مؤسسة قطر
Qatar Foundation

وايز
Wise

الأبحاث والسياسات
RESEARCH & POLICY

NAVIGATING SKILLS ADAPTATION: INTEGRATING AI IN HIGHER EDUCATION

Global Consortium on Artificial Intelligence and Higher Education for Workforce Development

November 2025

Lead Author
Dr. Mirka Martel

Co-authors
Selma Talha-Jebril
Sopiko Beriashvili

iie The Power of International Education

Foreword

The World Innovation Summit for Education (WISE) and the Institute of International Education (IIE) are pleased to release the first round of research findings emerging from the Global Consortium on Artificial Intelligence (AI) and Higher Education for Workforce Development. Our two organizations share a deep commitment to innovative research, furthering global knowledge about how AI is being integrated into teaching and learning practices. This effort could not come at a more critical time for institutions of higher learning.

Stavros N. Yiannouka
WISE

Jason Czyz
IIE

Global higher education is facing new opportunities and challenges with the advent of AI. The possibilities of AI integration are present in all aspects of our work, from administration and curricula to teaching and professional development. Colleges and universities have also had to face a host of new challenges regarding data privacy, ethics, and misuse. The speed of AI integration is overwhelming, and at time, higher education struggles to keep up.

Underlying these concerns is the emergence of new AI technologies that have not yet been thoroughly researched, leaving administrators, educators, and learners with confusion and uncertainty. In a field where knowledge and the pursuit of knowledge are paramount, this leaves many with more questions than answers.

The Consortium on AI and Higher Education for Workforce Development has been built on the premise that global research is needed to understand the landscape of AI integration in teaching and learning. WISE and IIE have built on our long-standing relationship and positioning as leaders in international higher education, with a collective commitment to produce research on practices and policies, and recommendations that can inform a wide range of stakeholders. A critical element of this research is its global nature, knowing that while AI permeates on a global scale, local interpretations and uptake differ. By providing comparative perspectives across Qatar, Colombia, Ghana, India, Kazakhstan, Spain, and the United States, we aim to highlight both similarities and differences.

Our work has just begun. We are committed to expanding on this global research and continuing to map areas of AI uptake in international higher education. As the Consortium deepens its connections and research perspectives, our efforts broaden our understanding and lead to new possibilities.

> “A critical element of this research is its global nature, knowing that while AI permeates on a global scale, local interpretations and uptake differ.”

Note from the Editors

The Global Consortium on AI and Higher Education for Workforce Development was conceived following observations from the **WISE 11 Summit** in 2023. With AI being adopted at an ever-increasing pace and impacting all levels of education, there was a clear need to explore its implications specifically in higher education, and to do so via a multi-country, comparative approach. Such a model enables capturing diverse regional contexts, not for comparison or ranking, but for understanding AI integration globally.

A multi-year approach with key research partners ensures that education systems worldwide are not just keeping up with AI changes but at the forefront of them. Our first year would not have been possible without our research partners:

- Universidad de los Andes (Colombia):
  Manuela Fernández Pinto, William Jiménez-Leal
- Ashesi University (Ghana):
  G. Ayorkor Korsah, Joseph K. Adjei, Joseph A. Mensah
- BITS Pilani (India):
  Shibani Khanra Jha, Jagat Sesh Challa
- Nazarbayev University (Kazakhstan):
  Elaine Sharplin, Aida Nuranova, Aiza Bissaliyeva
- Universidad Camilo José Cela (Spain):
  Natalia Lara Nieto-Márquez
- University of Pennsylvania (United States):
  Peter Eckel, Ross Aikins

For the Qatar case study, WISE and IIE collaborated closely with Hamad Bin Khalifa University (HBKU). We want to express our gratitude to Dr. Ahmed Elmagarmid, Executive Director of the Qatar Computing Research Institute (QCRI), for his support of the research, as well as Dr. Georgios Mikros, College of Humanities and Social Sciences (HBKU), for helping us envision the study.

At WISE, we extend our deep gratitude to our CEO, Stavros N. Yiannouka, for his unwavering belief in this Consortium from the moment the idea first took shape. From inception through every stage of design and execution, he has provided steady guidance, intellectual curiosity, and principled leadership. We would also like to thank Dr. Ahmed Baghdady, former WISE researcher, for his thoughtful contributions and reflections.

At IIE, Jonah Kokodyniak provided overall support to the project, and Sumeyra Ekin contributed to the literature review. Christina Ullman provided the report design.

Finally, we would like to thank the administrators, educators, learners, policy makers, and industry stakeholders who participated in surveys, interviews, focus groups, or workshops. Our research spanned seven global locations and six time zones, collecting data from over 2,600 stakeholders. Coordination and cooperation were key, reflecting the interest in and commitment to our global research.

Selma Talha-Jebril
WISE

Sopiko Beriashvili
WISE

Mirka Martel
IIE

Executive Summary

This report presents a comparative analysis of seven global case studies examining AI integration in higher education—across curriculum design, student and faculty skill development, bridges to employers and the workforce, and ethical considerations. The research findings highlight opportunities and gaps across varied education systems, underscoring the need for more consistent collaboration between academia and industry.

Effective strategies for integrating AI in higher education curricula and practice
The global case studies highlight the critical role of higher education institutions in providing guidance on the ethical use of AI in the academic context. A focus on the potential inclusive role of education to bridge digital and cognitive divides is only possible if academia, government, and industry work together.

Upskilling and reskilling for faculty and higher education leaders
Practical support for educators and administrators on using AI tools for administrative and academic tasks should increase. While uptake is strong, faculty struggle with resistance to technology, trust in its benefits, and ethical use in their disciplines.

Preparing students for the agility and resilience required in the AI era
Academia has a potential role to play in supporting learners in their consumption of AI-generated content, including ethical use, data verification and self-regulation. Human-centered skills focused on human interaction, critical thinking, and adaptability will be critical alongside digital skills.

The role of higher education in mitigating the skills gap in the workforce
Learners across global contexts are already using AI tools in and outside the classroom, and can harness this knowledge into an AI-enabled workforce. Academia and industry should ensure that universities prepare students to be ethical consumers of AI content and critical decisionmakers.

Strategies for fostering collaboration between academia and industry
Higher education and industry can work together to ensure that students gain exposure to AI needs and expectations in the job market, across disciplines. Bootcamps, internships, and bridging programs can give students practical insights into AI skills needed in the workforce.

The impact of AI on workforce dynamics and how education can respond
Concerns about the ethical implications of AI emphasize the urgency for clearer frameworks across higher education and industry to understand AI's role as a complement in key industries. Academia and industry can work together to ensure that AI enhances rather than replaces human knowledge and capabilities.

Contents

Introduction

The Global Consortium on AI and Higher Education for Workforce Development marks a significant milestone in the journey towards integrating AI in higher education, bringing together thought leaders and stakeholders from around the world to share their findings and collaborate on future initiatives. Through this first report, the Consortium's research contributes cutting-edge findings and insights.

Why This Research Matters

By bringing together a global network of scholars, educators, and industry leaders, the Global Consortium drives forward-thinking solutions that will shape the future of learning and work. The research emerging from this work addresses current challenges and paves the way for a more adaptive, resilient, and inclusive global higher education landscape.

Research Areas of Focus

Higher Education

Effective strategies for integrating AI in higher education curricula and practice

Upskilling and reskilling for faculty and higher education leaders

Preparing students for the agility and resilience required in the AI era

Workforce Development

The role of higher education in mitigating the skills gap in the workforce

Strategies for fostering collaboration between academia and industry

The impact of AI on workforce dynamics and how education can respond

About the Report and Case Studies

Part I presents global findings organized around key research areas of focus. This part concludes with global calls to action and recommendations for policy and programming.

Part II presents overviews of seven global case studies prepared in collaboration with our research partners. Each case study overview includes that country's research focus, key findings, and recommendations.

Countries and Research Partners Featured in Report Case Studies

Qatar
Hamad Bin Kalifa University (HBKU)

Colombia
Universidad de los Andes (Uniandes)

Ghana
Ashesi University

India
Birla Institute of Technology Pilani (BITS Pilani)

Kazakhstan
Nazarbayev University (NU)

Spain
Universidad Camilo José Cela (UCJC)

United States
University of Pennsylvania (UPenn)

PART I

GLOBAL FINDINGS: NAVIGATING SKILLS ADAPTATION

Integrating AI in Higher Education

Across global case studies, the integration of AI in higher education spanned a review of higher education systems and their integral components, including administration, curricula, teaching, and learning. Global findings indicate a high frequency of AI tool use across these domains, though with varying levels of integration. The findings further underscore the need to align students' needs for AI-related skills with educators across all areas of teaching.

Factors Linked to Availability of AI Tools

1. **Global adoption of AI tools is limited by local provider availability.** This finding also highlights the reality that the uptake of AI tools and providers remains disproportionate, as regions with limited internet access or limited technology remain disproportionately excluded from AI adoption.
2. **Policies that support or limit provider use also affect AI tool availability.** This relates to data privacy and security concerns (See section on Supporting Higher Education Administration). These policies can be at the institutional level, or more specifically, related to data privacy concerns in countries or contexts.
3. **Regionally created AI tools provide opportunities for variation and local context.** The limitations of AI tools in language adoption and local cultural accuracy were noted, prompting consideration of the greater proliferation of locally relevant AI tools (see Qatar Case Study).

AI Tool Use and Availability

AI Uptake across Higher Education Institutions Is Strong

Across all case studies, educators and learners reported adopting AI tools to support their teaching and learning. Those who specified not using any AI tools were in the minority, though educators showed greater variation. Beyond this, the frequency with which AI tools were introduced and the intention behind their use showed great differences. While some educators used AI in every aspect of their work, others used it only sparingly. Across global case studies, learners reported widespread AI adoption, especially with the more recent uptake of Generative AI (GenAI) and its capabilities.

AI Providers and Tools Vary Across Global and Local Contexts

There was some variation in the AI tools used across global contexts. While large language models that operate globally, such as OpenAI ChatGPT, Google Gemini, and Anthropic's Claude, were noted as tools across multiple global contexts, other tools were more localized in some regional or even national contexts.[1] A further review of these contexts suggests that the availability of AI tools is linked to three factors: (1) the availability of providers in these countries; (2) policies related to availability or, conversely, restrictions on tools; and (3) availability of regionally or locally created AI tools (see sidebar).

Educators and Teaching Practices

A critical element of the global case studies was understanding basic use of AI tools in teaching methods, while also understanding how the teaching profession may be influenced more broadly by the advent of AI as a tool for administrators, educators, and learners. As those "at the front line", educators held a critical view of how AI and higher education are becoming interlinked.

University Educators Use AI Tools for Teaching Preparation and Delivery

From a global perspective, most case studies indicated that educators in each context reported using AI in the preparation, delivery, and assessment of their courses. The frequency of adoption varied greatly: some educators reported using AI in all aspects, including course and lesson planning, curriculum development, readings and classroom materials, and assessment. Others were

[1] Most research collected for the case studies was conducted between September 2024 and April 2025, and thus reflects this period in terms of AI tools available to the public and in use.

Unlike traditional AI systems that rely on fixed rule-based outputs, Generative AI (GenAI) refers to machine learning models capable of generating new content, such as text, images, code, or music, based on human prompts. Notable tools like OpenAI's ChatGPT have made GenAI accessible to the public and are increasingly used by students and faculty. However, these tools bring with them many ethical considerations, especially in academia.

India Case Study

using it independently or for their own administrative tasks, with little integration in the classroom. This also led to differences noted by students on AI integration.

> I have two professors this semester, and one of my professors didn't have a word about it in the syllabus ... On the other hand, I have another professor who I have had for two semesters now who is completely enthralled [with] using AI in the classroom.
>
> Student, United States

> I think we're starting a process to empower ourselves with AI. Some people are willing to explore more... But that will also depend greatly on each person's level and the possibility of experimentation and openness to new things.
>
> Educator, Colombia

Most educators who were "early" adopters of AI indicate that these tools enhanced their efficiency and helped them meet the needs of the technology, noting that they knew learners would adopt these tools. For example, they

indicated they could more easily find new content for their classes, though verifying the content became the critical added component. For most educators in these cases, AI tools were seen as a positive additive. At the same time, most stakeholders, including educators, students, and employers, agreed that while AI tools can enhance teaching methods, they cannot replace educators' roles as mentors and facilitators of knowledge.

> The shift in teachers' roles emphasizes the need for human educators to continue providing the emotional and intellectual guidance that AI cannot replicate.
>
> Employer, India

> Technology will have a role in the [educator and learner] relationship... We will not be two in a room, we will be three (with AI).
>
> Educator, Qatar

Comfort with AI Integration Is More Common in Science and Engineering Disciplines

Educators who reported using and being comfortable with AI tools were more heavily concentrated in science, technology, engineering, and math (STEM) disciplines. In these disciplines, specifically technology and engineering, the concept of AI and its use and adoption have been in development and use for periods well before public AI consumption. Further, in STEM disciplines, the teaching of data science and technology skills (e.g., prompt engineering) is integral to the field, and as such, these educators noted more trust and comfort with their use. Learners in these fields also noted further comfort in observing their educators using these tools.

In comparison, educators in the humanities and social sciences, as well as law, were far less comfortable in their adoption of AI, or the more specific use of these tools. These educators were also more likely, globally, to feel that AI tools were in early stages and to be less trusting of AI tools for teaching and learning. This was particularly notable in law, where educators noted that chatbots created incomplete or erroneous materials related to their local judicial systems. In these disciplines, as well as in, medicine and the humanities, the level of trust in AI-generated material was low. In many of these fields, educators raised more fundamental critiques of the role of AI and the broader implications for their fields. There was also greater skepticism about the role of technology in education.

Reskilling and Upskilling University Faculty

Educators Seek Out Individual and Ad-hoc Learning on AI Tools

Some educators adopted individual learning, using the internet and technology tools to further their own knowledge. Others have created communities of learning or practice where educators in one discipline (or multiple) provide collective learning. In some cases, universities have adopted a more holistic approach to AI training and capacity-building for professors. Successful cases include AI working groups, institution-supported training and AI workshops, mentor groups, and AI adoption resources. Even with resources available, however, uptake varies. While some professors are taking advantage of these resources, others are more reticent.

There is also an indication that guidance is emerging too slowly from higher education institutions, leaving educators to adopt ad-hoc policies or focus on their own self-learning. Further, while courses or professional development for educators at the university level are helpful, they are often less grounded in specific guidance for educators' day-to-day work and instead focus on university policies and broader guidelines. This means that from a practical perspective, many educators are implementing practices without coordination with each other or broader leadership.

> We've been working in silos, and then the Provost wants to talk about all that we do to the Board when they ask, 'What are you doing in AI across the university?' The Provost cannot give them a list of 500 individual initiatives... We are working in hundreds and hundreds of silos.
>
> Administrator, United States

A concern raised by many educators is the time and resources required to adequately adopt AI tools and practices in their teaching, given the many pressures on their time. There is often a preference of integrating AI tools for efficiency because they will alleviate the pressure of time, versus a deeper learning of AI that is too overwhelming.

Reshaping the Educator Experience

Across global contexts, educators emphasized that AI is a critical tool and an area to be addressed in pre-service training, particularly for new generations of educators entering the profession. That being said, as much focus was given to in-service educators and not leaving educators less versed in AI tools behind. In these cases, what becomes pivotal is also whether AI is a "necessary good" or a "necessary evil." Perceptions of this still abound, and educators and administrators across contexts noted that a sensitive approach to pre-service and in-service delivery is needed.

> As university professors, we base all our authority on the fact that we know. So, saying, 'I have to learn from scratch...' implies that we're asking for a profound change among faculty, who were trained for other challenges. So, it seems a major challenge to find that critical mass to transform the university. I believe the critical mass exists, but we must help people understand, not punish, and attract those most fearful.
>
> Administrator, Colombia

> I hope that it becomes a tool that they use to augment their capabilities. I don't want to see academic professionals being replaced... Human interaction is an important part of anyone's education journey.
>
> Policymaker, Qatar

Learner and Student Skills for an AI Era

Students Are Using AI Tools but Need More Guidance and Support in Academic Settings

Use of AI tools was widely reported among learners, with students relying on AI tools for their activities in and outside the classroom. Learners across many global contexts raised valid opportunities and challenges in using AI tools, and their awareness of the benefits and pitfalls of relying on AI content was noted. From an academic perspective, many respondents focused on the role of the university, and the educators, on supporting students and providing them more guidance on ethical content generation and consumption.

> What I try to explain to the students is that AI is just another tool, and its quality and effects depend (as with any tool) on how it is used and for what purpose.
>
> Educator, Spain

The concerns around AI overreliance were evident across all stakeholders, especially educators. Faculty were more likely to highlight students who readily adopt and believe AI-generated content without checking its validity or credibility. It is interesting to note that among student respondents, many raised these concerns readily and spoke to their focus on checking AI content. As such, this could be an area of divergence in teachers' perceptions of student use.

> I know instantly that all these students have... accepted the false prophecy of a technology, and absolutely refuse to engage in a process of criticism or judgment about its capacity.
>
> Educator, Kazakhstan

Critical thinking—understood as the ability to analyze, question, and act responsibly—becomes an ethical backbone for preparing professionals to make informed decisions in complex settings while leveraging cutting-edge technology.

Spain Case Study

Technology should accompany, but not replace, the learning process, enabling personal and collective exploration and generating effective interactions that foster the development of creativity and critical thinking.

Colombia Case Study

Digital Skills Are Becoming Increasingly Important for Students' Professional Development

Several case studies highlighted the need for students to learn digital skills as part of their university experience, supporting their professional development and employability (See Workforce Development in an AI-enabled Era). Producing a training environment in the university context would allow educators to support students and also show them critically how to integrate AI skills in their disciplines.

> "The purpose is precisely (...) to allow them to effectively discover the gaps in this generative AI in producing knowledge... [It] effectively shows them how there are some things they can delegate to it, but there are other things they can't. And it allows them to interact and strengthen their existing knowledge, interact with it, and learn from it."
>
> Educator, Colombia

Human-centered Skills and Education

Educators' role is to advance knowledge among the next generations of learners and contributors to global society. Many case studies addressed educators' concerns about AI's potential to undermine learners' knowledge creation and critical thinking. Beyond knowledge generation, educators discussed their role as mentors to learners, furthering their critical thinking and supporting their development of knowledge and perspectives in key content areas. To ensure that AI supports intellectual growth rather than substitutes human cognition, educational institutions' curricula should support digital literacy and ethical training.

Does AI Support or Deter Critical Thinking?

Perspectives varied on AI's dual role in human development — as a catalyst or inhibitor of critical thinking and creativity. Some argued that AI further underscores the need for educators to pivot in their roles, noting its ability to hone critical thinking among learners. Educators who have used AI tools noted their ability to inspire critical thinking in learners' approaches to knowledge generation and retention, and their potential. At the same time, learners and employers also identified critical thinking as one of the areas of greatest concern, requiring further alignment and clarity on how AI influences human cognition.

Critical Thinking and Workforce Transformation — Spain Case Study

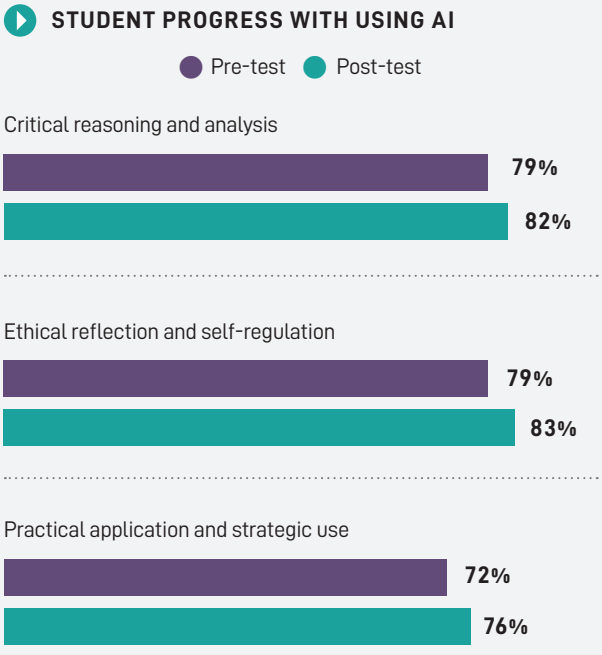
In Spain, UCJC used action research to explore how AI can impact students' critical thinking skills through AI-enhanced curricula. The researchers worked with 108 students and 24 professors during the semester and tested students' critical thinking before and after implementing the AI-enhanced curricula.

The proposed model consisted of four phases:

- **Phase 0:** Professors' upskilling focused on ethics, verification, and templates
- **Phase 1:** Bridge tools (ChatGPT/Copilot) for creation tasks
- **Phase 2:** Specialized tools for research, multimedia, and presentation
- **Phase 3:** Dual evaluation (AI + human review) supported by rubrics

Student activities were designed to include: (1) AI generation/search and (2) human analysis, reflection, and editing. This pattern validated AI as cognitive scaffolding without removing students' critical agency.

Results: Students across disciplines improved their critical reasoning, ethical reflection, and self-regulation in using AI content.



Read more in Spain's Case Study Overview on page 28.

Workforce Development in an AI-enabled Era: Industry and Academia

Global universities have a role to play in preparing learners for an AI-enabled workforce. Several case studies focused on this preparation, and the expectations that employers will have for students to come into the job market with digital skills. Even further, three case studies focused on how specifically industry and academia could and should work together to bridge the AI skills divide and ensure that students are prepared to succeed upon graduation.

Employers specifically focused on AI-generated bias and data privacy, and the role that universities can play in teaching students how to correctly and ethically use AI tools.

Employers Have Expectations of AI Skills in the Workforce

Case studies that focused on the importance of AI skills often noted the expectation that employers now have for graduating students to have digital and specifically AI skills. Some discussed the role of prompt engineering and the need to prepare students to correctly engage with AI tools. Still others focused on the critical role of universities to support students in deciphering and validating generated AI content, a theme already mentioned in previous sections. Employers specifically focused on AI-generated bias and data privacy, and the role that universities can play in teaching students how to correctly and ethically use AI tools.

One respondent noted that the ability to handle emerging trends or disruptions, such as those seen during the COVID-19 pandemic, is essential. This flexibility helps individuals and organizations maintain efficiency in changing conditions.

Ghana Case Study

> AI literacy is essential for job-readiness; otherwise, students will suffer productivity loss.
>
> Educator, India

> And also you have these students who are going out and getting internships and whatnot and AI is an expectation. And so they're thinking that, 'I'm going to leave this university next year and go to my job, and I need to be ready to use AI in that in the workforce, because it's expected.'
>
> Educator, United States

In reflection, some respondents noted the peril of the university not embracing technology and AI skills instruction, and becoming even further removed from the reality of what is expected in the workforce. Further, some noted that if higher education focuses further on rejecting rather than embracing the role of AI and technology, it runs the risk of being obsolete and irrelevant.

Skills for Employability Highlight Adaptability and Resourcefulness

Beyond digital skills, employers continued to focus on other skills that are critical in an AI-enabled workforce, including adaptability and resourcefulness. Successful workers are those that can quickly adapt and pivot in new situations, particularly as industry is influenced by AI. These soft or transversal skills, not necessarily related to industry-specific knowledge but approaches to new situations and work, are important as professions and whole industries adapt to AI in the future.

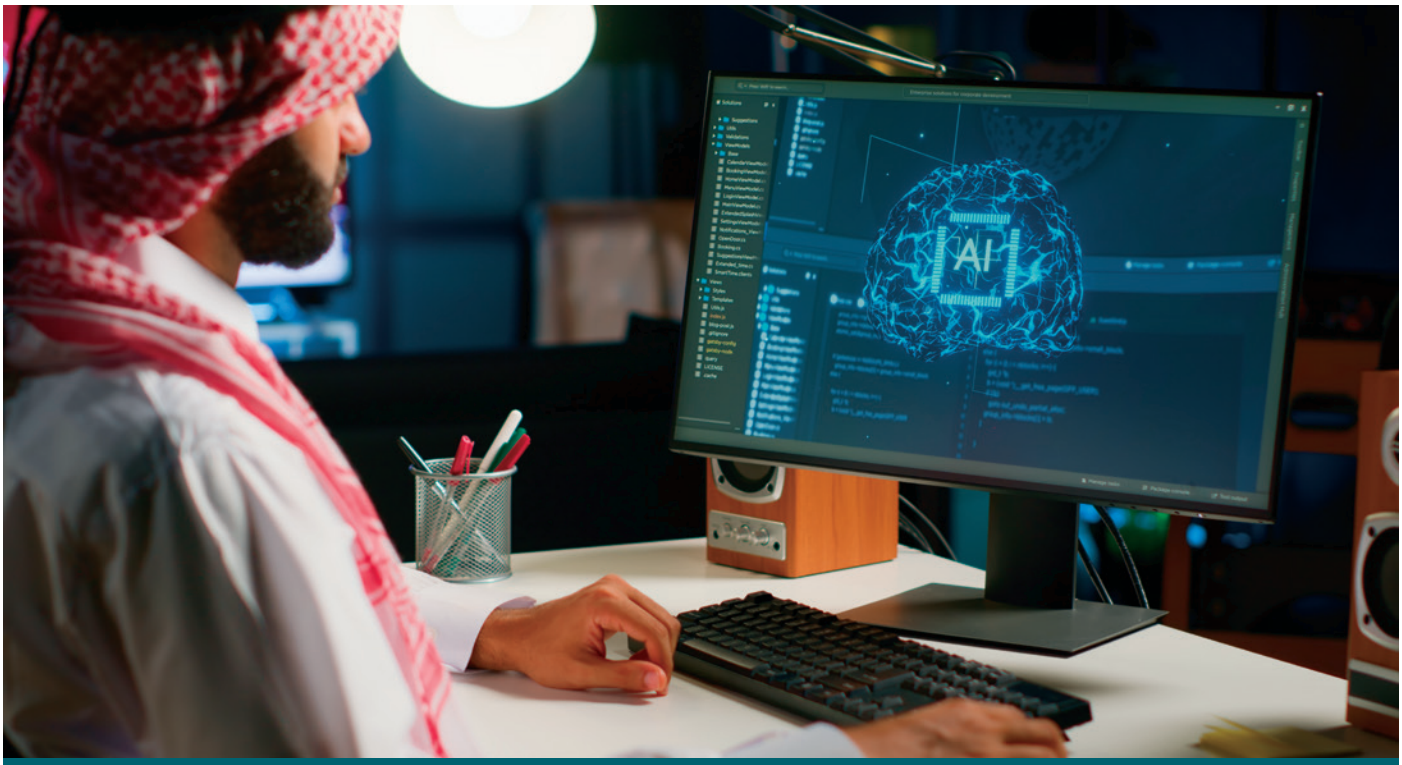
Employers Continue to Seek Human-centered Elements in Their Work

Employers continued to highlight the human element of their work, and the role that higher education plays in preparing students with people-to-people skills critical for professional work. Similar to the education experience, most employers agreed that while work will be heavily influenced by AI, there are elements of work that will continue to require human-centered skills. These include oversight and regulation of technology, assessment and judgment of content, and focusing on workforce needs that require human interaction. Employers and educators agreed that the university is the place to develop these skills.

> In certain areas, certain skills will be absolutely obsolete. But in some areas, it will be because human society has decided that even though autopilot in airplanes is 30 years old, we still want a human sitting there. Even though judges can augment their rulings and precedents and case law and all of that with AI giving them pure answers, we want a human being to be ultimately responsible for saying whether this person goes to jail or not. So societal policy will influence that. For certain job types, we insist on human oversight.
>
> Employer, Ghana

Universities and Industry Should Work Together to Identify Skills Needed in an AI-enabled Workforce

Respondents expressed concerns about outdated curricula in some universities failing to prepare graduates for industry demands. Key suggestions included dynamically changing curricula, stronger industry-academia collaboration, and hands-on experiences. The rapid evolution of technology, especially AI, makes it hard for educational programs to keep pace, with skills learned at the start of a degree often becoming outdated by graduation. Internships alone cannot bridge this gap due to faster industry advancements. There is a critical role for universities and industries to play together to bridge this divide.



Digital Skills Framework and Industry Collaboration — Qatar Case Study

In Qatar, the Ministry of Communication and Information Technology (MCIT) is working together with local industry and academia to design a **Digital Skills Framework**, enhancing digital skills across the current workforce and working with industry and universities to integrate this Framework into higher education.

- The framework covers 19 key digital skill domains, encompassing a broad range of essential competencies needed across both public and private sectors in Qatar.
- It identifies 115 digital skills, categorized into four progressive proficiency levels (see sidebar).

The aim of the Digital Skills Framework is to combine efforts across education, industry, and the government to ensure that Qatari workers, current and future, have the digital skills necessary to contribute to AI-enabled industries. According to Ibtechar, one of the industry partners, the next step is to create "mapping, profiles, and skill needs across the lifecycle, and this is where higher education plays a role."

Read more in Qatar's Case Study Overview on page 18.

Proficiency Levels

Awareness: Acquiring basic knowledge of digital skills

Knowledge: Deeper understanding of digital tools and technologies

Ability: Practical skills to effectively apply digital knowledge in the workplace

Transformation: Leverage digital technologies to drive innovation and transformation, enhancing efficiency

Supporting Higher Education Administration for Holistic Integration

Across global case studies, respondents noted that education systems, particularly higher education, are rooted in time-resistant frameworks and approaches, and that the emergent role of AI has resulted in a struggle to keep up. To some, this speaks to academia's role of being a source or arbiter of knowledge, and the fundamental shift that higher education needs to make to adapt. A reaction to restrict AI use, or completely deny it, also stems from this rejection of new creators of knowledge and its consumption.

> This is here, and this is here to stay. Policing use of AI, in my opinion, is not a productive way of preparing the new generation. It just shows why academia is so conservative. It's still this ivory tower, you know, the world has moved, but academia is still, you know, staying behind. Whereas academia is supposed to be at the forefront and just pushing these things forward.
>
> Educator, Kazakhstan

> I think we face a challenge: learning together. I may be a teacher, and you are a student, but we don't know much about this technology; we don't know what to do with it. So, I think this creates a very constructive pedagogical relationship if we're willing to embrace it. It can also be a source of great anxiety for teachers... I was supposed to know more, and now I don't.
>
> Educator, Colombia

AI-related Institutional Decisions Vary by Institutional Type

It is important to note that most of the universities included in the global case studies were private universities, with a level of autonomy to implement institutional policies and guidance. Among the few case studies that examined publicly funded or regulated universities, including Ghana, Kazakhstan and Qatar, the role of centrally designated guidance was critical.

In Ghana, the authors conducted a comparison of AI integration and guidance between private and public universities (see Ghana Case Study). The analysis indicated a difference in not only the uptake of AI, but also the budgets available for institutional AI-driven education, and AI policy oversight. These differences are important to consider in contexts that have higher education institutions that are both funded and regulated through a central education mechanism, or those that have more autonomy to make decisions and allocate resources.

Given the persistent gaps in energy, connectivity, and computational resources, further research is needed on low-cost AI models in Africa. Such studies should examine the feasibility of regional AI research hubs, low-energy AI systems, and decentralized data storage architectures. These inquiries can inform public-private investments and shape strategic roadmaps for data center deployment in low-resource settings.

Ghana Case Study

To ensure that GenAI does not exacerbate existing educational inequalities, policymakers must prioritize the improvement of digital infrastructure in underserved regions. Investments in high-speed internet, AI training for teachers, and access to AI tools are essential to ensure that all students, regardless of their socio-economic background, have the opportunity to benefit from AI-powered education.

India Case Study

Higher Education Institutions Should Focus on AI Ethics and Data Privacy

Administrator, educators, and learners alike noted the need for clearer guidelines on AI use across higher education. Educators had at times differing views on how to approach this guidance: while some expected to see guidelines early and were at times disappointed by the lack of clarity, others noted their desire to see guidance rooted in research, which takes time. Given that technology is expanding rapidly, educators across the spectrum agreed that guidelines would need to be iterative given this speed. Guidelines regarding data privacy were specifically important to respondents, including data privacy and security for stakeholder data, as well as approaches to maintain and safeguard education and research content.

> “Policymakers must ensure that AI systems in education are compliant with data protection laws and safeguard student privacy.”
>
> Policymaker, India

Is AI Bridging or Widening the Digital Gap in Education?

In global contexts, the potential for AI to bridge the digital divide was discussed among respondents, though

viewpoints varied on its benefit or detriment. In three case studies in Colombia, Ghana, and India, this topic was particularly pertinent. On the one hand, the focus was on ensuring that digital technology is available in low-resources areas, making technology and AI tools a priority in all areas to ensure that the gap does not widen further. To some, the accelerated page of AI concerns isolating under-resourced populations even further.

AI can be looked at as a bridge to greater education access, allowing students across education contexts, languages, and abilities to benefit from education. From this perspective, further proliferation means that more individuals have access to education resources. In all instances, the ethical implication of digital use in education, from primary to tertiary, shows the importance of underscoring fundamental guidelines to AI use in education, and its primary purpose.

Global Recommendations and Policy Tips

The following section outlines recommendations and policy tips across the global case studies of the Global Research Consortium on AI and Higher Education for Workforce Development. Case-specific recommendations are also noted in each of the Case Study Overviews that follow in Part II.

Higher Education Oversight and AI Policy Guidance

Universities should undertake a thorough review and revision of their current policies and governance frameworks to fully accommodate AI integration in teaching and learning. Specifically:

- **Redefine institutional ethics and academic integrity policies** to address issues raised by AI: clarify what constitutes plagiarism, authorship, and intellectual honesty when AI tools are involved. Higher education institutions can regularly conduct AI ethics workshops and seminars for administrators, educators and learners, to build awareness of key ethical issues such as plagiarism, data privacy, and transparency.
- **Introduce oversight mechanisms** (e.g., academic integrity committees, AI monitoring tools) and accountability structures to enforce these policies.
- **Develop nuanced policy boundaries** that allow AI as a co-creator. In this approach, institutions can use generative AI tools under certain conditions to preserve academic rigor without stifling innovation.
- **Establish clear guidelines for student assessment** that distinguishes between tasks suitable for AI-assisted work and those meant for wholly original student creation.

POLICY TIP: University policies and procedures should focus on the role of research in implementing AI guidelines. Research should be conducted at all stages of AI integration and supported by resources from university leadership. To the extent possible, knowledge across education institutions will support holistic integration of AI.

Curriculum Design and Variation

- **AI literacy in curricula should not be a one-size-fits-all approach.** Different academic disciplines have varying needs and challenges when it comes to integrating AI. For instance, in STEM fields, AI literacy may focus more on coding and automation, while in the humanities, the emphasis could be on content verification and creativity. Context-aware AI literacy programs should address the specific demands of various fields, ensuring that students, educators, and employers are equipped to use AI responsibly and effectively.
- **University leadership should support working groups** that review existing curricula with a focus on experiential learning models and ethical use. Communication between educators and learners is critical to discuss the integration of AI in curriculum development.
- **Curricula should maintain focus on human-centric skills alongside AI.** As AI increasingly mediates the way students interact with information and solve problems, pedagogical frameworks must emphasize human-centric skills that complement, rather than compete with, machine capabilities. Thus, it is imperative that curricular objectives evolve to reflect competencies that include digital literacy, critical thinking, adaptability, and resourcefulness.

POLICY TIP: Higher education institutions should work across disciplines to focus on skills regarding AI tool data verification and self-regulation. Institutions can provide further support and guidance to faculty and students on ensuring that AI-generated content is complemented with human-centric review and verification, and that AI supports creativity.

Reskilling and Upskilling Faculty in Higher Education

- **Strengthen faculty capacity through continuous training and AI digital literacy**. Provide ongoing faculty training to ensure that instructors not only understand the functions and limitations of AI tools but also learn how to integrate them into their practice. Universities can foster a community of AI-competent educators capable of guiding students toward critical, creative, and ethical engagement with technology, turning AI into a meaningful instrument for learning and inquiry.
- **Faculty must be recognized as educators and learners navigating complex technological change.** Supporting open and interdisciplinary communities of practice will help reduce uncertainty and anxiety while encouraging innovation and peer learning. Professional support can include meeting spaces, repositories of best practices, and cross-disciplinary collaboration.

POLICY TIP: Inclusive practices will ensure that faculty across all competency levels will feel supported in their update of AI tools. Peer-to-peer working groups can also support faculty who are resistant to AI integration and uptake over time.

Academia and Industry

- **Given the growing role of AI in the workplace, collaborations between academia and industry are essential.** Educational institutions should partner with industry and government to identify and provide pathways for critical skills needed in an AI-enabled workforce. Collaborations should focus on iteration and adaptation with changing needs.
- **Academia and industry can co-create programs that equip students with the skills needed to succeed in an AI-driven job market.** This could include:
  - **AI bootcamps, internships, and hackathons** that allow students to apply their digital and AI knowledge in real-world settings.
  - **Industry-sponsored student projects:** Companies can sponsor projects with real data and business problems to build an early AI talent pipeline. Industry partners can also offer projects that develop relevant AI skills and reduce future training time.

POLICY TIP: Industry can provide critical insights on data privacy and security to academia, rooted in workforce practices and industry work. These collaborations can support academic programs in graduating students with strong data privacy and ethics.

PART II
GLOBAL CONSORTIUM CASE STUDIES

Qatar

This case study focuses on how the tertiary education sector in Qatar is adapting and using AI to support teaching and learning, with a specific case study focusing on Hamad Bin Khalifa University (HBKU) in Doha. Through 22 interviews with 24 stakeholders across public and private higher education institutions, as well as the Qatari Government and the labor sector, this study elevates current and future practices integrating AI in curricula and learning, bridging AI skills from higher education to the workforce, and supporting faculty and higher education leadership to gain AI skills.

كلية العلوم الإنسانية والاجتماعية
College of Humanities & Social Sciences
جامعة حمد بن خليفة
HAMAD BIN KHALIFA UNIVERSITY

Hamad Bin Khalifa University (HBKU) is a research university and a member of Qatar Foundation located in Doha, Qatar. The case study was prepared by WISE and IIE. The primary author is Mirka Martel.

Key research areas of focus included:

- Effective strategies for integrating AI in curricula and practice at HBKU
- Upskilling and reskilling for faculty and higher education leaders at HBKU
- The role of higher education in mitigating the skills gap in the Qatari workforce

Landscape Overview

As early as 2009, Qatar committed itself to becoming a digital global leader through its Vision 2030, integrating technology across all aspects of education and workforce development (General Secretariat for Development Planning, 2008). Qatar's National AI Strategy emphasizes the role of education in supporting Qatar's growth in an AI-powered world (Ministry of Communications and Information Technology, 2019). The strategy emphasizes five primary goals: cultivating a skilled AI workforce, fostering research and development, enabling a thriving AI ecosystem, leveraging AI for societal and economic benefits, and ensuring ethical and responsible AI usage.

HBKU has been at the forefront of AI integration research and practice in Qatar. HBKU's Qatar Computing Research Institute (QCRI) released research as early as 2020 on the AI needs of the Qatari labor market (2020). This research emphasized a three-pronged strategy for workforce development: data-driven work cultures, AI-compatible systems, and continuous education. QCRI is implementing key initiatives across K-12 education focused on AI in teaching and learning, including the creation of a Qatari-born large language model Fanar, a collaboration between the Ministry of Communications and Information Technology and HBKU (2024).

HBKU's College of Science and Engineering also launched the AI ICT Academy Lab in 2024, an advanced hub for fostering innovation and providing hands-on training in AI and Information and Communications Technology (ICT). This Lab is a collaboration with the tech company Huawei, demonstrating how public-private partnerships can enhance educational infrastructure, particularly in emerging technological fields such as AI and ICT.

Key Findings

- **Qatar presents a unique environment for AI integration in curricula and practice.** Multiple stakeholders noted Qatar's deep commitment to AI integration and its unique role in funding research to complement pilot AI projects. One of the key considerations in the Qatari context is the ample resources available for AI research, and the strong collaboration among higher education, government, and industry.
- **AI integration among HBKU faculty is growing, but more guidance is needed.** At HBKU, AI uptake among faculty is growing. While some faculty are independently integrating AI strategies into their courses, others are opting to wait for further university guidance.
    - *Discipline-specific differences:* There were differences in AI adoption in teaching by type of discipline. As noted by some faculty, disciplines focused on science and technology have been familiar with AI and are more readily integrating it into their work. In contrast, in disciplines across the humanities, including policy and law, AI updates in teaching are more limited.
    - *Perceptions of student use:* Faculty are aware of students' use of AI and have mixed perspectives. Emotions shared by faculty ranged from enthusiasm and possibility to mistrust and rejection of AI uptake. This variation in acceptance is critical to consider in any institution-level adoption of AI.
- **Faculty upskilling and professional development are needed.** Consensus among faculty and administrators at HBKU pointed to the need for more guidance across the institution on AI use, as well as further professional development for current and future educators. Faculty and administrators shared several positive initiatives, including AI Working Groups and trainings from the Center for Faculty Advancement & Success in Teaching (CFAST).
- **Role of higher education in mitigating the skills gap.** Stakeholders across HBKU, the Qatari government, and industry agreed that AI requires higher education to pivot and to prepare students for the Qatari workforce. Key future skill sets noted as critical by industry included adaptability, creativity, resourcefulness, and resilience. Faculty had slightly differing views, citing the need to evolve work skills while maintaining core knowledge. The role of AI and ethics was also prominent.
- **Adapting the university experience.** Respondents also spoke about the future of Qatari universities and how higher education will need to shift given the use of AI. Qatar could lead the way in this innovation. Topics of inclusion and context were also critical here, noting the need to center adaptation in the Qatari context.

> [We can create] a unique ecosystem of innovation and disruption — working together into the unknown.
>
> Administrator, Qatar

Recommendations

- **Support research alongside AI adoption and integration.** A commitment to research ensures that pilot and innovative projects will be well documented and that key stakeholders can learn from AI experiences.
- **Consider variation in faculty discipline and comfort with AI adoption.** Faculty across various disciplines range in their comfort and trust with AI. Institution-wide uptake will only be possible when universities consider differences in faculty familiarity and stance toward AI in teaching and learning.
- **Consider local context and needs in bridging higher education and workforce needs.** Local context and labor needs should drive the integration of AI between higher education and local industry. By understanding well the local needs of industry and how AI can make a difference, higher education institutions will be able to adapt to bridge skill gaps.

Colombia

This study aims to understand how AI tools are being used at Uniandes, how the university is preparing for changes in the labor market related to AI literacy, and what resources are available to upskill and reskill faculty members. Our main goal is to collect insights on the role of AI in higher education at Uniandes and in connection to workforce development. The study employed a mixed-methods approach comprising a student survey with 529 responses, focus groups with 65 faculty members, and in-depth interviews with nine academic administrators.

Universidad de los Andes (Uniandes) is a private research university located in Bogotá, Colombia. The primary authors of this case study from Uniandes include Natalia Bolaños-Cristancho, Daniela Montaña, Helmman Cantor, Gonzalo Cocomá Arciniegas, Didier Santiago Franco, Carola Hernández, William Jiménez-Leal, Olga Mariño, and Manuela Fernández Pinto.

The study focused on four goals to obtain insights on:

- Current uses of AI tools in curricula and practice
- Student perceptions regarding the agility and resilience required in the AI era
- Faculty and academic administrators' perceptions regarding strategies for mitigating the skills gap in the workforce
- Perceptions regarding strategies for upskilling and reskilling of faculty and administrators at Uniandes

Landscape Overview

The Colombian National Policy on AI was first published in February 2025, signaling the national government's overall concern regarding the governance and regulation of AI systems (Consejo Nacional de Política Económica y Social, República de Colombia, 2025). According to the policy, Colombia's main challenges in AI training and capacity building revolve around limited development of digital skills, a shortage of qualified professionals, and deficiencies in the educational system. To address these challenges, the policy calls for a comprehensive strategy focused on strengthening the education system, expanding digital skills and STEM training, and fostering a culture of ethical and responsible AI use.

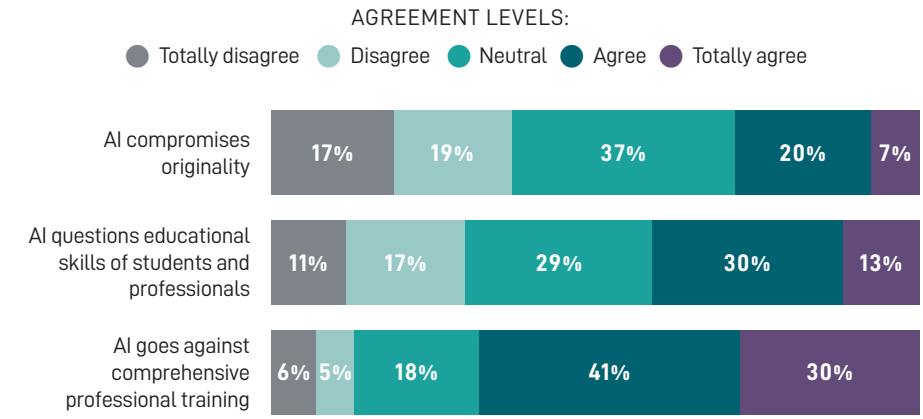
Within this context, Uniandes is a research and academic leader, bolstering innovation and development. In 2023, the university declared digital competence as a key transversal competence in student learning. This means all programs offered at the university are committed to training students to integrate digital technologies in a critical, creative, ethical, and safe manner. Uniandes is also moving forward with an institution-wide integration of AI skills across disciplines.

Key Findings

- **At Uniandes, students frequently use AI for basic tasks.** At the same time, professors emphasized its ethical use, curricular integration, and the need for digital competence, highlighting its transformative potential and impact on assessment and pedagogical roles.
- **Emotions such as curiosity, uncertainty, and distrust shape adaptation to AI.** While many students have incorporated AI as a tool to optimize academic tasks, reduce work time, and generate ideas, its use is not always accompanied by reflective understanding or skills to critically evaluate the information these tools produce. This shows an adaptation that is more immediate than strategic, requiring support from academic programs and demonstrating that digital literacy remains a challenge that universities must continue to address (Fig. 1).
- **AI is reshaping disciplines and career expectations, requiring higher education institutions to strengthen transversal skills such as critical thinking and digital literacy.** Professors called for tailored training aligned with disciplinary needs, especially where AI's integration is uneven or controversial.
- **Faculty upskilling and reskilling face challenges, as most training is self-directed and fragmented.** Structured institutional strategies and interdisciplinary collaboration are key to addressing digital literacy gaps, enhancing research practices, and supporting a reflective, ethical, and inclusive use of digital technologies across educational settings.

> "[We're] talking about a transformation that affects the quality of education at all levels. So yes, some professors are already trying things, but most need guidance: what can be done, what can't be done, how to do it well... we need a roadmap."
>
> Educator, Colombia

FIG. 1 STUDENTS' PERCEPTIONS ON THE RISKS OF AI IN THEIR LEARNING



Recommendations

- **Rather than limiting AI to basic academic tasks, Colombian universities should foster its deeper application in research and knowledge production.** Thus, institutions should ensure equitable access to AI tools.
- **Given the emotional and cognitive demands posed by the rapid adoption of AI, higher education institutions should create conditions that nurture resilience and adaptability among faculty and students.** Such measures may include open and interdisciplinary communities of practice among faculty as well as student training that goes beyond operational proficiency and includes critical digital literacy.

Ghana

With a focus on higher education institutions and employers in Ghana, this case study examines university faculty and students' views on AI, curriculum integration, effects on teaching, learning, assessment, and impacts on the workforce. Due to a lack of context-specific empirical research on how African institutions are adapting their pedagogical practices to AI, limited information exists on its impact on organizations and the workforce in Africa, and the response needed from the higher education sector. This study contributes to an understanding of these issues.

ASHESI UNIVERSITY

Ashesi University is a private, non-profit, and non-sectarian university located in Ghana. This case study was prepared by a team from Ashesi University's Department of Computer Science and Information Systems. The primary authors are G. Ayorkor Korsah, Joseph Kwame Adjei, and Joseph Agyapong Mensah.

The case study explored:

- The perceptions and experiences of Ghanian faculty and students regarding AI
- How AI is currently integrated into teaching, learning, and assessment across three Ghanaian universities, and faculty work beyond the classroom
- How AI is being adopted in workforce practices, its impacts, and the emerging skills gap related to AI integration

The research covered data from approximately 573 students and faculty in three Ghanaian universities: a public research university, a public technical university, and a private university. It also captured data from 40 representatives of 22 employer organizations.

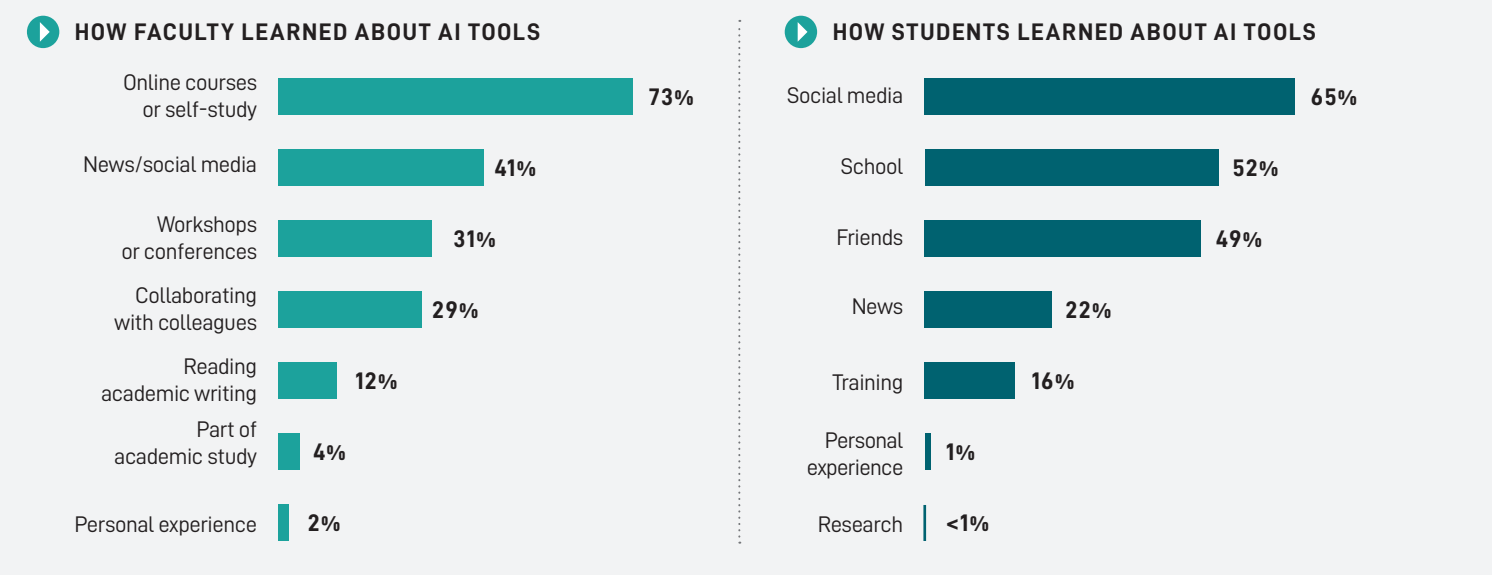
Landscape Overview

From a national perspective, Ghana has taken steps toward AI policy formulation and integration. The Ministry of Communications and Digitalization developed a 10-Year National Artificial Intelligence Strategy (MoCD et al., 2022). The strategy outlines the national vision for AI integration across education, research, public service, delivery, and entrepreneurship. The strategy also highlights the critical role that higher education must play in developing AI talent and localizing AI solutions (MoCD et al., 2022; UNESCO, 2021).

Key Findings

- Faculty and students from Ghanaian universities are generally familiar with AI tools and primarily use them for research, followed by teaching and learning, and administrative tasks.
- Most faculty learn about AI tools from online courses or self-study, while students get their content primarily from social media or school.
- Perspectives of faculty: Despite a strong belief in AI's potential to enhance teaching and learning, faculty expressed concern about students' misuse of AI and academic integrity. Other concerns include the lack of locally relevant (African) context in AI-generated responses, coupled with data privacy and security.

FIG. 1

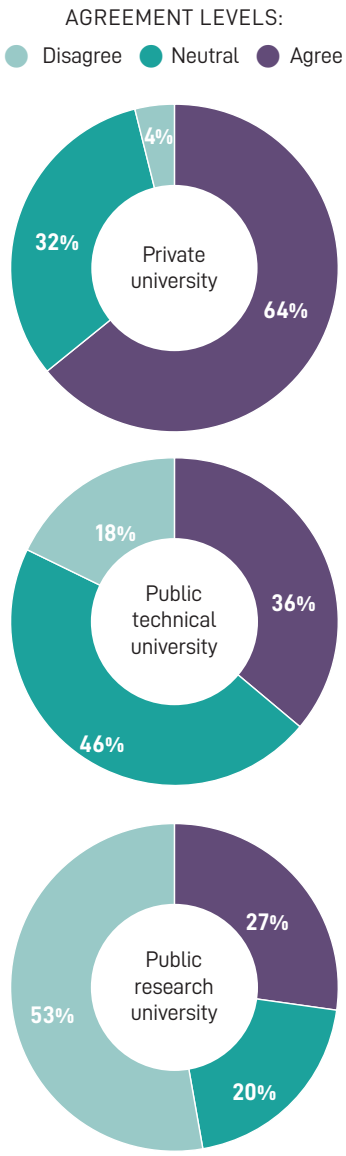


- Perspectives of students: Most students believe that AI can enhance their learning experience, but are also concerned that frequent use of AI may erode their critical thinking skills.
- Perspectives of employers: Employers across different industries are utilizing AI and assessing how it can accelerate tasks and support business and customer management processes. However, significant privacy concerns are prompting some organizations to explore in-house AI tools. Employers express a strong desire to collaborate with academia.
- Employers emphasize that the evolving and unpredictable nature of AI demands graduates to have advanced skills, including higher-order reasoning, asking the right questions, value creation, prompt engineering, and domain-specific knowledge.
- Limited institutional policies and infrastructural capacity are available to support and regulate the adoption of AI, creating inconsistencies in use. Policies at the public universities in the study seem to be less clear than those at the private university, according to faculty (Fig. 2).
- Beyond the classroom, more faculty at the public research university used AI for research (49%) than at the private university (38%), while more faculty at the private university used AI for administrative tasks (25%) than at the public technical university (5%), perhaps reflecting different faculty work expectations across the different types of institutions.

Recommendations

- **Higher education institutions in Africa should strengthen their existing teaching, learning, assessment, and ethical policies to guide the adoption of AI tools.** The nature of such policies should be pre-emptive, adaptive, and human-centered.
- **There is a critical need for research that explores the development of AI systems** tailored to African linguistic, cultural, and infrastructural realities, as current AI models best suit data and design logics of the Global North.
- **Researchers should explore African institutions as incubators of AI-driven development.** Empirical studies examining university–industry linkages, innovation ecosystems, and entrepreneurial pathways can yield actionable insights into how higher education institutions can contribute to AI literacy and AI-led economic transformation across Africa.

FIG. 2 FACULTY VIEWS ON THE EXISTENCE OF INSTITUTION-SPECIFIC AI POLICIES



India

The integration of AI into Indian higher education is causing a paradigm shift in how students, educators, and employers interact with the learning and teaching process. This case study delves into the perspectives of students, educators, employers, and policymakers to understand the multifaceted impact of AI on academic outcomes, employability, ethical considerations, and institutional practices. By interpreting both qualitative insights from 128 interviews and quantitative data from 1,024 student surveys, the case study highlights key trends and challenges in the use of AI across various disciplines in educational contexts.

The Birla Institute of Technology and Science, Pilani is a private university focusing on engineering and sciences in Pilani, Rajasthan, India. The case study was prepared by the Departments of Civil Engineering and Computer Science. The primary authors are Shibani Khanra Jha, Jagat Sesh Challa, Dhruv Kumar, and Harshita Goyal.

The study addressed the following research questions:

- How are students, educators, and employers in India perceiving and using AI tools in higher education?
- What academic, ethical, and professional impacts are associated with AI usage across disciplines?
- How do stakeholder perceptions and experiences differ across domains such as engineering, medicine, pure sciences, commerce, design, and pharmacy?
- What opportunities and risks do stakeholders anticipate in the growing integration of AI within Indian higher education?

Landscape Overview

India has seen a rapid acceleration in the adoption of AI across sectors, including education. Government initiatives such as NITI Aayog's National Strategy for Artificial Intelligence (2018) have emphasized India's aspiration to become a global AI hub, with education listed as one of the five priority sectors. Subsequent policy visions, including the National Education Policy underscored digital tools and AI in improving educational quality, equity, and access (2020). Further, the Ministry of Electronics and Information Technology (MeitY) unveiled India's AI Governance Guidelines to ensure safe, inclusive, and responsible adoption of AI across sectors (2025).

While elite institutions like the Indian Institutes of Technology and private universities have begun to explore AI-based pedagogies, digital literacy remains a barrier in many Tier 2 and 3 institutions (Shivdas et al., 2020). Additionally, financial constraints and limited infrastructure resources could further hinder progress in these institutions.

One of the most promising applications of AI in India lies in its multilingual potential (Wang et al., 2025). With over 20 major languages and hundreds of dialects, models like Bhashini (India's national language translation mission) (Bhashini, n.d.) and AI models trained on Indic data (Parida et al., 2024; Singh et al., 2024) could allow AI to serve learners in their native tongues. This has significant implications for rural and first-generation learners, making AI education more inclusive.

Key Findings

- **The study found that students have quickly adapted to using AI tools, using them extensively for assignments, content creation, and exam preparation.** Students reported increased productivity, time savings, and enhanced creativity and employability. However, concerns were raised about over-reliance on AI, which may impede the development of critical thinking, independent problem-solving, and originality.
- **Educators recognized AI's potential to automate administrative tasks, generate content, and provide personalized student support.** They expressed reservations about its integration into the classroom, particularly concerning the authenticity of student work and diminished critical thinking. Educators emphasized that while AI tools can augment teaching, they cannot replace the human aspects of education, such as mentorship, empathy, and the ability to guide students through thought processes.
- **Employers viewed AI as a tool that enhances productivity, particularly in fields requiring technical skills such as coding and data analysis.** However, they were cautious about students relying too heavily on AI-generated content, fearing that it could undermine the development of core problem-solving. Employers stressed that while AI literacy is important, it should be paired with the traditional skills to ensure that graduates are equipped for the challenges of the workforce.
- **Policymakers emphasized the importance of creating a robust regulatory framework to govern the use of AI in education.** They highlighted the need for policies that ensure ethical usage, transparency, and equitable access to AI tools across institutions. Policymakers also recognized the potential of AI to democratize education, especially in rural areas, where it could provide tailored learning experiences and bridge the gap between urban and rural students.

Differences by Discipline

STEM: In fields such as engineering and computer science, AI is primarily used for task automation and coding support, enhancing efficiency and productivity.

Medicine and Pharma: Accuracy and trustworthiness of AI-generated content are critical, with concerns about plagiarism and validation.

Design: While some see AI as a creativity-enhancing tool, others fear it may limit individual creative expression by promoting dependency on automated processes.

Recommendations

- **Curricular Re-invention:** Institutions must evolve curricula to maintain a balance between traditional teaching methods and AI-enhanced learning. There is a need to integrate AI literacy into all disciplines while also fostering critical thinking and creativity.
- **AI Literacy for Students and Educators**: Ensuring that students across disciplines are well-versed in AI tools will equip them to navigate an AI-driven future, balancing technological with the development of core skills that are still crucial in the workforce. Educators must undergo continuous professional development to effectively incorporate AI tools into their teaching practices while maintaining high academic standards.
- **Support for Disadvantaged Institutions:** Policymakers must address digital inequalities by providing infrastructure and resources to ensure equitable access to AI tools, particularly in rural and underserved educational settings.

Kazakhstan

This case study presents NU faculty perspectives on the use and impact of AI tools in learning and teaching. The study investigates how faculty from eight schools have adopted and used AI for learning and teaching, reflect on the benefits and risks, and address the pedagogical, ethical, and institutional implications in higher education. The research covered quantitative data from 75 survey respondents and 15 semi-structured interviews.

Nazarbayev University (NU) is an autonomous research university located in Astana, Kazakhstan. This case study was prepared by NU's Center for Innovation in Learning and Teaching (CILT). The primary authors are Elaine Sharplin, Aiza Bissaliyeva, Roza Sagitova, and Aida Nuranova.

The study considered these four sub-questions:

- How familiar are faculty members with AI, and what factors influence their decision to adopt or reject these tools?
- How do faculty perceive the usefulness and benefits of AI in enhancing their teaching practices?
- How has the integration of AI tools transformed faculty pedagogical approaches, and what impact has this had on student learning outcomes and their preparation for the future workforce?
- What challenges do faculty face when integrating AI tools, and how do they overcome these barriers?

Landscape Overview

The use of AI at NU needs to be situated within the contexts of Central Asia (CA) and Kazakhstan. The five CA countries (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) have recognized the importance of AI for regional development. Regulations and principles on AI are being harmonized between the countries through the C5+, a government forum in collaboration with the Eurasian Economic Union (Qalampir, 2025). The Kazakh Government developed the *Concept for AI Development 2024–2029*, with a mandate to increase AI-related courses in higher education from 5% in 2024 to 60% in 2029 (Digital Government Support Center, 2024).

NU has engaged with the opportunities and challenges of AI since the establishment of its Institute for Smart Systems and Artificial Intelligence (ISSAI) in 2019. The university took a proactive approach in developing an institutional response to generative AI in 2023 and has supported professional learning across the institution. Two initial studies in 2023 and 2024 (AI Working Group, 2023; Bissaliyeva, 2024) provided a foundation for further exploration in this study.

Key Findings

- **Familiarity and adoption of AI among faculty.** The survey results revealed that NU faculty members are moderately familiar with AI tools. Among the most influential factors affecting engagement with AI tools were concerns about academic integrity (56%) and the perceived benefits of using AI (53%). The majority of respondents indicated that they were introduced to AI tools through social media or word of mouth rather than by formal training. The diverse range of responses suggests a cluster of "early adopters," while some faculty remain unfamiliar with the tools. Those adopting AI are not yet using it for sophisticated applications in learning and teaching. Faculty reported being "caught off guard" by the lack of clear institutional policies, including the need to redesign assessment tasks, self-learning under pressure, and students submitting AI-generated assignments.
- **Perceived utility and benefits of AI.** Despite moderate familiarity with AI, 51% of faculty members believe that it can improve teaching quality. In terms of practical applications, more than half use AI to generate content and teaching materials, followed by personalized learning and reducing administrative workload. This was also reflected in interviews, where faculty described AI as an "augmented intelligence", highlighting its learning applications such as proofreading. Other faculty members shared concerns about students' overreliance on AI, especially among undergraduate students who are vulnerable to trusting information generated by AI.
- **Challenges and barriers to AI integration.** Faculty identified a lack of training (52%), time constraints (45%), and limited institutional support (42%) as key barriers to AI integration. To overcome those barriers, educators seek to learn through peer collaboration and informal training. Criticizing institutional inertia in addressing the challenges outlined above, faculty members advocated adopting more sophisticated AI policies, gaining access to AI tool subscriptions, and participating in targeted training.

Among the most influential factors affecting engagement with AI tools were concerns about academic integrity and the perceived benefits of using AI.

Faculty identified a lack of training, time constraints, and limited institutional support as key barriers to AI integration. To overcome those barriers, educators seek to learn through peer collaboration and informal training.

Recommendations

- **Pedagogical practice and faculty professional identity.** Continuous professional development and learning to keep up with the latest AI developments are essential. Professional learning opportunities need to target the diverse range of knowledge and skill levels, from entry-level training to more sophisticated pedagogical applications.
- **Student learning and ethical use.** Given the perception of inadequate guidance on the ethical use of AI, faculty believe students use AI as a shortcut rather than "an augmented intelligence." This creates concern and anxiety among educators about the risk of eroding deep learning and understanding through AI-enhanced learning.
- **Institutional governance, infrastructure, and support.** While NU addressed the issue of AI in education proactively, NU faculty are seeking additional guidance, more targeted professional learning, and increased support for resourcing access to AI tools. Without a relevant strategy, supported by infrastructure and professional education, AI integration remains fragmented.
- **Re-shaping educational purpose and curriculum.** The disruption caused by AI has challenged current curricula, pedagogical, and assessment practices. It is not sufficient to rethink what students learn; it is also necessary to rethink how and why. To prepare graduates for the future labor market, it is crucial to promote creativity, adaptability, and critical thinking rather than focusing solely on content knowledge.

Spain

This case study used an action research design to develop, implement, and evaluate curricular innovations integrating AI. Grounded in action research, the main objective was to explore how AI can enhance students' critical-thinking skills through the design and assessment of innovative curricular activities. Three studies were planned to gather teacher and student perspectives through descriptive designs (144 professors, 271 students, and an analysis of 21 activities) and to analyze the implementation of these activities in the classroom.

Universidad Camilo José Cela
SEK EDUCATION GROUP

The Universidad Camilo José Cela (UCJC) is a private university established in 2000 and based in Madrid, Spain. The case study was prepared by UCJC's Education Faculty. The primary authors include Natalia Lara Nieto-Márquez, Laura Ramos-Martos, Rubén Madrigal-Cerezo, Nicolás Rueda Díaz, Tomás García Martín, and Francisco López Muñoz.

The project was structured around four objectives:

- Design and development of curricular activities integrated with AI to improve the critical thinking of university students.
- Assess the effectiveness of the implementation of activities to work on critical thinking, from the teaching and student experience.
- Identify key features and practical tips for creating tasks that foster critical thinking.
- Create a methodological framework that universities can use to integrate AI across their curricula.

Landscape Overview

The European educational ecosystem has been gradually transforming and integrating AI technologies to foster lifelong learning, gender equality, and ethical, transparent use. AI-related training has been expanding rapidly in Spain as well. Spanish higher education offerings have included AI-focused bachelor's programs and a range of master's degrees. Some educators have already used AI as an active-learning strategy. However, its uptake remains lower than that of well-established methods, such as cooperative learning, and teachers have requested more professional development in this area (Cabanillas-García, 2025).

Rolling out this study aligns directly with UCJC's academic model, which emphasizes innovation, digitalization, and social commitment. The institution's drive for a cross-cutting, hands-on curriculum has made it easier to integrate AI-based activities that nurture critical thinking. Critical thinking—understood as the ability to analyze, question, and act responsibly—becomes an ethical backbone for preparing professionals to make informed decisions in complex settings while leveraging cutting-edge technology.

Key Findings

Effective Strategies for Integrating AI in Curricula and Practice

- The university community operated at two clearly different levels of AI integration. Both students and professors turned to GenAI tools—especially ChatGPT and Copilot—but professors explored a more expansive repertoire that included academic search engines (Perplexity, Consensus), slide-deck generators (Gamma, Tome), and multimedia storytelling applications (Fliki, InVideo). This gap suggests a potential explorer-curator role for professors who could serve as guides to students' digital literacy.
- Regarding tasks, students mostly used AI to search for information (49%) and to resolve doubts or request clarifications (cognitive support, 17%). In contrast, professors used it for ideation or preparation of materials, and research (ideation, 38%).
- Professors who already used AI scored higher in activity design as well as in critical-thinking assessment, and support for self-regulation. These results suggest that digital competence was a direct lever for pedagogical innovation.
- AI can accelerate production and work on academic tasks, making it essential to leave room for human reflection. In addition, AI-designed activities proved transferable, with no significant differences across disciplines or educational levels.

Upskilling and Reskilling for Faculty and Higher Education Leaders

- 89% of professors already used AI, and these users achieved significantly higher scores on every dimension; this validates the need for targeted training to tap AI's pedagogical potential. Professors requested practical guides, templates, mentoring, and learning communities to share practices and solve problems.
- A thematic analysis of 21 tasks identified seven recurring features: clear deliverables, mandatory critical phase, AI-human combination, active methodologies, use of GenAI and/or specialized AI tools, as well as work on declared transversal competencies. Consequently, the dual model — generate with AI, critically review with humans — is recommended as a guiding template for teaching practice.

According to outcomes of action research to explore AI impact on students' critical thinking skills highlighted on page 13, the following framework is proposed to achieve curricular integration of AI:

- Early teacher upskilling in ethics, verification, and templates
- Initial use of bridging tools (ChatGPT/Copilot) for creating tasks, and subsequently, a progressive introduction of specialized AI according to the discipline and level of the course

* Dual assessment (AI + human review) supported by common ethics rubrics

89% of professors already used AI, and these users achieved significantly higher scores on every dimension; this validates the need for targeted training to tap AI's pedagogical potential.

Recommendations

This research shows that AI has become normalized in academic life, yet its transformative capacity depends on the pedagogical and ethical scaffolding that supports it. The gap between knowing how to use AI tools and applying them strategically suggests the need for critical AI literacy across university programs.

- **Institutional governance:** Create a collaborative space on university platforms for announcements and shared resources (templates, rubrics, and validated AI case studies).
- **Research boost:** Establish an interdisciplinary research group focused on evaluating AI use in teaching and learning.
- **AI training pathway:** Implement a sequence that moves from critical literacy to competence development and practical application; courses may run within existing subjects or extracurricular trainings.
- **Activity design:** Adopt the dual model—generated with AI, followed by a critical review—in all relevant courses.
- **Learning assessment:** Introduce reflective e-portfolios which enable students to document prompts, iterations, and decisions.
- **Student development and peer leadership:** Create an AI-Ambassadors program that trains students to advise peers on critical and strategic AI use.

United States

The case study investigated AI in American higher education through three interrelated studies. The central thesis across the three components of this case study is that institutional responses to AI are not merely technical or policy-based but are profoundly shaped by organizational culture and identity, as well as by student interest and concern. These cultural factors dictate how AI is introduced, accepted, resisted, and used across campuses.

Penn GSE
GRADUATE SCHOOL OF EDUCATION
UNIVERSITY of PENNSYLVANIA

The University of Pennsylvania (UPenn) is a private research university in Philadelphia, Pennsylvania, United States. The case study was prepared by UPenn's Graduate School of Education. The primary authors are Peter D. Eckel, Matthew Hartley, and Ross Aikins.

Three component areas the case study focused on:

- The first study highlighted how institutional culture influences AI adoption and use, focusing on comparative case studies from two distinct universities.
- The second study adopted a cultural lens and worked to understand counter-cultural resistance to AI implementation.
- The third study looked at the student experience of AI adoption across three institutions, including use cases and concerns surrounding their use of AI for academic work.

Landscape Overview

The United States has a highly decentralized education model, meaning that most U.S. higher education institutions direct their own initiatives to integrate AI into teaching and learning, as well as into other aspects of leadership and administration. Several large university organizations (e.g., the Association of American Universities and the American Association of Colleges and Universities (AAC&U)) have collected resources on AI integration in higher education and have coordinated with and responded to the U.S. Government on issues related to AI (Jauregui-Volpe, 2025; AAC&U, n.d.).

The U.S. Government has issued limited communications on AI and education. In July 2025, the U.S. Department of Education outlined how federal grant funds can be used to support AI integration in education (U.S. Department of Education, 2025). This includes funding for AI-enhanced tutoring, instructional materials, and career pathway exploration. Across the private sector, major tech companies have also committed resources. For example, Google expanded its *AI for Education Accelerator* to 200 U.S. colleges and committed $150M in grants (Pichai, 2025).

Key Findings

AI is not merely a technology challenge but also an institutional culture challenge. Institutions that respond intentionally and with deep cultural awareness will be better positioned to navigate the profound changes AI is bringing to higher education. Culture shapes not only the how, but also the why, of AI adoption.

AI as a cultural artifact in the institutional context. The first case study featured two contrasting institutional case studies on the role of culture in shaping AI adoption.

- The first institution saw AI as a tool for student success and access. The provost acted as an internal champion, promoting a broad-based AI agenda focused on learning support, workforce readiness, and institutional productivity. Initiatives like "AI Day" and an ad-hoc AI Transformation Committee helped galvanize campuswide attention and broad adoption.
- A second U.S. university found that efforts were channeled through research-led faculty fellowships, discipline-specific pilot projects, and the creation of the university's own large language model. Students often led the AI application conversation, primarily through co-curricular spaces like makerspaces. The institution held an AI Summit as its high-profile event, but instructional innovation was only one part of that day's focus.
- Key differences: The first institution focused on AI as a leveling tool for equity and student success. The latter institution emphasized intellectual inquiry, research leadership, and technological innovation. Institutional purpose, cultural values, and organizational priorities shaped strategies, stakeholder engagement, and expectations for AI integration.

Resistance at an institution with a culture of innovation. In the second case study, a university with a long history of pedagogical innovation unexpectedly experienced significant faculty resistance to AI. Despite institutional support and a robust teaching and learning center, AI raised unanticipated concerns about ethics, climate impact, and surveillance; fear that it would pose threats to the university's well-being and erode faculty autonomy; and anxiety about the future of writing, knowledge production, and the academic profession. The implications are that cultural alignment cannot be assumed, even in an innovation-friendly environment with financial resources and instructional structures to advance adoption.

Student Use and Perspectives on Generative AI. Based on interviews with 22 U.S. students from diverse institutions, most use tools such as ChatGPT, Gemini, and Claude for academic support. Analysis showed strong associations in student discourse between AI use, course policies, perceived helpfulness, and ethical tensions. International students particularly benefit from language support and engage in ways that differ from those of U.S. students.

Students expressed nuanced ethical views: they value AI's convenience but fear becoming overly dependent on it. Student interviews revealed that academic integrity concerns are real, but many navigate unclear, evolving policies and course-by-course AI rules with varying levels of effectiveness. Finally, students are very aware of AI's role in the future workforce and want their institutions to prepare them for this shift better.

Institutions that respond intentionally and with deep cultural awareness will be better positioned to navigate the profound changes AI is bringing to higher education. Culture shapes not only the how, but also the why, of AI adoption.

Recommendations

- **Cultural alignment is key.** AI strategies must reflect institutional missions—whether focused on equity and access or intellectual leadership and research.
- **Avoid "one-size-fits-all" models.** Institutions differ in resources, culture, and goals. Copy-paste solutions or borrowed templates, especially across universities with different missions and cultures, are unlikely to succeed and may be counterproductive.
- **AI is an expansive agenda.** Successful AI integration goes beyond class-room applications. It includes workforce preparation, research productivity, administrative efficiency, and ethics.
- **Student engagement is essential.** Students are often ahead of institutions in using AI. Leaders should both harness and guide student insights in shaping AI policies and curricula.

References

AI Working Group. (2023). *Nazarbayev University AI Working Group Discussion Paper*. Nazarbayev University.

Association of American Colleges and Universities. (n.d.). *Trending topics: Artificial intelligence*. https://www.aacu.org/trending-topics/ai

Bissaliyeva, A. (2024). *Integrating AI and EdTech solutions in higher education: Faculty experiences at Nazarbayev University* (Masters Thesis). Nazarbayev University Library Repository.

Bhashini. (n.d.). Bhashini. https://bhashini.gov.in/

Bolaños-Cristancho, N., Montaña, D., Cantor, H., Arciniegas, G.C., Franco, D.S., Hernández, C., Jiménez-Leal, W., Mariño, O., & Pinto, M.F. (2025). *Integrating AI in higher Education in Uniande*s. WISE Case Study.

Cabanillas-García, J.L. (2025). The application of active methodologies in Spain: An investigation of teachers' use, perceived student acceptance, attitude, and training needs across various educational levels. *Education Sciences*, 15(2), 210. https://doi.org/10.3390/educsci15020210

Consejo Nacional de Política Económica y Social, República de Colombia. (2025). *Política nacional de inteligencia artificial*. Documento COMPES. https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/4144.pdf

Digital Government Support Center. (2024). КОНЦЕПЦИЯ РАЗВИТИЯ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА на 2024–2029 годы [*The Concept for AI Development 2024-2029*]. https://govtec.kz/assets/media/kontseptsiya-26062024-1500.pdf

Eckel, P., Hartley, M., & Aikins, R. (2025). *Exploring AI as artifacts of institutional culture and student use in American higher education*. WISE Case Study.

General Secretariat for Development Planning. (2008). *Qatar National Vision 2030*. https://www.gco.gov.qa/en/about-qatar/national-vision2030/

Goyal, H., Challa, J.S., Kumar, D., & Jha, S.K. (2025). *The impact of generative AI on higher education in India: A multi-stakeholder perspective across disciplines*. WISE Case Study.

HBKU. (2024). *Fanar: Arab artificial intelligence project*. https://www.fanar.qa/en

HBKU. (2020). *AI Impact on Qatar's Labor Market: An Assessment*. https://www.hbku.edu.qa/en/news/ai-impact-qatar

Jauregui-Volpe, M. (2025, March 7). *OpenAI partners with AAU members and other research institutions to find new applications for AI*. Association of American Universities. https://www.aau.edu/newsroom/leading-research-universities-report/openai-partners-aau-members-and-other-research

Korsah, G.A., Adjei, J.K., Mensah, J.A., Arthur, L., & Ariff, A.S. (2025). *Exploring the impact and implications of AI on higher education and the workforce in Africa: A case-study in Ghana*. WISE Case Study.

MeitY. (2025, November 5). *MeitY unveils India AI governance guidelines under IndiaAI Mission to ensure safe, inclusive, and responsible adoption of artificial intelligence across sectors*. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2186639

Ministry of Communications and Information Technology. (2019). *National Artificial Intelligence Strategy for Qatar*. https://www.mcit.gov.qa/en/about-us/qatar's-national-ai-strategy

Ministry of Communications and Information Technology. (2024). *Digital skills framework*. https://futureskills.mcit.gov.sa/en/skills-framework

Ministry of Communications and Information Technology. (2025, February 25). *MCIT launches "Digital Skills Framework" initiative to accelerate digital transformation in Qatar*. https://www.mcit.gov.qa/en/news/mcit-launches-digital-skills-framework-initiative-to-accelerate-digital-transformation-in-qatar/

Ministry of Education, Government of India. (2020) *National Education Policy*. https://www.education.gov.in/nep/about-nep

Ministry of Communication, Digital Technology, and Innovations. (2022). *Republic of Ghana National Artificial Intelligence Strategy: 2023-2033*. Republic of Ghana. https://moc.gov.gh/2025/05/02/embracing-the-future-ghana-launches-national-ai-strategy-to-drive-innovation-2/

Nieto-Márquez, N.L., Ramos-Martos, L., Madrigal-Cerezo, R., Rueda Díaz, N., García Martín, T., & López Muñoz, F. (2025). *Critical thinking and workforce transformation: Redefining university curricula for the AI era*. WISE Case Study.

NITI Aayog. (n.d.). NITI Aayog. https://www.niti.gov.in/

Parida, S., Panwar, S., Lata, K., Mishra, S., & Sekhar, S. (2024). *Building pre-train LLM Dataset for the INDIC Languages: A case study on Hindi* (arXiv:2407.09855). arXiv.

Pichai, S. (2025, September 4). *Google highlights efforts to support AI education in the U.S*. Google Blog. https://blog.google/outreach-initiatives/education/ai-education-efforts/

Qalampir. (2025, February 3). *Building the future: Central Asia's push for AI development*. https://qalampir.uz/en/news/khalk-aro-va-mintak-aviy-markazlar-maktablarda-ai-darslari-markaziy-osiye-mamlakatlari-uz-kelazhagini-sun-iy-intellekt-bilan-k-urmok-chi-113788

Sharplin, E., Bissaliyeva, A., Sagitova, R., & Nuranova, A. (2025). *"Outsourcing your brain", Principled resistance or enthusiastic adoption: The diversity of faculty perspectives on the adoption and impact of AI at Nazarbayev University, Kazakhstan*. WISE Case Study.

Shivdas, A., Menon, D.G., & Nair, C.S. (2020). Antecedents of acceptance and use of a digital library system: Experience from a Tier 3 Indian city. *The Electronic Library*, 38(1), 170–185.

Singh, H., Gupta, N., Bharadwaj, S., Tewari, D., & Talukdar, P. (2024). *IndicGenBench: A Multilingual Benchmark to Evaluate Generation Capabilities of LLMs on Indic Languages* (arXiv:2404.16816). arXiv.

UNESCO. (2021). *Artificial intelligence needs assessment survey in Africa—UNESCO Digital Library*. https://unesdoc.unesco.org/ark:/48223/pf0000375322

U.S. Department of Education. (2025, July 22). *U.S. Department of Education issues guidance on artificial intelligence use in schools, proposes additional supplemental priority*. https://www.ed.gov/about/news/press-release/us-department-of-education-issues-guidance-artificial-intelligence-use-schools-proposes-additional-supplemental-priority

Wang, Y., Shelmanov, A., Mansurov, J., Tsvigun, A., Mikhailov, V., Xing, R., Xie, Z., Geng, J., Puccetti, G., Artemova, E., Su, J., Ta, M.N., Abassy, M., Elozeiri, K.A., Etter, S. E., Goloburda, M., Mahmoud, T., Tomar, R.V., Laiyk, N., ... Nakov, P. (2025). GenAI Content Detection Task 1: English and Multilingual Machine-Generated Text Detection: AI vs. Human. *ArXiv*. https://arxiv.org/abs/2501.11012

WISE. (2023). WISE 11: *Creative Fluency: Human Flourishing in the Age of A*I. https://www.wise-qatar.org/wise-11/

About WISE

WISE is a global education platform and think-and-do tank convening leaders to shape the future of learning. Established in 2009 by Qatar Foundation under the leadership of its Chairperson, Her Highness Sheikha Moza bint Nasser. WISE drives educational innovation through policy engagement, research, leadership development, and practitioner programs. Through our year-round activities and flagship bi-annual Summit, WISE is building the future of education through strategic local, regional, and international collaborations.

wise-qatar.org

About IIE

Founded in 1919, the Institute of International Education (IIE) is the leading global NGO in designing and implementing international education and exchange programs. We work with governments, policymakers, educators, and employers across the globe to prepare students and professionals for the global workforce and equip them to solve the increasingly complex challenges facing our interconnected world. With support from donors, we also create initiatives that assist students, scholars, and artists whose lives and work are threatened; expand teaching and learning across cultures; and provide opportunities to underserved populations.

iie.org

New Research

The research study **Fortifying Education in the Age of Disinformation** led by World Innovation Summit for Education (WISE), Hamad Bin Khalifa University (HBKU) and Northwestern University in Qatar (NUQ) moves beyond reactive responses to offer a proactive, evidence-informed, and human-centric framework for navigating the challenges of AI and disinformation in educational settings. Through this partnership, WISE and its partners aim to provide Education City, and by extension Qatar and the broader region, with a strategic blueprint for responding to this transformation in a way that preserves the core mission of higher education while harnessing technology for human flourishing. The report is organized in three sections as indicated below:

- Part 1: Institutional Foundations
- Part 2: Fostering Healthy Digital Discourse
- Part 3: Building National Resilience

Access the report here:
https://www.wise-qatar.org/fortifying-education-in-the-age-of-disinformation-a-strategic-framework-for-ai-in-higher-education-in-qatar-a-strategic-framework-for-ai-in-higher-education-in-qatar/

AI Disclosure: *The authors acknowledge the use of AI tools in the writing process of this study, primarily to enhance the readability of the findings. AI-generated content was not used verbatim; instead, it was thoroughly reviewed, edited, and curated by the authors to ensure accuracy, authenticity, and integrity. Human oversight and judgment were essential in interpreting and validating AI's contributions.*

ThinkBay
Qatar Foundation – Education City
P.O. Box 5825 Doha, Qatar

One World Trade Center
36th Floor
New York, NY 10007

Suggested citation: Martel, M., Talha-Jebril, S. & Beriashvili, S. (2025). *Navigating skills adaptation: Integrating AI in higher education*. Global Consortium on AI and Higher Education for Workforce Development. Report 1. WISE.

ISBN: 978-0-87206-426-3