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Teaching with Gen AI at AFIT: From Guidebook to Practice

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- Guidebook Overview
- Featured Articles
- Overview of General Education
 Applications Section
 - Live Demo
 - Key Takeaways
- Overview of Application Specific Section
 - Live Demo
 - Key Takeaways
- Way Forward

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Motivation

To share practical examples and insights from military and academic peers to support effective use of Generative AI in teaching.

Authors & Editors

AFIT Faculty researchers, instructors, instructional designers, and technologists with real-world classroom experience

Objective of the work

Empower faculty with practical, ethical, and student-centered strategies.



Cleared for public release: https://scholar.afit.edu/docs/140







- Featured Articles
 - Ethical AI and Bias for the Department of Defense in the Age of Gen AI
 - Observations from Advising Graduate Student Research
 in Gen AI Applications
- Background information on various technical concepts related to Gen AI
- General Educational Use Cases
 - 13 practical articles
- Application-Specific Use Cases
 - 3 targeted articles
- Way Forward
 - Future directions, innovative pathways, and continuous faculty development
- Additional Resources





Structure



	Background, resources & support	Improve the learning experience	Structure educational materials	Generate educational materials	Lesson plans	Instructor efficiency	Research and Applications
Page - Chapter title (condensed)							
17 - Introduction	x						
27 - Ethical Al and Bias	x						
48 - Key Concepts & Foundations	x						
352 - Innovation Pathways	x						
175 - Gen Al Context & Relationships	x				x		
355 - Gen Al Resources	x						
70 - Gen Al for Learning		x					
88 - Reverse Engineering Outcomes			x				
210 - Curriculum Review Augmentation			x				x
58 - Gen Al for Lessons				x			
118 - Concept Inception & Ideation				x			
133 - Streamlining Quiz Creation				x			
137 - Guide & Test Generation				x			
155 - Developing Discussion Topics				x			
163 - Interactive Discussion Lesson		x			x		
222 - Gen Al for Writing					x		
262 - Gen Al Data Management					x		
303 - Gen Al Code Development					x		
193 - Graphics Generation Lesson					x		
113 - Comparing Assignment Solutions						x	
35 - Advising Gen Al Research							x
105 - T-LAS Modeling Use Case							x





Ethical AI and Bias for the Department of Defense in the Age of Generative AI:

Highlights the risks of bias in Al systems and the importance of ethical use in military settings. It introduces the DoD's five Ethical AI Principles and provides practical guidance, policies, and tools to help ensure responsible and trustworthy AI implementation across defense and education contexts.







Observations from Advising Graduate Student Research in GenAl Applications:

Highlights lessons from two graduate projects that explored using GenAI for game-based assessments and digital engineering. The article encourages faculty to guide students in using GenAI thoughtfully and collaboratively.



Rawia Inaim / Kwantlen Polytechnic University





13 articles on ways faculty are integrating generative AI into teaching and learning.

- Lesson & Assessment Design: Streamline the creation of lesson plans, quizzes, study guides, and practice tests aligned to course outcomes.
- Active & Interactive Learning: Support engagement through AI-enhanced discussions, live model-student dialogues, and collaborative assignments.
- Course & Curriculum Enhancement: Use Gen AI to reverse-engineer course objectives, improve curriculum alignment, and generate ideation for new content.
- Canvas Integration & Automation: Simplify the development of quizzes and content within the LMS using Gen AI tools.
- Visual & Concept Development: Generate instructional graphics and early-stage concepts to support teaching goals.









Redefinition

Tech allows for the creation of new tasks, previously inconceivable

Modification

Tech allows for significant task redesign

Augmentation

Tech acts as a direct tool substitute, with functional improvement

Substitution

Tech acts as a direct tool substitute, with no functional change





Live Demo Using Gen Al to Foster Active Learning







Using Generative AI for Written Content

Explores how Gen AI tools can support student learning by assisting with editing, summarization, organization, and critical thinking.

Using Generative AI for Data Management

Presents practical strategies and classroom-tested activities for teaching data summarization, cleaning, and analysis using Gen AI tools.

Using Generative AI for Code Development

Explores how AI tools can support writing, documenting, and optimizing code in Python.







Live Demo of how the Guidebook can with Using a Gen AI for Written Content











Empower students and faculty to explore critical thinking, creativity, and adaptability through intentional Gen AI use.

Foster a culture of inquiry—recognizing that we are only beginning to understand Gen Al's long-term impacts on learning.

Support ongoing research into how Gen AI affects diverse learners and educational outcomes.

Engage as a community of educators to critically shape Gen AI's role in preparing students for an AI-augmented world.







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https://scholar.afit.edu/docs/140





AFIT Generative AI Teaching Guidebook Synopsis



https://scholar.afit.edu/docs/141/





Back Up







- introduce book
 - -- discuss team, motivation, objective, structure
 - key takeaways from featured articles
 - -- pull from Reith Patel
 - overview of general application section
 - deep dive thought partner Zemmer
 - -- including live demo
 - -- key takeaways
 - overview of specific application section Bateman
 - deep dive written content
 - -- live demo
 - -- key take aways
 - way forward





Ethical AI and Bias for the Department of Defense in the Age of Generative AI

Lt Col Hiren Patel, AFIT/LSS





Recommendations

- Embrace the tools by teaching associated strengths and weaknesses with respect to the topic.
- Consider creating a collaborative space for faculty and students to share how they might use this technology to complete assignments.



Rawia Inaim / Kwantlen Polytechnic University





Course Observations

- GenAI seems suited for summarizing and searching large amounts of text (but not so good at math).
- GenAI is only as useful as the training data and augmented materials provided to it.
- Students seem to employ it to address the "blank page" problem.

Research Observations

- The DoD has published several policy memorandums and guidance related to GenAI technology.
- The DoD has concerns about data spillage through this technology.
- Some commercial and private GenAI may restrict licensing to the military.







Reverse Engineering a Course: Extracting and articulating meaningful learning outcomes from existing course content and assessments

Dr. Brett Borghetti, AFIT/ENG





- You've been told you are going to teach the next offering of an existing course
 - A typical course design process involves ensuring that learning activities cover the learning outcomes and that these outcomes are assessed by the learning assessments
 - There are some existing learning activity content items (Lecture slides)
 - There are some existing Learning Assessments (Quizes)
 - The syllabus lists learning outcomes... and you might have your own idea of what learning outcomes are for the course
- Investigation Activities Use Gen AI to:
 - A1: Extract learning outcomes from existing content
 - \circ A2: Improving the wording in student outcomes
 - A3: Evaluate whether learning outcomes are covered by an assessment and create a per LO mapping to specific questions in the assessment





- Gen Al is adequate at extract LOs from Lecture Slides even if those LOs are not explicitly described in the content
 - Can discover LOs that are present in the content but not expected!
 - \circ Human review required
- Gen Al is very good at refining text (e.g., making LOs better)
 ABET/HLC compatible (with the correct prompt engineering)
- Gen Al can successfully create a mapping from LOs to quiz questions that cover them, even if the quiz questions only partial cover the LOs
 - Was also able to identify "other" distracting questions that were irrelevant for the LOs





Using Gen Al to Foster Active Learning

Dr. Jonathan Zemmer, AFIT/CIE





Prompt:	
Response:	

- Use AI to generate activities that emphasize higher-order thinking.
 - Leverage AI for Efficiency, Not Finality





T-LAS Modeling Use case for Gen Al

Maj Nicholas Francis, AFIT/LSB













- 1. If the laser was 4x as strong, what is the new Pk?
- 2. If the tracking subsystem is improved, what is the max targets that can be tracked?
- 3. How many radio stations or podcasts will the pilots be able to listen to with the communications subsystem?
- 4. How much ice cream can drip on the system before it breaks?
- 5. How useful will the T-LAS system be in an alien invasion?
- 6. How many hours would it take to train your grandmother to use the whole system?

 How does your system respond to a target coming from out of the systems field of view?
 How does your system react to a stray transmission or a jamming signal?
 What happens if your laser doesn't shut off?

- 4. How does it react to a swarm of missiles?
- 5. How does your system react to a UFO?





Familiarizing with Generative AI Through Comparison of Assignment Solutions

Maj Timothy Wolfe, AFIT/ENG







The following text may be used in the example nominal homework assignment:

- <u>Problem 1.</u>
 - For a twelve-mask-layer process photolithography process, find the final yield given xyz information on the number of fatal defects in different mask layers.
- Problem 2.
 - Given a proposed photomask detailed setup, analyze potential problems, compute metrics on the quality, and suggest how the setup might be corrected based on what you have learned in class.
- For problems 1 and 2: Enter the same question into ChatGPT or other generative AI or start with the AI and then change your approximations to obtain a new set of solutions. You will find similar but slightly different expressions than those in the book/slides, or the "look up" in the provided charts will yield something different.
 - Share your exact prompt as part of your homework answer, take note of its approximations/assumptions, and list them and the subsequent answers. Compare/contrast with your own approximations/expressions and result. Are your answers "reasonably close"? Which one is "better", and why would you argue that (greater accuracy? At what potential cost or trade-off?) Is the AI more cautious than you (the student) with its approximations and answers?
 - The intent here is to observe what the AI **can** do in terms of lithography process design but recognize where there remains room for reasonable argument depending on specific details. Thus: AI can be a useful starting point for planning your lithography process, but you had better be able to independently **interpret** the suggestions/solutions it returns you.
 - You **may** use AI for the other problems, but if you do so: repeat the same comparison process.







- Introduce ground rules on using ChatGPT or other generative AI tool in the course syllabus and discuss on first day of class.
- Require use of generative AI tools in a non-exam assignment
 Be clear about not only what you want the students to do, but "why."
- Offer an optional extra credit use of Generative AI tools on a prior assignment
- In this course, a student used ChatGPT to assist in an assignment within the rules laid out by the syllabus, and matching instructor's intent, after having had the tools introduced through the course. Such practice may have never happened without the combination of instructor approval and guided, thoughtful use.
- Use of generative AI tools could also apply to other design-based engineering courses:
 - $\circ~$ For example, a viable antenna design or an impedance matching network.
 - These "open-ended" questions are good places to learn how to accelerate productivity by starting with an
 aggregate of the current body of knowledge and iterate
 - While also scoping out the limitations in accuracy that necessitate "checking the work" with human expertise.





The Rest:

- Lesson and Exercise Creation
- Concept Inception and Ideation
- Study Guide Generation
- Discussion Topic Generation
- Guided Model Class Interaction
- Context and Relationships
- Graphics and Figures
- Written Context: Critical Thinking, Summarization, & Editing
- Data Management: Cleaning, Summarization, & Visualization
- Code Development: Writing & Documenting

Maj Mark Bateman, AFIT/ENV





Gen Al Teaching Guidebook Project Overview

Maj Mark Bateman, AFIT/ENV

