support, administrative operations, and recruitment. With the education technology market poised for significant growth, AI agents are reshaping academic experiences by offering personalized learning, streamlining administrative tasks, and fostering greater student engagement.

The rise of artificial intelligence (AI) agents, forecasted to drive a multi-trillion dollar opportunity,[1] is changing the academic landscape. AI agents and agentic AI solutions are becoming a significant part of the education technology (EdTech) market, which was valued at approximately $194 billion in 2024 and is projected to reach $1063 billion by 2033 (https://www.businessresearchinsights.com/market-reports/education-technology-edtech-market-117665).

AI agents are already driving major changes in how education is delivered and experienced. For instance, educators at the University of Sydney in Australia are leveraging generative AI to create "AI doubles," personalized agents that enhance teaching by providing students with instant, tailored feedback and guidance across various subjects. The agents are developed using Cogniti, a self-service AI platform built on the university's secure Azure infrastructure, which is powered by Azure OpenAI Service.[13] Educators use these AI agents to support a range of activities, including elucidating key principles, delivering study tips, handling routine questions, and encouraging curiosity. A chemistry professor developed an AI agent for a Fundamentals of Chemistry course to promote educational equity by bridging learning gaps. The agent provides concise explanations of key concepts, checks student understanding with questions, and assesses their knowledge level.[2]

Task-oriented AI agents that follow predefined rules, such as those that are used at the University of Sydney, are already revolutionizing teaching and learning by providing real-time feedback and enhancing student engagement. Agentic AI, with its higher autonomy and ability to adapt to complex environments and long-term goals, continuously learns from data, integrates seamlessly with various technologies, actively perceives its surroundings, and proactively responds to changes,[14] making it a powerful tool for transforming the academic industry by enhancing personalized learning, improving administrative efficiency, and fostering long-term engagement with students and alumni.

As agentic AI advances, its adoption will expand across a wider range of teaching and learning activities. In the near future, agentic AI is expected to offer daily support to faculty by reviewing student submissions on discussion boards, posting follow-up questions, and fostering discussions with faculty approval. It will scan newly released research and relevant course materials, share updates on the Learning Management System (LMS) for student review, and suggest additional content, including lecture notes and quizzes, to enhance the course schedule based on ongoing research findings.[15]

Agentic AI can enhance student engagement throughout and beyond university education. CollegeVine's AI Advisor supports current students, improving retention and success, while the AI Ambassador fosters lifelong institutional affinity by connecting with alumni postgraduation.[3]

The adoption of this technology could also alleviate growing administrative costs, which are increasing more rapidly than faculty expenses. For instance, from 2002 to 2022, the number of administrators per 1000 students almost doubled, rising from 45 to 82, while faculty positions saw only a slight increase, from 55 to 64.[4] Agentic AI is capable of automating tasks that presently consume significant administrative resources. For example, agentic AI can autonomously dispatch a text message to prompt an applicant to complete their document submission, freeing up staff time.[15] At the strategic level, while keeping abreast of new products and strategies implemented by other universities, the agent will analyze and project potential improvements, offering recommendations and identifying efficiencies as opportunities emerge.[5]

Agentic AI can also transform key processes such as instructional design by reviewing course syllabi, testing learning outcomes, and ensuring relevance to current and future career fields. It offers suggestions on content emphasis and pedagogy and creates a curated list of resources, which are updated throughout the semester, along with custom graphics, quizzes, and learning tools that are tailored to the needs of subject matter experts and instructional designers.[5]

The rise of AI agents will also present new challenges for colleges. AI agents, for example, could automate processes such as identifying and submitting missing assignments via the LMS, which undermines active student participation. As this technology advances, colleges will need to rethink course designs and the overall purpose of education to ensure that learning remains relevant and impactful in the age of AI automation.[6]

This article examines the transformative impact of AI agents and agentic AI solutions on higher education, emphasizing their effects on teaching, administrative efficiency, student services, and recruitment. It underscores the increasing adoption of AI technologies by universities to boost student engagement, enhance academic support, and optimize operational processes.

ACADEMIC SUPPORT AND TUTORING

AI agents are transforming academic support and tutoring by providing personalized, real-time assistance tailored to individual learning needs. In 2015, an AI agent was introduced as a teaching assistant for an AI course at the Georgia Institute of Technology. Students only discovered later that it wasn't human. By 2020, the agent had supported 17 courses across various subjects and education levels.[16]

Likewise, as noted earlier, at the University of Sydney, many AI agents have been created to enhance instructional activities, including one that was developed by a chemistry professor to assist students with inquiries regarding unit organization, assessments, deadlines, and administrative tasks. The agent's instructions are simple: act as a supportive guide, provide accurate information, and refer students to the education support team for uncertainties. Using Cogniti, the professor can upload resources like course pages, assessment details from the LMS such as Canvas, and unit-specific information. The goal is to improve responsiveness in an asynchronous learning environment; ensure that students receive timely, accurate information; and reduce the administrative burden on staff.[2]

Further advancements in agentic AI are expected in the near future. AI agents are expected to soon function as personalized tutors, tailoring their approach to each student's learning style and delivering real-time academic support.[17]

Research on the impact of AI assistants and agents in higher education is ongoing. A study by learning platform Nectir revealed that students who used AI course assistants experienced statistically significant improvements in their grade point average. These findings suggest that AI agents used as assistants can play a crucial role in providing the academic support that students need to enhance their academic performance and overall success.[18]

OPTIMIZING ADMINISTRATION

Agentic AI can also be leveraged for streamlining university administration. The University of Murcia in Spain implemented "Lola," an AI agent that assists students with inquiries about schedules, course registration, and other administrative tasks. By automating these routine interactions, Lola reduces the workload of administrative staff and provides students with immediate responses, improving efficiency and accessibility. This integration enhances the overall student experience and streamlines university services.[19]

Georgia Southern University partnered with enterprise AI platform Druid to implement an agentic AI solution—Gus— that integrates seamlessly with its digital infrastructure. Gus provides 24/7, real-time access to campus services and information, streamlining administrative processes and reducing manual workload. This solution has been reported to significantly boost student and staff engagement, modernizing

communication and operational efficiency while addressing the needs of the student population.[20]

AI agents will also revolutionize key organizational functions in universities, such as accounting, operations, marketing, and human resource management (HRM). In operations, efficiencies and advances in the daily operation of the physical plant and grounds will be conducted. In marketing, agents will analyze enrollment campaigns, recommending even minor adjustments to copy, distribution strategies, and graphics to optimize outcomes. They will then assess the results and propose further revisions. Marketing plans will be based on comprehensive data analytics, addressing the needs of prospective students and identifying new recruitment opportunities.[5] In HRM, the Druid AI agents that are used by Georgia Southern University enable self-service by automating repetitive inquiries, screening candidates, and managing HR processes (https://www.druidai.com/solutions/human-resources-ai-agents#:~:text=According%20to%20Gartner%2C%20large%20enterprises,performing%20specific%20HR%2Drelated%20processes). The agent will also optimize staff scheduling to reduce expenses and improve work outcomes.[5] Accounting tasks, including budget projections, identifying cost-saving opportunities, and making adjustments to align with shifting priorities, will also be handled by the AI agent.[5]

TRANSFORMING STUDENT RECRUITMENT AND ADMISSIONS

CollegeVine has developed Trellis, an agentic AI platform designed to assist in student recruitment. The platform provides universities with autonomous AI recruiters that engage prospective students through personalized communication, helping to manage large-scale outreach efforts. Trellis allows agentic AI recruiters to interact with students across various channels such as phone, text, and e-mail, adapting to guide students through the enrollment process.[21] As of October 2024, an AI recruiter was used by more than 95 institutions and has facilitated more than 500,000 conversations with prospective students, providing personalized engagement throughout the recruitment process.[3]

A major Australian university faced an overwhelmed admissions help desk due to high inquiry volumes from multinational students, many encountering cultural and language barriers. InovarTech addressed this by implementing an agentic AI system, which streamlined the admissions workflow and provided real-time access to information on services like parking, housing, and academic programs. The solution resulted in a 40% reduction in help desk inquiries,

a 30% increase in student satisfaction with the admissions process, and improved operational efficiency across departments (https://www.inovar-tech.com/case-studies/transforming-admissions-for-a-leading-australian-university-with-agentic-ai).

IMPROVING COLLEGE ENROLLMENT RETENTION

AI advisors can help current students with academic guidance and retention strategies. Summer melt has been a significant challenge, one that AI agents can help to address. In 2010, the Fort Worth Independent School District, based in Fort Worth, Texas, faced a 48% melt rate, with even higher rates among low-income and Latino graduates at 56% and 59%, respectively, compared to 19% for white students (https://sdp.cepr.harvard.edu/summer-melt#:~:text=%E2%80%9CSummer%20melt%2C%E2%80%9D%20the%20surprisingly,college%E2%80%94but%20don't). To address enrollment challenges, Georgia State University identified key obstacles for students between high school graduation and the start of college, such as financial aid and class registration. They introduced a new student portal and the AI-powered agent "Pounce" to provide 24/7 support. In its first summer (2016), Pounce answered more than 200,000 questions, reducing summer melt by 22%, and ensuring that 324 more students attended the first day of classes (https://success.gsu.edu/initiatives/reduction-of-summer-melt/#:~:text=Georgia%20State%20developed%20an%20approach,Pounce%2C%E2%80%9D%20to%20answer%20thousands%20of).

RISKS AND CHALLENGES

Although AI agents and agentic AI offer new capabilities, they also introduce additional risks. First, agentic AI faces new and more serious privacy and cybersecurity risks. Unlike standard AI models, where threats are limited to inputs, processing, outputs, and software vulnerabilities, AI agents expand the attack surface to include the entire chain of interactions that they initiate—many of which remain invisible to human or system operators. These risks include data exposure, unauthorized coding logic errors leading to breaches, and supply chain vulnerabilities from third-party libraries.[7] Because agentic AI systems depend on large numbers of real-time data from students, faculty, and staff, it makes concerns about data privacy and security more serious.[8] AI agents' dynamic nature makes threat detection challenging, with increased risks when models are connected to other systems.[9]

Also a concerning trend is that cybercriminals are leveraging this technology for malicious purposes,

such as self-improving phishing campaigns. These AI agents learn from past attacks to refine future ones, perform automated spear phishing, adapt in real time to the target's response, and execute multistage attacks. Additionally, AI can combine multiple communication channels, like text and deepfake calls, to improve the effectiveness of phishing attempts.[10]

Second, agentic AI is often a "black box," meaning that its decisions can be difficult to explain to regulators, customers, or auditors, raising concerns about transparency and accountability. As this technology becomes more integrated into the academic industry, ensuring its explainability will be essential for mitigating risks and maintaining trust.[11]

Third, agentic AI faces challenges in areas such as model limitations, memory capabilities, latency, and access to relevant data. Although advancements in task-specific and multimodal models are underway, they still require significant prompting. Improvements in memory, such as larger context windows, could enhance agent functionality, but multiagent setups may lead to high costs and latency.[22]

Fourth, agentic AI raises concerns about potential job displacement as roles become fully automated or as skills become less rare, rendering certain positions more precarious.[12] For instance, Meta CEO Mark Zuckerberg predicted that "2025 will be the year when it becomes possible to build an AI engineering agent that has coding and problem-solving abilities of around a good mid-level engineer."[23] Recent surveys have found that 45% of workers fear job insecurity due to AI, and 33% view it as a threat, not a tool. Additionally, digital divides emerge, with younger employees, men, and senior managers benefiting more from AI training compared to older workers, women, and unskilled manual laborers.[24] Finally, as these systems become more autonomous, the risk of insufficient human oversight grows. It is perhaps worth noting that without proper governance and control, AI agents may operate unchecked, potentially leading to unintended consequences.[9]

As AI evolves, employees must be prepared for autonomous agents in the workplace, and businesses should deploy their own AI-based security agents to stay ahead of cybercriminals.[8] Ensuring the responsible handling of sensitive information will require a thoughtful and strategic approach. Addressing both privacy and oversight challenges will be crucial for the successful and ethical integration of agentic AI into university settings.[9] To mitigate these threats, universities should also educate faculty staff and students on social engineering and other AI agent risks and foster a culture of cybersecurity.[7] Enhancing security awareness through dynamic training tools that are tailored to risk levels is essential.[8] It is crucial to detect and flag anomalous activities, and map all AI agent interactions to ensure compliance with enterprise policies.[7] To combat advanced social engineering, organizations can also use agentic AI to monitor and detect threats, analyze behaviors, and prioritize vulnerabilities.

CONCLUSION

AI agents and agentic AI solutions have started to powerfully influence the higher education landscape, transforming teaching, administrative processes, and student engagement. By offering personalized learning experiences, enhancing academic support, and streamlining administrative tasks, AI agents hold the potential to improve educational outcomes while addressing the growing administrative burden faced by institutions. However, the widespread adoption of agentic AI also presents significant challenges, including privacy and cybersecurity risks, transparency issues, and potential job displacement. For successful and ethical integration, universities must prioritize security, transparency, and responsible AI use while ensuring that all stakeholders are prepared for the changes ahead. As these technologies continue to evolve, their responsible implementation will be crucial in shaping the future of higher education.

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