

Actuarial Education & AI: Paradox to Practice

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#TASKConvention2026

convention.actuarieskenya.or.ke

Meet the speaker

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Outline

Generative AI:
Impacts in Learning

Toolkit and
Examples

Generative AI:
Current Status in
Actuarial Industry
and Education

SECTION 01

Generative AI: Impacts in Learning

Actuarial Education & AI Paradox

- AI has the capability to be both a cognitive amplifier and inhibitor
- To maximize benefit use as Enabler vs. Substitute fostering intellectual autonomy, problem solving, and deep learning.
 - Use to decrease Cognitive Load but sustain Active Cognitive Engagement [Cognitive Load Theory]
 - Don't use to recall alone but sustain higher-order thinking [Bloom's Taxonomy]
 - It must generate autonomy and competence vs. dependency [Self-Determination Theory]
- Reliable Hallucinations – fluent output that needs checking
- Dangerous Opportunities – productivity gains with hidden pitfalls
- Standardized Personalization – bespoke help, uniform artifacts & rules



Actuarial Education & AI Paradox: Power to Raise the Floor

Personalized Learning (Mahmoud and Sornsen, 2024): The ability of AI to tailor educational experiences to the individual needs, preferences, and abilities of students represents a significant departure from the traditional, one-size-fits-all approach that has long dominated the educational landscape. By analyzing vast amounts of data and adapting in real-time, AI-powered personalized learning systems can provide a level of customization that was previously unattainable, thereby enhancing student engagement, improving learning outcomes, and supporting teachers in delivering more effective instruction. AI has the capability to be both a cognitive amplifier and inhibitor

“Adaptive learning systems, intelligent tutoring systems, and learning analytics, have already begun to demonstrate the profound impact that AI can have on education.”



Instantaneous Formative Feedback

Scaffolding explanations

Non-biased Brainstorming Partner

Exploratory Data Summaries

Automation of Tasks

Practice Variants

Actuarial Education & AI Paradox: Danger of Lowering the Ceiling

A recent study by Gerlich (2025) explores the **relationship between AI usage and cognitive skills** found a negative correlation between frequent AI usage and critical-thinking abilities, suggesting that individuals who rely heavily on automated tools may struggle with independent reasoning.

One contributing factor is cognitive offloading, where AI users engage less in deep, reflective thinking and instead prefer quick AI-generated solutions.



Other Empirical Evidence of AI's Cognitive Impact:

- **Memory Retention** (*Akgun and Toker, 2024. 73 Students*): Prolonged AI exposure led to memory decline. AI enhances accessibility but may weaken retention if overused.
- **Problem Solving and Critical Thinking** (*Odo et al, 224, 206 vocational students*): AI has the potential to reduce cognitive engagement because the students may accept passively the information provided without critical scrutiny.
- **Creativity** (*Habib et al, 2024*): AI-supported students scored better on fluency, flexibility, and elaboration, but also found that the use of AI had liabilities, including cognitive fixation and lower creative confidence as the students over-relied on AI suggestions.

Actuarial Education & AI Paradox: Guardrails

*“AI raises the floor... so we can raise the ceiling!
In the end, if I am thoughtful about where and how I lean on these tools,
I can accomplish much more than I would without.”*

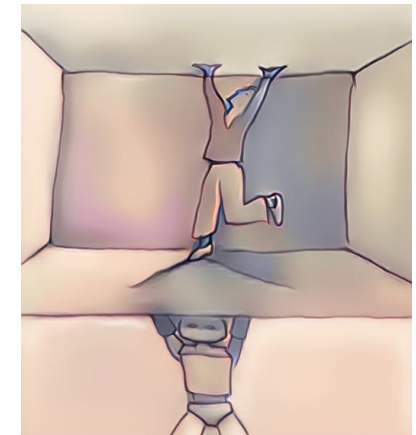
by Titi Ala'ilima | Medium

What to keep human-only (protect the ceiling)

- Core derivations: Work out models by hand first.
- Transfer tasks: Apply the concept to a new problem/dataset before asking AI.
- Final judgments: Choose models, thresholds, and remediations yourself—then justify.

Simple “Three-pass” study workflow

- Pass 1 – Solo draft (no AI): Sketch the solution path; mark stuck points with “(?)”.
- Pass 2 – Targeted assist: Ask AI only about the “(?)” items. Copy answers into notes in your own words.
- Pass 3 – Defense: Close AI. Explain aloud: *why this link, what fails if assumption breaks, one ablation you’d run...*



Hand drawn, water color by Petallica Paint.

Actuarial Education & AI Paradox: Guardrails

Personal red flags (when AI is lowering your ceiling)

- You can't re-derive a key equation without peeking.
- You can't explain why a distribution is used, or a certain condition is required
- You default to AI wording; your solution lacks your own examples.
- You can't answer a "what if we change...?" question live.



Use to decrease Cognitive Load
BUT

Sustain Active Cognitive Engagement
[Cognitive Load Theory]



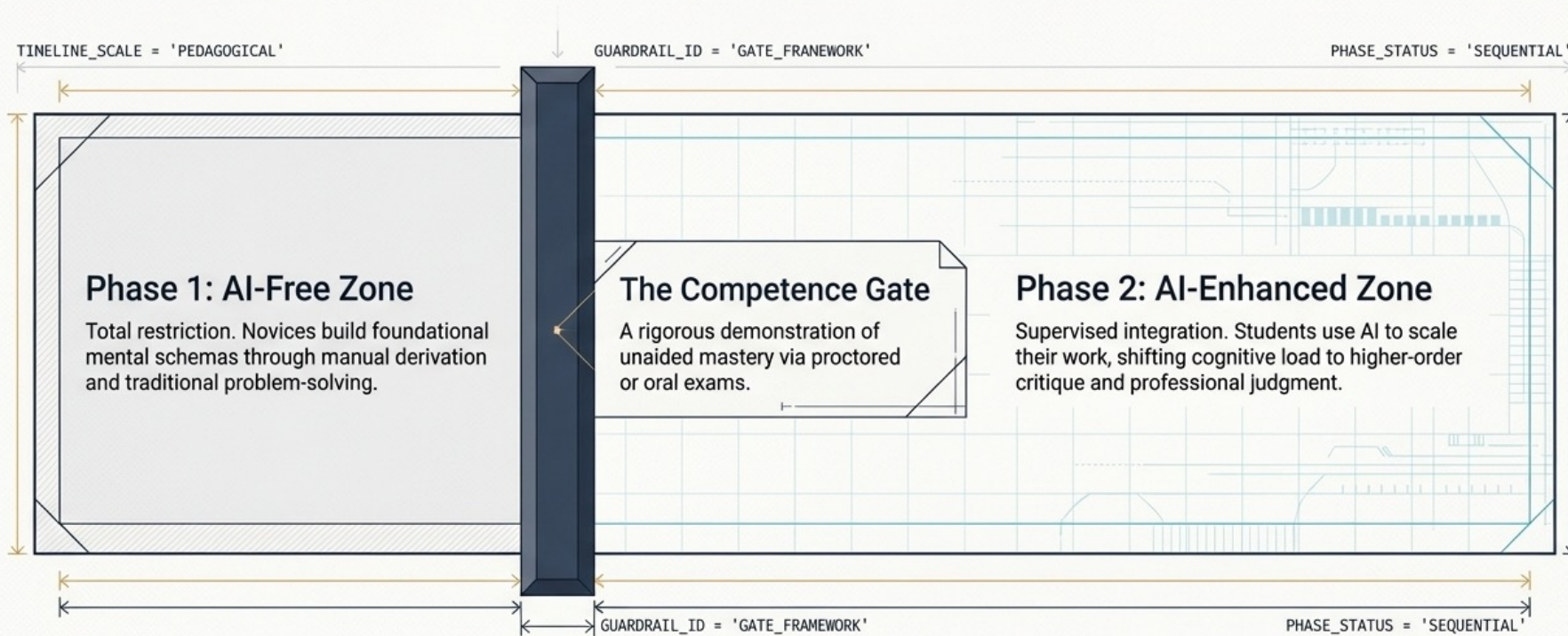
Don't use to recall alone
BUT
to aid higher-order thinking
[Bloom's Taxonomy]



It must generate autonomy and
Competence
VS
Dependency
[Self- Determination Theory]

Pedagogical Guardrails: The Gate Framework

To prevent cognitive erosion in new professionals, training must follow a structured pedagogical timeline.



Note: Slide generated by NoteBook LM using a white paper by Dr. Stefanos Orfanos, Georgia State University, presented at the Actuarial Faculty Development Program

SECTION 02

Toolkit and Examples

Enhancement/ Erosion Matrix: Teacher Focus

Teaching moment	Where AI can raise the floor (use it)	Where it may lower the ceiling (watch-outs)	Guardrails & concrete moves
Syllabus & policy design	Draft clear AI use policies; map activities to learning outcomes.	Vague “don’t cheat” language invites confusion.	Provide discipline-specific examples and “allowed/always-human” lists; align to course outcomes.
Assignment (re)design	Convert generic problem sets into process-heavy tasks (iterations, comparisons, reflections).	AI completes end-products with minimal learning.	Add process artifacts : planning brief → drafts → revision memo; require comparison of AI vs. student approach.
Formative feedback	Use AI to generate quick rubric-aligned feedback and exemplars.	Over-reliance dulls students’ self-evaluation.	Pair AI feedback with student self-assessment and “feed-forward” goals.
Metacognition & reflection	Prompt logs help students explain what they asked, why, and what they accepted/rejected.	“Invisible help” hides misconceptions.	Make prompt journals graded artifacts; require a short error diary (“ what the model got wrong and why ”).
Programming & modeling labs	AI scaffolds boilerplate code, docstrings, and debugging tips.	Cargo-culting code; weak grasp of likelihoods/assumptions.	Mandate oral mini-defenses and ablation studies ; prohibit AI during derivations/live defenses.
Assessment integrity	Generate variantized practice items; draft oral/viva prompts.	Text-only take-home exams invite substitution.	Mix formats: oral checks, in-class reasoning, dataset-specific tasks; keep an “ always-human ” core.
Active learning in class	Use AI to spark multiple solution paths or case variations.	Students passively accept fluent but wrong output.	Adopt critique cycles : students must find/repair at least two AI errors per activity.
Academic integrity & transparency	Normalize disclosure (tools used, prompts, versions).	Hidden use undermines trust and grading fairness.	Require a Use-of-AI statement on submissions; sample and verify.
Case studies (actuarial)	Speed up documentation (data/model cards), risk memos, and communication drafts.	Governance gaps; hallucinated claims in artifacts.	Standardize data/model cards ; link to evidence; instructor spot-checks.
Ethics & bias discussions	Use AI to surface contrasting explanations and scenario stress-tests.	False authority; unexamined proxies.	Require slice metrics and bias analyses as graded deliverables; debate model choices.
Team projects	Auto-summaries for stand-ups; draft task boards.	Social loafing behind AI output.	Track individual prompt logs + rotating “explainer” role; grade process equity.

Example 1: Application of Matrix to Training Check-List in a Pricing Team

AI can accelerate pricing work, but actuarial rigor comes from documentation, validation, and human defense

- 1. **Data understanding** (before modeling)
 - ☐ Data Card completed (purpose, unit, exposure, time window)
 - ☐ Leakage check done (no post-bind variables)
 - ☐ Forbidden / restricted variables identified
- 2. AI use & development
 - ☐ AI use documented (EDA, code scaffolding, diagnostics)
 - ☐ **Prompt log** maintained for AI-assisted steps
 - ☐ Final model choice justified by analyst (human decision)
- 3. Validation & fairness
 - ☐ At least **one ablation** study performed
 - ☐ **Slice metrics** reviewed (e.g., territory, class)
 - ☐ One potential adverse impact identified and addressed
- 4. Brief **viva check** (≈5 minutes)
Analyst can explain:
 - ☐ Link function and offset choice
 - ☐ One key assumption and failure mode
 - ☐ One diagnostic that would trigger review
- 5. Governance & handoff
 - ☐ **Model Card** completed (metrics, limits, monitoring)
 - ☐ **Peer review** sign-off recorded

Example 1: Application of Matrix to Training Check-List in a Pricing Team

AI "**raises the floor**" by automating routine, manual, and time-consuming tasks, allowing junior analysts to produce professional-grade artifacts more quickly: **EDA and Code Scaffolding, Documentation Support, Scenario Generation.**

The "**ceiling is lowered**" when over-reliance on AI leads to "metacognitive laziness," where the analyst focuses on the "bot interaction" rather than the actual synthesis and analysis of the results: **"Cargo-Culting" Code, Unthinking Model Selection, The "Deer in the Headlights" Effect**

Guardrails!



Example 2: Application of Matrix to Accreditation-Evaluation of Actuarial University-Training Programs

From an accreditation and professionalism perspective, the key question is not whether AI is used, but whether actuarial competencies remain demonstrable, defensible, and auditable.

Programs should be able to show evidence that students can:

1. Demonstrate actuarial judgment
 - Explain assumptions, limitations, and implications of results
 - Defend model structure and diagnostics orally or in writing
2. Apply methods independently of tools
 - Perform and explain core derivations and reasoning
 - Transfer concepts to new data or unfamiliar contexts
3. Uphold professional standards
 - Recognize bias, inappropriate variables, and misuse risks
 - Take responsibility for outputs—even when AI is used
4. Communicate clearly and transparently
 - Disclose AI use
 - Articulate results to technical and non-technical audiences

A strong program should not rely on:

- Grades based solely on take-home submissions
- Black-box outputs with no explanation
- Undisclosed AI use
- Performance metrics without interpretability or context

Example 2: Application of Matrix to Accreditation-Evaluation of Actuarial University-Training Programs

Expectation	Evaluation Question	Acceptable Evidence
Technical competence	Can the student explain and apply core methods?	In-class problems; derivations; oral defense
Judgement & Professionalism	Can the student justify decisions and limitations?	Written reflections; viva responses
Integrity of Assessment	Is learning authentic and not outsourced?	Transfer tasks; no-AI windows; process grading
Transparency	Is AI use visible and bounded?	AI-use policy; disclosure statements
Public Interest	Are bias and misuse risks surfaced?	Slice metrics; forbidden variable discussion

SECTION 03

Generative AI: Current Status

In Actuarial Industry and Education

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Industry Adoption

	USE CASES	BENEFITS
MARKETING & CUSTOMER SERVICE	- Customer assistance (e.g., Q&A, contract selection) - Client-dedicated chatbots	New marketing and communication channels
CLAIMS MANAGEMENT	- Support for customer claims handling - Support for claims handlers and fraud investigators	- Improved claim assessment - Fraud detection
POLICY ADMINISTRATION & CUSTOMER SATISFACTION	Customer calls and feedback analysis	Improved customer satisfaction
SALES & PRODUCT DEVELOPMENT	- Support for company sales - Assistance in comparing competitors' policy conditions	Easier product development
UNDERWRITING	Analysis of documents and other unstructured data	Improved risk analysis
ACTUARIAL & FINANCIAL FUNCTIONS	- Coding assistance - Reporting automation	- Improved efficiency - Enhanced compliance
LEGAL	- Analysis of legal documents - Answers to customers' legal questions - Support for researching insurance regulations	- Initial guidance on legal questions - Improved customer service

Education Status



Universities

- Including Machine Learning in Curriculum
 - Teaching LLM prompting, ethics etc
 - Redesigning teaching and assessment
-
- Universities with actuarial/ insurance programs in Greater China are moving past curiosity into implementation: most now **teach LLMs inside existing ML/data courses** ($\approx 64\%$), with nearly half adding “**basic LLM knowledge**” and **data-analysis uses**, while about a quarter offer **hands-on LLM operations** (fine-tuning/ running models).

Education Status



Actuarial Societies

- Research
 - [How Does AI Change the Technical Skill Requirements for Actuaries? | SOA](#)
- Pathways redesign
- Assessment redesign?



Education Companies

- New content creation(?)
- Interaction with existing content: search, summarize, expand, explain differently, change medium, accessibility etc.
 - Deployment of AI agents to support learning
- Translation
- Grading/Feedback



What will we see in the next 2 years in Actuarial Education?

In the short term, the focus will be on rapidly redesigning curricula and implementing defensive pedagogical frameworks to protect foundational knowledge.

Universities



- Curricular Integration of LLMs: Universities are already moving past curiosity; Students will increasingly be taught specific skills such as prompt engineering, AI ethics, and hands-on model fine-tuning
- Adoption of the "Gate Framework": To combat "metacognitive laziness"—where students focus on bot interaction rather than analysis. Students will likely first demonstrate theoretical mastery in AI-free zones before passing a "gate" to use AI tools for higher-order tasks like distribution fitting or reserve analysis
- Assessment Redesign: Traditional "take-home" exams will be replaced or augmented with process-heavy assignments, such as reflective AI process journals and live oral defenses (viva checks) to verify that learning is authentic and not outsourced

What will we see in the next 2 years in Actuarial Education?



Professional Bodies

- Professional Body Credentialing: Organizations like the IFoA and SOA will identify AI-related competencies and test them as teachable skills, building them into core credentialing programs
- The International Actuarial Association (IAA) plans to complete a global "Interactive Framework" by 2026 to guide the profession in responsible AI adoption



Training/ Self Study/ Exam Prep

- AI as a Personalized Tutor: We will see the widespread deployment of personalized learning assistants and chatbots designed to help students learn complex regulations (like IFRS 17) or specialized software (like AXIS) in real-time.
- AI agents to be embedded in current eLearning platforms: Instead of static video or text, eLearning platforms will deploy agents that act as personalized learning assistants, integrating for example, context-aware scaffolding and real-time feedback



What will we see in the next 2 years in Actuarial Education?



“Can we think further into the future? 5 years? 10 years?”

Sources/ Resources (1/4)

Research Reports and Academic Papers

- The cognitive paradox of AI in education: between enhancement and erosion: <https://pubmed.ncbi.nlm.nih.gov/40297599/>
- Barometer of generative AI adoption in the European insurance industry (Milliman): <https://www.milliman.com/en/insight/impact-of-ai-to-life-insurer-value>
- Work With ChatGPT, Not Against: 3 Teaching Strategies (PubMed): <https://pubmed.ncbi.nlm.nih.gov/38502607/>
- Reflections on deep learning and the actuarial profession(al): https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4672447
- An AI Vision for the Actuarial Profession: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4758296



Sources/ Resources (2/4)

Educational & University Resources

- Harvard Derek BOK Center for Teaching and Learning- Teaching in the Age of AI: <https://bokcenter.harvard.edu/artificial-intelligence>
- Columbia University Center for Teaching and Learning (CTL) AI Resources: <https://ctl.columbia.edu/resources-and-technology/resources/ai-tools/>
- Caltech Center for Teaching, Learning, & Outreach (CTLO) - AI in Education: <https://ctlo.caltech.edu/universityteaching/resources/resources-for-teaching-in-the-age-of-ai>



Sources/ Resources (3/4)

Professional Body Projects and Tools

- IAA AI Case Studies and Jupyter Notebooks (GitHub): <https://github.com/IAA-AITF/Actuarial-AI-Case-Studies/>
- IAA Online Community: <https://aiforactuaries.org/>
- IAA/ Ronald Richman- Embracing AI: Transforming the Actuarial Profession: https://actuaries.org/app/uploads/2025/05/4_RON_Embracing-AI-Transforming-Profession_AI_Summit_Day1.pdf
- CAS Newsletter - AI Impact Article: <https://www.casact.org/newsletter/article/ais-impact-actuarial-methods-and-its-transformative-potential>
- CIA News- Revolutionizing Actuarial Work with Generative AI: A Glimpse into the Future: <https://www.cia-ica.ca/news/revolutionizing-actuarial-work-with-generative-ai-a-glimpse-into-the-future/>
- American Academy of Actuaries -Actuarial Professionalism Considerations for Generative AI : <https://www.actuary.org/wp-content/uploads/2024/10/professionalism-paper-generative-ai.pdf>
- IFoA GenAI Working Party Substack- <https://ifoagenai.substack.com/p/emerging-risks-of-agentic-ai-in-actuarial>

Sources/ Resources (4/4)

Official AI Guardrails and Frameworks

- EU AI Act (Official Site): <https://artificialintelligenceact.eu/>
- NIST AI Risk Management Framework: <https://www.nist.gov/itl/ai-risk-management-framework>
- EIOPA Draft Guidelines on AI Governance: https://www.eiopa.europa.eu/publications/opinion-artificial-intelligence-governance-and-risk-management_en
- OECD AI Principles: <https://oecd.ai/en/ai-principles>



Thank You.

11th Annual TASK Actuarial Convention · The Next Frontier: Actuaries Beyond Boundaries

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