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AI-Enhanced **Personalized** Learning in Higher Education

Global examples and a critical assessment - how these technologies are being adopted in practice and what the evidence actually tells us.

Adaptive learning **Intelligent tutors** **Generative AI** **Predictive analytics**

Prepared by the academic team of the Business and Technology University (BTU) and BTUAI, in Tbilisi, Georgia.

CHAPTER 01

Introduction

For decades, higher education relied on a standardized model - one syllabus, a fixed schedule, and uniform teaching for everyone. That is now changing fast. Artificial intelligence (AI) lets institutions tailor content, pace, and feedback to each student, flag those at risk of failing before it is too late, and deliver individual feedback at scale.

"**Personalized learning**" is no longer just a nice-to-have - it is gradually becoming the norm. Recent examples (mostly 2024–2026) show that AI has moved well beyond pilots and is now widely adopted across universities and colleges. Even so, human oversight and training remain decisive.

According to an EDUCAUSE survey of more than 800 higher-education institutions, **57% named AI a priority in 2025**, up from 49% the year before. The AI-in-education market is projected to grow **from \$7.6 billion (2025) to \$112 billion by 2034**.

i What does "personalized" mean here?

The system gathers data on what a student actually does (answers, mistakes, time spent) and uses it to **adjust content and difficulty in real time** - instead of giving everyone the same material at the same moment. Important: simply using ChatGPT is not yet personalized learning.

This report reviews the forms AI-enhanced personalized learning takes, presents **concrete, current examples** from institutions around the world, and finally offers a **critical assessment of the broader picture** - how solid is the ground beneath what is often called a "revolution."

CHAPTER 02

Concept and Typology

"AI-enhanced personalized learning" is not a single technology - it is a family of distinct tools. Below are six main types, which in practice are often combined.

Type	Description and example
Adaptive platforms	Algorithmically tailor content, pace, and assessment to each student (e.g. ALEKS, BioSpine, ACES).
Intelligent tutors / assistants	One-on-one-style support: Socratic questions, step-by-step explanations, instant feedback (NeuroBot TA, Jill Watson, Khanmigo).
Simulation and practice	AI characters students practice on in a safe environment (AI Patient Actor, ASU "Sam").
Chatbots / nudging	Timely reminders about deadlines and tasks; reduce administrative barriers (GSU Pounce).
Generative content creation	AI creates new material - explanations, examples, exercises, summaries - matched to the student's level, goals, and interests (e.g. ASU Atomic).
Predictive analytics	Identifies at-risk students early so intervention can happen in time (Ivy Tech "NewT").

Table 1 - The six main types of AI-enhanced personalized learning.

Note one key distinction: an **adaptive platform selects and sequences** already-existing material based on a student's performance, whereas generative content creation **produces brand-new material** matched to the student's interests and level - for example, explaining fractions through basketball examples for a student who loves basketball.

💡 "Precision learning"

When these types combine - adaptive material + tutor + analytics - some call it "**precision learning**," by analogy with precision medicine, where the intervention is based on an individual's own data.

CHAPTER 03

Current Examples from Around the World

Below are concrete, documented examples from leading institutions, grouped by tool type. Each case shows what the institution itself reports - and where open questions remain.

3.1 Intelligent Tutors and Virtual Assistants

NeuroBot TA - a trustworthy AI assistant at Dartmouth's medical school

Dartmouth's Geisel School of Medicine built **NeuroBot TA** for its Neuroscience and Neurology course - a virtual assistant powered by a technique called "retrieval-augmented generation" (RAG). In plain terms: a ChatGPT-like bot first searches for the answer in specific, trusted sources and only then writes its reply - so it does not "make things up," but draws on real material. As of 2025, **190 medical students** across two cohorts used it around the clock.

Why does this matter? Ordinary chatbots often "hallucinate" - confidently stating something false. NeuroBot TA's answers, by contrast, are anchored only in **vetted course material**: textbooks, lecture slides, and clinical guidelines. A survey found students **trusted this curated bot more** than general-purpose tools - over a quarter singled out its reliability and convenience, especially when studying for exams. Planned additions include Socratic tutoring and spaced-retrieval practice.

Jill Watson - a virtual assistant at Georgia Tech

Georgia Tech's **Jill Watson** is one of the longest-studied virtual assistants. It answers student questions in online courses - about the syllabus, deadlines, and materials. It began in 2016 on IBM Watson, later moved to BERT, and in 2023 to ChatGPT. In fall 2023 it was deployed in the online Master of Science in Computer Science (OMSCS) and an English course at Wiregrass Georgia Technical College, serving **more than 600 students**.

How much does it actually help? To find out, researchers ran an **A/B experiment**: some students had access to the assistant, others did not, and their results were compared. The findings:

- **Accuracy:** Jill Watson answered correctly **75–97%** of the time, versus roughly 30% for OpenAI's generic assistant.
- **Teaching presence:** students with Jill Watson reported a stronger sense of course organization and live engagement.
- **Grades:** more A grades (**66% vs 62%**) and fewer C grades (**3% vs 7%**).
- **Safety:** the bot anchors answers only in validated material and checks logical entailment, producing far fewer harmful or confusing errors - a useful lesson for other institutions too.

Khanmigo - a Socratic tutor built for scale

Khan Academy's (a non-profit) AI tutor **Khanmigo** differs from others in that it does not hand the student a ready answer - it uses a "Socratic" approach, guiding the student to the answer through questions. This deliberately counters "outsourcing" thinking to AI. Its users grew in a single year **from about 68,000 to 700,000** (2023/24 → 2024/25), across more than 380 school districts, with over 1 million expected in 2025/26. The platform already reaches classrooms in India, Brazil, and the Philippines.

The evidence, however, calls for caution. In a 2025 study at Eastern Kentucky University, **69 physics students** were split into three groups - Khanmigo, Google Search, and paper-only. All three improved significantly, but **there was no statistically significant difference between groups**. In other words, the AI tutor did not outperform traditional methods here. Students still rated it positively - as a supplement, not a replacement for the teacher.

Harvard and LearnLM - randomized experiments

Two rigorous experiments measured the real effect of an AI tutor. "Randomized" means participants were assigned to groups at random - the gold standard for establishing cause and effect. In a Harvard physics course (**N=194**), a purpose-built AI tutor was compared with a live, active-learning class: students **learned roughly twice as much in less time** and felt more motivated. In a joint Google–Eedi study (N=165), human tutors supervised the AI and

approved **76%** of its messages unchanged; with AI support, students were 5.5 percentage points more likely to solve novel problems.

3.2 Simulation and Practice in a Safe Environment

AI Patient Actor - a virtual patient (Dartmouth, Thesen Lab)

Dartmouth's Thesen Laboratory **AI Patient Actor** lets healthcare trainees "talk" to a simulated patient - by text or live, emotive voice - and practice diagnosis and patient communication. The key advantage is safety: a mistake here harms no real patient, and the student can try as many times as needed.

- Supports **52 languages**, offers patients of varying personality and symptoms, and is free to educators at non-profit institutions.
- Educators author their own clinical scenarios and retain full control of the process; video guides and manuals are included.
- Already used in medical schools worldwide; early studies indicate students particularly value the individualized feedback and the chance to practice safely and repeatedly.

ASU "Sam" - a patient-provider simulator

Arizona State University's College of Health Solutions built a similar tool - the chatbot "**Sam**." Students practice patient-provider conversations in realistic scenarios and receive immediate, qualitative feedback; this is especially helpful for building "motivational interviewing" skills. Clinical faculty rated its effectiveness positively. "Sam" is one product of ASU's AI Innovation Challenge (see 3.5).

3.3 Adaptive Learning

ASU - ALEKS and BioSpine

In its so-called "gateway courses" - foundational subjects where failure rates have traditionally been high - ASU deployed the adaptive platform **ALEKS**. ALEKS builds a "knowledge map" for each student: it first checks what they already know and what is missing, then serves only the topics they are ready for. As a result, the share of students earning a C or better in College Algebra **rose from 57% to 79%**. ASU also created the world's first fully adaptive biology degree (BioSpine), and in 2026 launched ASU Atomic, which turns a professor's materials into ready, interactive lessons in minutes.

ACES - adaptive courses at six universities

In March 2024, APLU and Every Learner Everywhere published six case studies from the **ACES** (Adaptive Courseware for Early Success) initiative, in which universities redesigned gateway courses using adaptive platforms:

- **Cleveland State and Toledo - deeper learning:** faculty cut time spent on basic definitions and shifted it to critical thinking; student questions moved from simple recall toward analysis.
- **University of Central Florida - connecting with students:** the adaptive course ensured every question reached and was answered by every student, clarifying physics concepts.
- **University of Texas at El Paso - sustainability:** a focus on open educational resources (OER) - faculty own the material, making the redesign sustainable over the long term.
- **University of Texas Rio Grande Valley - community of practice:** collaborative redesign created a shared culture of responsibility for student success.

Across all institutions, faculty reported a **clearer view of equity gaps** and improved teaching practices.

Squirrel AI - adaptive learning in China

China's **Squirrel AI** is one of the largest adaptive systems in the world. It breaks a subject into hundreds of tiny "knowledge points" and pinpoints exactly which ones a student is missing. The company says the system draws on data from **more than 24 million students**. A higher-education study in Shanghai (experimental group N=153) found significant gains in motivation and engagement compared with conventional teaching.

3.4 Predictive Analytics and Early Intervention

Ivy Tech "NewT" - predicting success in Indiana

Indiana's Ivy Tech community college built an AI system, "NewT," that predicts which students are at risk of failing - while help is still possible. Its approach is notable: the system **ignores grades, attendance, and demographics** (age, gender, background) and looks only at how a student engages with the online platform - how often they log in, whether they do assignments, and in what order. From these behavioral patterns, the system analyzed **12 million interactions**.

- By week 2, accuracy is **60–70%**, rising to about **80%** when run daily.
- In a 2016 pilot, 10,000 course sections were analyzed, **16,000 at-risk students** were flagged, and proactive outreach followed; as a result **3,000 students** raised their grade to at least a C, and 98% felt neutral or positive about being contacted.
- The program (Project Student Success) produced the **largest drop in D/F grades in 50 years** and has since helped more than 34,000 students.

GSU "Pounce" - a chatbot against summer melt

"Summer melt" is a well-known problem: a student is admitted but never enrolls in the fall - often because of bureaucratic hurdles or confusion. To counter it, Georgia State University launched the chatbot **Pounce** in 2016, which texted students reminders about deadlines and steps and answered their questions at any hour. As a result, melt fell **from 19% to 9%**, the bot exchanged 185,000 messages in its first summer, and a course-embedded version raised first-generation students' average grade by about 11 points. In 2024 the project received a \$7.6 million grant to expand.

3.5 AI Literacy and Institutional Initiatives

University of Louisiana System - an AI literacy microcredential

In spring 2025, the University of Louisiana System used state funding to launch a free, self-paced, **16-hour online course**, "Empowering AI Literacy for Students." It covers AI history, ethics, best practices, digital literacy, and data privacy - that is, not just the "how," but the "when and why."

By early 2026 the course already had **82,000 participants**. On completion, students earn a digital badge that certifies AI literacy. One professor added the course to her class for extra credit and noted that even initially reluctant students began using AI for practical tasks - for example, drafting professional emails.

ASU AI Innovation Challenge - community-driven innovation

ASU's **AI Innovation Challenge** launched in February 2024 with the goal of gathering AI ideas not from the "top down" but from the university community itself. The response exceeded expectations: in just two weeks it received **more than 175 proposals**, and by July **more than 200 projects** were underway across **80% of academic units**. Winners received ChatGPT Edu licenses and technical support. The conclusion of ASU's CIO is simple: when AI targets real, community-identified problems, the results are far more valuable.

UConn - AI4ALL

In fall 2025, the University of Connecticut launched the course **AI4ALL**, enrolling about 500 students in its first semester. The goal is ambitious: by 2028, every first-year student should complete a foundational AI-literacy course, regardless of major.

CHAPTER 04

The Broader Picture and a Critical Assessment

What overall picture emerges? Adoption is fast and broad - it spans many subjects, countries, and tools. Yet a careful look shows that enthusiasm often runs ahead of the evidence. Five honest observations follow, and then some practical recommendations.

Enthusiasm is running ahead of the evidence

Many of the most-quoted successes were never tested rigorously. Often there was no control group, so we cannot tell whether the gains came from the AI or from the extra attention, the redesigned course, or simply motivated early adopters. Where strict experiments do exist, the results are mixed - sometimes an AI tutor merely matches good traditional teaching rather than beating it. The honest takeaway: AI can help, but the evidence is thinner and more context-dependent than the headlines suggest.

Read the numbers with care

Be cautious with eye-catching figures like "54% higher scores" or "10× more engagement." Many come from vendors' marketing rather than independent research. The most reliable evidence comes from **controlled experiments** - and even those describe one specific setting, not a universal truth.

The real bottleneck is people, not the technology

A tool is only as good as the person using it. Surveys suggest that **roughly half** of teachers and students have had little or no AI training. Without that training - and without a human staying involved to check the AI - even an excellent tool underperforms or gets used in ways that backfire. Investing in people's skills matters more than buying the newest system.

Personalization can narrow gaps or quietly widen them

Used well, AI can lift exactly the students who need it most. But adoption is often **driven by cost-saving and efficiency rather than fairness**, and most evidence comes from wealthy, mostly Western institutions. Students with weaker internet, older devices, or less digital confidence can fall further behind. Equity has to be a goal from the start, not a hoped-for side effect.

When the data carries old bias, the algorithm can lock it in

Personalization runs on data, and data reflects the past - including its inequities. An algorithm trained on biased history can **repeat and even amplify it**. The danger grows when the system is a "black box" whose reasoning no one can inspect. Grounding AI in trusted, transparent material and allowing its decisions to be reviewed are basic safeguards, not optional extras.

The "black box" problem

Many systems decide who counts as "at risk" or what a student sees in ways no one can fully explain. Without transparency and accountability, bias is hard to spot - and harder still to fix.

Convenience can quietly weaken both thinking and connection

When the answer appears instantly, two things are at risk. First, the human relationship: students can feel more distant from teachers when a bot does the mediating. Second, the thinking itself: leaning on AI to do the hard mental work is linked, over time, to weaker independent reasoning. The fix is not to ban AI but to design tasks that keep students actively thinking.

A reason for optimism

The same research suggests that **education and AI literacy protect against these effects**. Tools that ask questions instead of giving answers keep students actively thinking. The problem is rarely the technology itself - it is how we choose to use it.

The bottom line: thoughtful adoption beats the hype

The broader picture is this: AI-enhanced personalized learning **offers real value** - more individual support, earlier help for struggling students, and more time for deep thinking. But that value appears only when the technology is

paired with good teaching, backed by training and safeguards, and used to **support - not replace** - the human teacher.

Recommendations for institutions (including BTU)

Start with the learning goal, then choose the tool. Decide what students should learn, and bring in AI only if it serves that goal.

Invest in people before platforms. Teach both students and staff how to use AI critically and confidently.

Keep a human at the wheel. Anchor the AI's answers in trusted material, and have staff check what it tells students.

Build in moments that make students think. Add steps where the learner explains the AI's answer in their own words.

Be transparent and measure results. Set clear data rules and check whether each tool actually works.

⚡ The key message

AI-enhanced personalized learning is neither a magic cure nor a threat - it is a **tool** whose value is determined by how thoughtfully it is deployed. An institution that does not sacrifice pedagogy, training, equity, and human connection will reap its genuine benefits.

Bibliography

Sources are based on public and peer-reviewed publications from 2024–2026.

Dartmouth (2025). AI Can Deliver Personalized Learning at Scale, Study Shows (NeuroBot TA). home.dartmouth.edu

Thesen Laboratory, Geisel School of Medicine. AI Patient Actor Platform. geiselmed.dartmouth.edu/thesen

Georgia Tech Research (2025); Taneja et al. (2024). Jill Watson Outperforms ChatGPT in Real Classrooms. research.gatech.edu

RAISE Summit (2025). Top AI Case Studies in Education 2025 (Louisiana microcredential, ASU challenge, training statistics). raisesummit.com

Google for Education. Case Study: Ivy Tech GCP (NewT predictive analytics). edu.google.com

Every Learner Everywhere & APLU (2024). Impacts of Adaptive Learning Implementation: ACES Case Studies. everylearnereverywhere.org

Journal of Teaching and Learning, Univ. of Windsor (2025). Leveraging "Khanmigo" Generative AI for Personalized Tutoring (Eastern Kentucky University, N=69). jtl.uwindsor.ca

Workday / EDUCAUSE (2025). AI in the Classroom: Personalized Learning and the Future of Education. blog.workday.com

Inside Higher Ed (2019); ASU News (2019). Arizona State adaptive courseware success (algebra 57%→79%); BioSpine. insidehighered.com/news.asu.edu

Mainstay / GSU (2022; 2024). Georgia State University: Pounce chatbot; NISS \$7.6M grant. mainstay.com; news.gsu.edu

Kestin, G., Miller, K., Kiales, A. et al. (2025). AI tutoring outperforms in-class active learning: an RCT. *Scientific Reports* 15, 17458.

LearnLM Team (Google & Eedi, 2025). AI tutoring can safely and effectively support students: an exploratory RCT. [arXiv:2512.23633](https://arxiv.org/abs/2512.23633)

UConn Today (2025). UConn Leverages AI to Personalize Learning (AI4ALL). today.uconn.edu

Springer, Education and Information Technologies (2025). AI-based adaptive learning on motivation and engagement (Squirrel AI, Shanghai, N=153).

MDPI Education Sciences (2025). The Impact of AI on Inclusivity in Higher Education: A Rapid Review. 15(9), 1255.

Gerlich, M. (2025). AI Tools in Society: Impacts on Cognitive Offloading and the Future of Critical Thinking. *Societies* 15(1), 6.

Kosmyna, N. et al. (2025). Your Brain on ChatGPT: Accumulation of Cognitive Debt. MIT Media Lab; [arXiv:2506.08872](https://arxiv.org/abs/2506.08872)

Schiller University (2025). Risks of AI Algorithmic Bias in Higher Education (UT Austin). schiller.edu