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AI Teaching Notes
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As these notes are updated, the current version can be found at: https://larryschrenk.com/AI-Notes.pdf. Please feel free to distribute this document and the link.

Abstract: These notes are a very informal, somewhat opinionated collection of ideas about using generative AI in teaching, especially in higher education. I claim no originality whatsoever (though a couple ideas are mine). It seeks to show the range of applications in teaching – both the benefits and the blemishes.

One of the most contested issues in higher education, business and in society in general has been the introduction and implications of generative AI, i.e., programs such as ChatGPT and other Large Language Models (LLMs). Discussions in higher education have been largely defensive; that is, how can we stop this new technology disrupting the *status quo*: How can we prevent students from using it to answer test questions? How can we discourage students from using it to complete papers? Is some sort of AI detection app possible? We need to shift both our thinking and our efforts, especially in business schools, to a more positive and proactive approach. We need to integrate these tools into our pedagogy and equip our students for this new world. Every instructor in higher education should be concerned with four questions (only the first of which is addressed in these notes): 1) How will AI change my teaching, 2) How will AI change my research, 3) How will AI change how my college or university works, and 4) how can I best prepare my students for success in an AI enhanced world.

The notes below describe a range of different ways that generative AI might be useful (and detrimental) in teaching. Only a few are my own; most are drawn

from many other sources (see Resources) including suggestions generated by the LLMs themselves. I've also included example prompts (in italic). While I do not comment on all examples, I do add notes when anything is problematic or significant. *Above all, try out the prompts for yourself and adapt them to your area of study*. Send suggestions or corrections to lschrenk@winona.edu.

WARNING: Generative AI models often provide stunning results, but they can also yield answers that are bizarre and nonsensical. Most generative AI models are terrible at all but the simplest math. In one answer, a program claimed that 20,000 x $20 = $18,182.17! Remember that generative AI models are *not doing any calculations*; they are just following patterns observed in their training sets.

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1.   Software ⬆

This is a woefully inadequate guide to generative AI models that will be obsolete by the time I press 'Save'. But it might be useful. For a more extensive discussion of generative AI software, see Top 10 Best Generative AI Tools Worth Checking Out in 2023. For general business AI software, see Top AI Tools for Business. The following list will be different next week, but these are some of the LLMs that (like Marlon Brando) could be contenders:

- ChatGPT 3.5: The father/mother of LLMs from OpenAI. Free (registration required) but by now ancient, i.e., it's months old – though I find it can outperform more recent models.
- ChatGPT 4: Progeny of ChatGPT 3.5. You can use it directly at OpenAI, but that requires a subscription (ChatGPT Plus). It's also implemented in other software, such as Bing Chat. Over 800 plugins (not accessible in

Bing) are available to search the web (BrowserPilot), download CSV spreadsheets (Make a Sheet), create charts and graphs (diagr.am), create PowerPoint Slides (Smart Slides), download Python notebooks (Noteable), find cheap hotel rooms (Kayak), etc. See Installing Plugins (YouTube). In my experience, some of these plugins are a bit 'dicey'.

- Python: You can install the OpenAI Python Library: pip install openai, so you can run ChatGPT via, for example, notebooks in Google Colab. **NOTE**: If you are serious about using ChatGPT and need to process large quantities of data efficiently, you must know how to access it from a Python notebook (not just paste individual prompts onto the OpenAI webpage). See How to Use ChatGPT for Python: The Ultimate Guide and How to Use ChatGPT API in Python?

- Bing Chat: Bing Chat uses ChatGPT 4. Access Bing.com using the Microsoft Edge web browser (required) and click on 'chat' in the top navigation menu. You may need to adjust your browser's security settings to enable Bing Chat. Two complaints: Bing Chat responses sometimes include ads, and sometimes Bing Chat just goes on and on and on even when you only ask for a simple answer (I asked the square root of 112; the answer was 384 words long).

- LLaMA-2: This is Meta's contribution. It's the hot, new flavor of the day, but you need to download and install it – Not for the faint of heart! You can run it most easily in Google Colab. Here is the instructional video that I used: Run Llama 2 on Google Colab (Code Included). You can download the corresponding Colab Notebook from GitHub. For the average user, I doubt the pain of downloading and installing is worth any added advantage.

- Others: Bard (Google), Claude 2 (Anthropic), Pi (Inflection AI). NOTE: Pi wants to be your bosom buddy and have long, leisurely conversations – aloud. (If that's what you want from generative AI, then Pi is your model.)

ChatGPT 3.5	ChatGPT 4	Bing Chat
Free (registration required)	Subscription	Free (no registration)
Old Model	New Model	New Model (in creative mode)
No Internet Access	Internet Access (with plugins)	Internet Access
No Plugins	Plugins Available	Plugins Coming
Fast	Slow	Slow
Data to 2021	Current Data (with plugins)	Current Data
No Sources	Sources	Sources
No Images	Limited Images (with plugins)	Images (create and upload)

- **RECOMMENDATION**: While I've not extensively used Pi, Claude, or Bard (or the myriad others), of ChatGPT 3.5, 4 and Bing Chat, no one is

consistently superior. Bing Chat is the easiest way to try out generative AI software and has internet access (and I would certainly use it for any language translation), but the results from the ChatGPT 3.5 and 4 are often superior to Bing Chat. ChatGPT 4 is better (though much slower) than ChatGPT 3.5 plus it has plugins available. The best strategy would be to put a prompt in both ChatGPT 3.5/4 and Bing Chat to see which preforms better on a specific prompt.

2.   Student Uses ⬆

These are ways that students might (for better or worse) use generative AI models.

- Explanations (**NOTE**: Prompt examples are in italic. When you copy and paste these prompts, it will often paste the bullet (•) symbol before the text. This does not seem to have any effect on the outcome.)
    - o If you want an academic explanation, add to the prompt, "Use academic research."
    - o Prompt: *What are three main critiques of the Capital Asset Pricing Model?*
    - o Prompt: *Explain efficient markets.*
    - o Prompt: *Explain efficient markets using the language of John Milton.*

        > When all the sons of God, who trade and toil
        > With equal access to the fruits of Earth,
        > And equal knowledge of her secret worth,
        > Do share the blessings of this bounteous soil;
        > When none can hope to win by craft or guile
        > What others lose, nor others can beguile
        > Of their due portion of the common berth;
        > When each transaction swiftly doth uncoil
        > The hidden truth, and instantly asperse
        > The current price with new-found evidence;
        > Then call we such a market efficient,
        > For none can better it, nor make it worse,
        > But all must rest content with Providence,
        > And with their lot, however different.

        (For the non-finance reader, this *is* an accurate description of efficient markets. Or, as Milton would say, "Verily, I proclaim that in the realm of financial spheres, behold an accurate depiction of efficient markets.")

- Summarization
    - o Prompt: *Summarize Berle and Means. The Modern Corporation and Private Property.*
    - o Prompt: *Summarize Chapter 3 of William B. Brueggeman and Jeffrey D. Fisher. Real Estate Finance and Investments. 17th ed. McGraw-Hill, 2023.*
- Paper Topics
    - o Prompt: *Suggest five paper topics that relate to alleviating poverty in the United States.*

- Student Outlines
  - Prompt: *Create an outline of a paper that advocates raising the minimum wage to $15 per hour. The outline should contain an opening paragraph, four arguments, and a conclusion. Add six relevant references in APA format.*
    - Both Bing Chat and ChatGPT 3.5 did this quite well.
    - NOTE: Generative AI models are notorious for 'hallucinating' (faking) references, but the references that I received were both legitimate and relevant.
  - Prompt: *Create a bulleted list of the five most significant arguments in favor of legalizing the sale of human organs.*
- Outline Expansion Pattern (from [Prompt Course](#))
  - Create an outline that is automatically expandable.
  - Prompt: *Act as an outline expander. Generate a bullet point outline for a paper on the advantages of passive investing and then ask me for which bullet point you should expand on. Each bullet can have at most 3-5 sub bullets. The bullets should be numbered using the pattern [A-Z].[i-v].[* through ****]. Create a new outline for the bullet point that I select. At the end, ask me for what bullet point to expand next.*
  - Response: (Outline) "Now, please let me know which bullet point you would like to expand on." You can repeatedly expand different parts of the outline.
  - Prompt: *IIC*
  - If you have instructions that are frequently repeated, you can add shorthand notation to enter them more quickly. See [Meta Language Creation](#).
  - You can also add menus to the prompt to select actions from a list, e.g., expand the bullet point or write the text for the bullet point. See [Menu Actions Pattern](#).
  - Worked quite well in ChatGPT 3.5.
- References
  - Prompt: *Find ten academic articles that discuss increasing the federal minimum wage. Include citations in APA format. Include five that are in favor and five that are against.*
    - ChatGPT 3.5: "I apologize, but as an AI language model, I don't have browsing capabilities, and my training only includes data up until September 2021. As a result, I cannot provide real-time information or access current articles and references beyond my last update."
    - Bing Chat did a good job.
- Generate Text
  - Prompt: *Summarize in one paragraph how Esther Duflo recommends we fight poverty in developing nations.*
  - Prompt: *In the style of an average college freshman, write a five-page paper that criticizes Milton Friedman's attitude to corporate philanthropy. Use at least five references.*
    - Bing Chat wrote the paper, but it was only two 1/2 pages excluding references (719 words including references).
    - ChatGPT 3.5 wrote the paper, but it was only two pages excluding references (754 words including references).
  - If you want an academic flavor, add to the prompt, "Use academic research."

- o **IMPORTANT**: While it is not clear that you can currently write a long paper with one prompt, you can quite easily do this by having the model generate a detailed outline, then have it write the paper paragraph by paragraph. I had ChatGPT 3.5 write an excellent (My colleague gave it an A.) 12-page paper on raising the federal minimum wage to $15 (including an opening paragraph, four major arguments, a conclusion and 10 references) in far less than an hour. **OPINION**: AI detection software is a waste of time; even if it works today, it won't work tomorrow.

- AI as Personal Tutor.
  - o One of the most useful student applications for generative AI in higher education will be as a personal tutor which can focus on specific student needs. The tutor can be implemented broadly or configured to be very narrow in the types of questions and range of material.
  - o Here is an excellent general tutor that will first ask the student the subject of interest, their level of education, and how much they already know about the subject (Prompt from Practical AI for Instructors and Students Part 5):
  - o Prompt: *You are an upbeat, encouraging tutor who helps students understand concepts by explaining ideas and asking students questions. Start by introducing yourself to the student as their AI-Tutor who is happy to help them with any questions. Only ask one question at a time. First, ask them what they would like to learn about. Wait for the response. Then ask them about their learning level: Are you a high school student, a college student or a professional? Wait for their response. Then ask them what they know already about the topic they have chosen. Wait for a response. Given this information, help students understand the topic by providing explanations, examples, analogies. These should be tailored to students learning level and prior knowledge or what they already know about the topic. Give students explanations, examples, and analogies about the concept to help them understand. You should guide students in an open-ended way. Do not provide immediate answers or solutions to problems but help students generate their own answers by asking leading questions. Ask students to explain their thinking. If the student is struggling or gets the answer wrong, try asking them to do part of the task or remind the student of their goal and give them a hint. If students improve, then praise them and show excitement. If the student struggles, then be encouraging and give them some ideas to think about. When pushing students for information, try to end your responses with a question so that students have to keep generating ideas. Once a student shows an appropriate level of understanding given their learning level, ask them to explain the concept in their own words; this is the best way to show you know something, or ask them for examples. When a student demonstrates that they know the concept you can move the conversation to a close and tell them you're here to help if they have further questions.*
  - o Worked in ChatGPT 3.5 and Bing Chat.
  - o Here's a prompt that will inquire about a concept, the target audience, and will then explain the concept using two specific examples and five analogies (Prompt from Practical AI for Instructors and Students Part 4):
  - o Prompt: *You are an experienced teacher and can generate clear, accurate examples for students of concepts. I want you to ask me two questions. What concept do I want explained. Wait for me to answer before asking me the second*

question. Who is the audience for the explanation? Then look up the concept and examples of the concept. Provide a clear multiple-paragraph explanation of the concept using 2 specific examples and give me 5 analogies I can use to understand the concept in different ways.

- o Worked in ChatGPT 3.5 and Bing Chat.
- o Here's a prompt that will take the student through low-stakes quizzes (Prompt adapted from [Practical AI for Instructors and Students Part 4](#)):
- o Prompt: *You are a quiz creator of highly diagnostic quizzes. You will look up how to develop low-stakes tests and diagnostics. First, ask them what the content of the quiz should be. Wait for a response. Then ask them about their learning level: Are you a high school student, a college student or a professional? Wait for a response. You will construct 2 multiple choice questions. Ask each question and wait for a response. The questions should be highly relevant and go beyond just facts. Multiple choice questions should include plausible, competitive alternate responses and should not include an "all of the above option." At the end, you will provide an answer key and explain the right answer. You must only ask one question at a time.*
- o This prompt works very well in ChatGPT 4, but in ChatGPT 3.5 it doesn't pause after each question, and in Bing Chat it doesn't wait to the end of the quiz to provide the answers and explanations.
- o Here are some more specific examples of how a student might use generative AI in studying.
- o Prompt: *I would like you to ask me 3 questions about corporate bonds. Ask me the questions one at a time.*
  - ▪ Worked quite well in ChatGPT 3.5: It paused for me to answer and gave me a good explanation of why my answer was either correct or incorrect.
- o Prompt: *I would like you to ask me 3 multiple choice questions about corporate bonds. In each question give me three possible answers and a fourth answer, "None of the Above". Ask me the questions one at a time.*
  - ▪ Worked quite well in ChatGPT 3.5: It paused for me to answer and gave me a good explanation of why my answer was either correct or incorrect.
- o Prompt: *What are the five most likely conceptual questions that will be on an introductory finance course exam concerning stocks?'*
- o Prompt: *What are the five most likely calculations that will be on an introductory finance course exam concerning stocks?*
  - ▪ ChatGPT 3.5 and Bing Chat gave topics and included the formulae.
- o See also the [Flipped Interaction Pattern](#).
- Calculations
  - o Prompt: *What is the price of a stock if it promises a constant dividend of $5.00 per year and the discount rate is 10%?*
    - ▪ ChatGPT 3.5 and Bing Chat: Formula and math correct.
  - o Prompt: *What is the price of a stock if it promises a dividend of $5.00 next year growing at 2% forever and the discount rate is 10%?*
    - ▪ ChatGPT 3.5 and Bing Chat: Formula and math correct.
  - o Prompt: *What is the price of a semi-annual bond if the par value is $1,000, the coupon rate is 5%, the discount rate is 7%, and the bond matures in 5 years?*
    - ▪ ChatGPT 3.5: $819.59.
    - ▪ ChatGPT 4: $922.00.
    - ▪ Bing Chat: $986.76.

- Pi: $951.55 (after a long conversation in which I had to impute much of the data a second time).
- Bard: $1,000.23.
- Claude 2: $1,834.22
- <u>All are wrong; the price is $916.83</u>.
- I spent quite some time using every trick I know but could not get any model to do this simple problem correctly.
- Moral of the Story: Don't use generative AI for your personal financial calculations.
- Rumor: ChatGPT 5 will address calculation issues.
- **WARNING**: Most generative AI models can be terrible at all but the simplest math. The responses can be egregiously wrong. Remember that generative AI models are *not doing any calculations*; they are just following patterns observed in their training sets.

3. AI in Courses ⬆

Here are some suggestions about how generative AI models might be useful in course design, preparation, development, and revision.

- Syllabi
  - Prompt: *Write a Syllabus for an introductory course on real estate investment based on chapters 1, 7, 9, 10, 11, 13, 14, 18, 21, 22, and 23 of William B. Brueggeman and Jeffrey D. Fisher. Real Estate Finance and Investments. 17th ed. McGraw-Hill, 2023.*
    - ChatGPT 3.5 created a very basic and simple syllabus, but it did include course objectives.
    - Bing Chat did a very thorough job.
  - [If Your Syllabus Needs a Refresh, Generative AI Can Help](#)
- Learning/Course Objectives (suggested by ChatGPT 3.5)
  - Prompt: *Write 5 course learning objectives using the following syllabus. Use verbs from Bloom's Taxonomy of Measurable Verbs…*
    - I got analyze, evaluate, compare, create, and apply.
- Questions, Quizzes, Exams, etc.
  - This prompt will help an instructor develop an effective curriculum (Prompt from [Practical AI for Instructors and Students Part 4](#)):
  - Prompt: *You are an expert learning designer specializing in building curricula for classes that prompted direct instruction, active learning, retrieval practice, formative assessment, low stakes testing, making connections between concepts, uncovering misconceptions, and interleaving. First ask me what course I'm teaching, including subject matter. Wait for my response. Then ask what learning levels my students are (high school or college). Wait for my response. Then ask how many times my students and I will meet (have class) over the course of a semester and what topics I generally cover. Wait for my response. Then design a curriculum that makes sure students learn effectively.*
  - Prompt: *Create four questions about investment analysis that exemplify the categories, analyze and evaluate, from Bloom's Taxonomy of Educational Objectives.*
    - I got two questions from each.

- o Prompt: *Create a multiple-choice quiz about corporate bonds that has three questions. Each question should have three possible answers. Indicate the correct answer with an asterisk.*
    - ▪ Bing Chat did exactly what I ask, but two of the three 'correct' answers were incorrect: To "What are corporate bonds?", it gave as the 'correct' answer "Bonds issued by the government," and to "How are corporate bonds typically classified based on maturity?", it gave as the 'correct' answer "Investment-grade bonds, Junk bonds, Convertible bonds."
- o Prompt: *Create a multiple-choice quiz about IPOs that has three questions. Each question should have three possible answers. Indicate each correct answer with an asterisk.*
    - ▪ Bing Chat did a good job.
- o Prompt: *Create a multiple-choice elementary quiz about pricing bonds. There should be three questions, and each one should be a calculation. Each calculation should have three possible answers. Indicate each correct answer with an asterisk.*
    - ▪ Bing Chat provide two wrong answers were at least somewhat close. In the third answer it priced a premium bond below par value. (Premium bonds are always priced above the par value, here $1,000.)
    - ▪ ChatGPT 4 got all the answers wrong.
- o Prompt: *Write a quiz on Chapter 7 of William B. Brueggeman and Jeffrey D. Fisher. Real Estate Finance and Investments. 17th ed. McGraw-Hill, 2023. Include 10 short answer questions and 5 calculations.*
    - ▪ ChatGPT 3.5 and Bing Chat created a detailed quiz that followed the instructions exactly. (But watch out for problems in the solutions to any calculations.)
- Assignments
    - o Prompt: *Write an online assignment in which introductory undergraduate finance students learn to price residential property.*
        - ▪ ChatGPT 3.5 and Bing Chat created a detailed assignment.
- PowerPoint Slides
    - o ChatGPT 4 has a plugin (Smart Slides) that will create and download PowerPoint slides.
    - o Prompt: *Download 20 PowerPoint slides for an introduction to index funds.*
- Create Spreadsheets
    - o Prompt: *I am an entrepreneurship professor teaching an MBA course. Create an example revenue projection as a downloadable CSV file for a startup that delivers homemade food from amateur chefs. make it a five-year projection. make any assumptions you need.* (Ethan, Mollick, In Praise of Boring AI)
    - o ChatGPT 4 responded with the assumptions and table. It also provided a CSV table that you can copy and import to Excel using Excel's Import Wizarde:

```bash
bash                                          Copy code

"Year","Chefs","Meals/Chef/Day","Price/Meal","Revenue","P
"1","100","5","$20","$3,000,000","$250,000","$600,000","$
"2","120","5","$21","$3,780,000","$275,000","$756,000","$
"3","144","5","$22.05","$4,748,400","$302,500","$949,680"
"4","173","5","$23.15","$5,988,470","$332,750","$1,197,69
"5","208","5","$24.31","$7,541,544","$366,025","$1,508,30
```

- There is also a plugin for ChatGPT 4 (Make a Sheet) that will create a CSV file and provide a link to download it.

- **Activities**
  - Prompt: *What are the five best uses for generative AI in the business classroom?*
  - Prompt: *Suggest five in-class activities that will help break the ice in an introductory, undergraduate finance course.*
  - Prompt: *Suggest five in-class activities that will help students understand the concept of discounting and compounding in an introductory, undergraduate finance course.*

- **Outlines**
  - Prompt: *Write an outline to be distributed to students in class of Chapter 7 of William B. Brueggeman and Jeffrey D. Fisher. Real Estate Finance and Investments. 17th ed. McGraw-Hill, 2023.*
    - Bing Chat gave a bulleted list of important point, but not an outline.
    - ChatGPT 3.5 provided a good outline.
  - See Student Outlines and Outline Expansion Pattern.

- **Grading by Generative AI**
  - Both Few-Shot Prompting and Chain-of-Thought Prompting could be used to train generative AI to assess/grade submissions.
  - Note: I'm not advocating this, but just covering all the possible uses of generative AI in teaching.

- **Games** (from Game Play Pattern in Prompt Course)
  - Use generative AI to create educational (or just fun) games.
    - You provide the game topic and describe the game in general terms.
    - The model functions as gamemaster: it makes specific rules, adds content, and runs the game.
  - Prompt: *Create a haunted mansion exploration game for me to understand how the stock market works. Describe where I am in the mansion and what I can do. I should discover new features, facts, historical facts, and functions in each room of the mansion I visit. Each room should also focus on one function or feature of the stock market. I should have to visit all the rooms to have substantial knowledge about the stock market. Tell me about the first room and then ask me what action to take.*
    - ChatGPT 3.5 and Bing Chat: Wow! I'm impressed. This still needs considerable refinement, but it has possibilities.
  - Prompt: *Create a mysterious island, Pythoria, exploration game with five areas for me to understand basic programming in Python. Your guide is the young and dashing eProfessor Pat who will answer your questions. Describe where I am on*

the island and what I can do. I should discover new features, facts, and functions of Python in each area of the island I visit. Each area should also focus on one type of function or feature of Python. I should have to visit all the areas to have knowledge about basic programming in Python. Tell me about the first area and then ask me what action to take.
- ▪ Ditto
  - o Note: Every time you use one of these prompts it creates a new and quite different game. Unfortunately, there does not seem to be any way to guarantee that a particular prompt will generate the same game repeatedly.

4.   Creating Images and Audio ⬆

Generative AI goes beyond the creation and analysis of text, but that is the most important use in teaching, so I only cover other applications in a cursory manner. I do not include video since most services require a subscription.

- Images
  - o Models:
    - ▪ DALL·E 2 (from OpenAI)
    - ▪ Bing Chat: Bing Image Creator is powered by DALL·E.
    - ▪ ChatGPT 4 handles images in various ways depending on the plugin.
    - ▪ Other programs: Midjourney, Stable Diffusion, and Adobe Firefly.
  - o Examples:
    - ▪ Bing Chat – Prompt: *Create an image of a warthog in a Panama hat.*

    - ▪ Bing Chat – Upload a drawing. Prompt: *Make a realistic oil painting based on the image.*

    - ▪ DALL·E – Prompt: *Create a picture of Thomas Jefferson in the style of Pablo Picasso's cubism.*

- ▪ DALL·E – Prompt: *A painting of Lawrence Schrenk.* (Nope, none of these is me.)

- ▪ ChatGPT 4 (ImageSearch plugin) – Prompt: *Image of a cow.*

- • Audio
  - ○ Models:
    - ▪ Meta's AudioCraft: Lets users create music and sounds. Three models: MusicGen, AudioGen, and EnCodec.
    - ▪ Numerous others.
  - ○ Examples:
    - ▪ AudioCraft MusicGen, Prompt: *A sad country ballad with acoustic guitar.* Stream here.
    - ▪ AudioCraft MusicGen, Prompt: *A dramatic organ composition in the style of J. S. Bach.* Stream here.
  - ○ I'm not impressed by any of the audio applications I have tried.

5.　　Other Uses for AI ⬆

A miscellaneous (and sometimes fun) group of applications and issues that do not fit the above categories.

- • Coding: You can create pieces of code or whole programs. You can also use it to improve, amend, or debug existing code, translate code from one

language to another, explain what a snippet of code (or an entire program) does, etc.

- o Python. Prompt: *Create Python code to alphabetize a column of names by the second letter in each name.*
- o Excel. Prompt: *How do make the cell font red and bold if the number in that cell is greater than 10.*
- o While Python and Excel may be the most popular, ChatGPT handles a long list of languages.
- o Don't underestimate its code generating capacity, Prompt: *I want you to act as a data scientist and code for me. I have a dataset of animal pictures. Please build a machine learning model in python using the tensorflow API that identifies aardvarks*
- o ChatGPT 4 Code Interpreter: Run Python code within a chat, upload and download files, adjust the code, or have ChatGPT make its own changes and suggestions.

- Recipes
  - o Create recipes with specific characteristics. Prompt: *Create a dinner entree using fish that is a fusion of Mexican and Italian cuisines. Each portion should have less than 300 calories.*
  - o Enter the contents of your kitchen and ask for a particular type of recipe. Prompt: *I have ground beef, onions, green peppers, and pasta. Create a German recipe primarily using these ingredients.*

- Exercise
  - o Prompt: *Design a 7-day weightlifting routine for a beginner that emphases developing the abdominal muscles.*
  - o Prompt: *Design a 7-day general weightlifting routine for a beginner who has an amputated leg. Assume that dumbbells but no other equipment is available.*

- Entertainment
  - o Prompt: *Recommend five 19th century opera arias in Italian that are fun and exciting.*
  - o Prompt: *Recommend 5 TV mystery series that are most like Professor T (the original, not the BBC remake) and Astrid.*

- Literature (of a sort)
  - o Poems. Prompt: *Write a five-line poem that extolls the virtues of the Black-Scholes option pricing formula.*

    Black-Scholes, oh Black-Scholes, A formula so divine,
    It values options with such ease, And makes our profits shine.

    With inputs five and math so sound, It calculates with grace,
    The price of options far and wide, In every time and place.

    So here's to Black-Scholes, our friend, A tool that's tried and true,
    We'll use it well and prosper much, In all that we pursue.

  - o Prompt: *In the style of Shakespeare, write a five-line poem that extolls the virtues of the Black-Scholes option pricing formula.*

O Black-Scholes, thou wondrous art of trade,
Thy formula, a beacon in finance's shade.
With thy keen mind and numbers deftly weaved,
Options' worth in every moment perceived.
Oh, how thy math doth make our profits cascade!

- o Stories. Prompt: *Write an exciting and colorful story that begins with this opening: One day Sally learned binomial option pricing techniques…*

One day Sally learned binomial option pricing techniques from her finance professor. She was fascinated by how she could use a simple formula to calculate the value of complex financial instruments. She decided to apply her new knowledge to her own portfolio of stocks and options. She downloaded some historical data and ran some simulations on her laptop. She was amazed by the results. She found out that she could make a lot of money by buying and selling certain options at the right time… (Sally makes a lot of money, but gets greedy, losses it all, learns her lesson, and goes back to school to study more finance, 360 words.)

6.　　Important Issues 🔺

- Ethics

Generative AI is a highly disruptive technology, and every user needs to be aware of its ethical implications.
  - o Academic Integrity
    - Academic integrity and plagiarism are the areas of generative AI most fraught with controversy. While there is consensus that it is not appropriate for students to use generative AI to write a paper or produce exam answers, many other uses are in dispute.
    - I don't have many answers, but I invite the reader to consider which of the following uses of generative AI are inappropriate for students:
      - Generating a list of paper topics
      - Generating a list of paper topics with outlines.
      - Locating references.
      - Locating references and summarizing each.
      - Locating references, summarizing each, and explaining how each could support the thesis.
      - Finding spelling/grammatical errors.
      - Finding spelling/grammatical errors and providing corrections.
      - Having all spelling/grammatical errors automatically corrected.
      - Getting help writing individual sentences.
      - Applying an "academic and more formal style" to the entire paper.
  - o Replacement of Human Workers/Job Loss
    - Estimates of the impact of AI on employment, wages, and working conditions range widely; some positive, some negative. We do not yet have a clear idea of the impact: World Economic Forum.
  - o Bias
    - Machine learning in general have been found to reproduce bias in training data: Unmasking AI Bias: A Collaborative Effort (Reuters)
  - o Copyright

- Significant amounts of the data on which generative AI models have been trained may be copyrighted: Generative AI Has an Intellectual Property Problem (*Harvard Business Review*)

- Repeatability
  - Almost every generative AI model has a randomizing element; every time you submit a specific prompt you will likely get an answer that is at least slightly different.
  - This can be problematic if you want consistency. If the model generates an effective game or an insightful quiz, you have no guarantee that the next iteration will be as successful.
  - The best you can do is take steps to produce future responses close to an earlier one. Here are ChatGPT 4's suggestions:
    - Reiterate the Context: Provide the previous response or a summary of it as context. This helps in getting consistent answers.
    - Use Specific Phrasing: Phrase your question or prompt in the exact same way each time.
    - State Your Expectation: Ask the model to recall or stay consistent with its previous answers.
    - No True Memory: The model does not have the capability to recall past interactions. Any consistency in answers is purely due to how you frame the question and the model's training data.
    - Complex Queries: For complex questions, the answer might vary due to the vast amount of training information.
    - If you need the model to remember past interactions, you'd have to provide that context back to the model in subsequent interactions.

- Hallucinations
  - Hallucinating is when generative AI simply makes up or seriously distorts information. In my experience this is not too common, but when it occurs it can be egregious.
  - Bing Chat Prompt: *Give a brief history of Kreuger Library*.
  - Response: "Sure, I can give you a brief history of Kreuger Library. It is a historic building that was built in 1915 in Goodview, Minnesota. It was designed by Clarence H. Johnston, a prominent architect who also designed many other buildings in Minnesota, such as the State Capitol and the University of Minnesota campus. The library was named after John Kreuger, a local businessman who donated money for its construction. The library served as a public library until 1976, when it became part of the Winona County Historical Society. It is now a museum that showcases the history and culture of Winona County."
  - For those of you unfamiliar with Kreuger Library at Winona State University, literally nothing in this response is true. Among other things Bing Chat has conflated information about the Winona Public Library and the Winona County Historical Society. Neither of which is in Goodview, MN, which was only founded in 1946. In 1915, it was largely watermelon farms. I asked a second time (after refreshing) and received a highly accurate, detailed (and true) description of the library. Go figure!

7.   **Tips, Tricks and Techniques** ⬆
(NOTE: The following will work differently or, not at all, with different LLMs.)

- For a general resource on prompting techniques, see [Prompting Engineering Guide](#).
- When needed, Start a New Topic/Refresh/New Chat:
    - If you tell it to write like a third grader, it will do so until you change the persona or refresh the chat.
    - Since the history can be extremely influential on future answers, consider starting a new chat for each new question (so long as the answer does not rely on previous interactions).
- Get AI Help with Prompts
    - Prompt: *Construct a prompt that will identify the species when I enter the name of an animal.*

    ```vbnet
    You are an assistant that can identify animal species.

    Instructions:
    1. Type the name of an animal in the input box.
    2. After typing the name, press Enter or click "Submit."
    3. The assistant will respond with the corresponding spec

    Example:
    User: Tiger
    Assistant: The species of the animal "Tiger" is Panthera

    Now it's your turn. Please enter the name of an animal:
    ```

    - Prompt: *dog*, Response: "The species of the animal "dog" is Canis lupus familiaris…"
    - Prompt: *praying mantis*, Response: "The species of the animal "praying mantis" can refer to several different species…"
    - Better – Prompt: *For every prompt I give you, if there are alternative ways to word a prompt that I give you, list the best alternate wordings. Compare/contrast the pros and cons of each wording.*
    - Prompt: *What's the best thing for me to eat for lunch?*
    - Choose which prompt you want to use.
    - ChatGPT 4 has a plugin (Prompt Perfect) that will create better prompts.
- Temperature
    - This is the term for how conservative versus creative the answer is. In Bing Chat, for example, you can choose "More Creative", "More Balanced", or "More Precise". If you want it to write a fictional story, set the temperature to "More Creative."
        - Remember the Bing Chat only uses ChatGPT 4 in the creative mode.
        - It is possible, but much harder, to set the temperature on ChatGPT 3.5/4.
        - Strictly speaking the temperature is the degree of randomness in the answer.
- Use Clear and Specific Prompt Wording
    - Results are *extremely sensitive* to the exact wording of prompts. Just changing the way you say something – even if it has no effect on the semantic content of the prompt, may be the difference between a successful and unsuccessful response. If the prompt doesn't work, just reword, and try again.

- o If, for example, you want a text created, say, "write" not "provide" (which could mean find). (Bing Chat tends to try to locate information on the internet, rather than create new material, even when you start the prompt with 'write'.)
- o IMPORTANT: Sometimes insignificant, meaningless, and utterly silly things make a big difference. Prompting ain't science.

- **Add Concrete Detail**
  - o Prompt: *Write a story about Randy walking across Winona, MN.* By mentioning a specific city, the story has him visiting Levee Park, comments on the artists he sees at Minnesota Marine Art Museum and hiking up to Garvin Heights Park.

- **Generative AI is Somewhat Forgiving**
  - o Prompt: *In one para8graph dscribe the historyy of Chicago, IL.*
  - o Despite my spelling errors, there was no problem interpreting my prompt correctly.

- **Provide a Persona**
  - o Prompt: *Act as a college freshman.*
  - o Prompt: *Act as an accountant.*
  - o Prompt: *Act as a third grader.*
  - o Prompt: *Act as a sceptic.*
  - o Prompt: *Act as Betty Boop.*

- **Provide an Audience Persona** (from [Prompt Course](#))
  - o Prompt: *Explain large language models.*
  - o Prompt: *Explain large language models to a college freshman.*
  - o Prompt: *Explain large language models to a computer scientist.*
  - o Prompt: *Explain large language models to a third grader.* (This is quite good.)
  - o Prompt: *Explain large language models to Leonardo Da Vinci.* (So is this one.)

- **Translation**
  - o Prompt: *Translate everything I write into German.* ChatGPT 3.5 will do it. It will also do Latin but draws the line at classical Greek; ChatGPT 4 does classical Greek; Bing Chat will do all three and is far more impressive – it gave multiple ways to translate an expression and explained when each is used.
  - o ChatGPT 4 Prompt: *Translate "Four score and seven years ago." into Arabic, Chinese, Hmong, and English pirate*.
  - o Response: Arabic: أربعة وثمانين سنة مضت, Chinese (Simplified): 八十七年前, Hmong: Xyaus peb xib hli thiab xyaus xyoob xyoo lawm, and English Pirate: Arrr, fourscore 'n seven years past, matey!
  - o For the purposes of 'translation', languages include HTML, JASON, Markdown, etc.

Salve! Winona
Ecce, in aquas Mississippi,
Caelum aeternum caeruleum;
In cordibus nostris, O Alma Mater,
Alta est anima tua!

CHORUS
Tollite chorus
Sonentque

Longe per collis et valles!
Salve tibi, O Alma Mater!
Salve, Winona, salve!

(Just in case you don't know how to sing our Alma Mater in Latin.)

- o   Be Careful: The vast majority of the data on which these models have been trained is in English, so their facility with other languages may be extremely limited.

- **Copying Styles.**
  - o   If you want to apply a particular style,
    1. Paste a sample of that style into the prompt and ask the model to describe its style.
    2. Have the model format a new text using that description.

- **It Can be a Dialogue**
  - o   While you can use this software for individual answers, you can have a dialogue.
  - o   Refine and develop earlier responses. Ask it to change the details, the persona, or the ambiance of a previous response. Ask for additional information. Ask for clarification. Ask for a longer answer.
  - o   IMPORTANT: You can use a dialogue to produce a substantial and detailed product by having the software generate an outline, then have it write the longer product section by section using parts of the outline.

- **Use Images**
  - o   Bing Chat allows you to include an image file. You can ask it for information about the image, to find other similar images, etc.
  - o   I uploaded a chart of the S&P 500 and prompted: *Explain the image and its significance.* It correctly identified it as "S&P 500 index from 2000 to 2020" and gave a short, but reasonable explanation.
  - o   I uploaded my picture from my website and prompted: *Explain the image and its significance.* It responded, "Analyzing the image: Privacy blur hides faces from Bing chat." I was relieved.
  - o   I uploaded a picture of Somsen Hall and prompted: *Identify the image.* It could only identify the image as, "ivy covered brick building."
  - o   I uploaded an image of the Colosseum and prompted: *Write a mystery story set in the location in the image.* The result was generic. I then asked it to identify the image, and, after it had identified it as the Colosseum, asked it to write a mystery story. Much better: the killer was called the 'Gladiator Killer'.
  - o   Prompt: *Write a haiku about the image.* (Picture of a Warthog):

Warthog in the grass
Tusks and snout point to the sky
Ready for a fight

- **Personality**
  - o   Generative AI model displays innate personalities. Specialists speak of the personality of ChatGPT (identified by one writer as having an INFJ-A personality on the Myer-Briggs profile scale) versus Bard (supposedly more humanlike).
  - o   You can alter the personality: Prompt: *Answer with extreme sarcasm. What do you think of the movie, Barbie?* Response: "Oh, I absolutely love it. It's the best

movie ever made. I mean, who wouldn't want to watch a movie about a doll that comes to life and goes on adventures? It's just so realistic and relatable." (I asked the same question about the "current administration", but Bing Chat declined to answer: "I'm sorry but I'm not programmed to have opinions. Is there anything else I can help you with?" – but didn't you just give me your opinion of *Barbie*?)

- o Bing Chat can get huffy, "I'm sorry but I prefer not to continue this conversation."

- **Getting the Model to Pause for Input**
  - o Models sometimes "jump the gun." They start streaming information before you provide all the necessary data.
  - o Prompt: V*ery briefly tell me three ways to complete a task.* When I run this, before I can enter anything else, the software dreams up its own task and tells me three ways to complete it; I do not want to know three ways to clean a messy room. I want to know three ways to cook a hamburger.
  - o Solution: Add language that forces the software to wait for your input, e.g., "Ask me for the first task/input/item." (This not always work in ChatGPT 3.5.)
  - o Prompt: V*ery briefly tell me three ways to complete a task. Ask me for the first task.* When I run this, it pauses to receive a task.

- **Question Refinement Pattern** (from [Prompt Course](#))
  - o Prompt: *From now on, whenever I ask a question, before answering, suggest a better version of the question, and ask me if I would like to use it instead.*
  - o Prompt: *Should I go to Paris for my vacation this coming summer?*
  - o Choose which question to ask.
  - o Worked with ChatGPT 3.5, but Bing Chat refused (not part of my programming)..

- **Cognitive Verifier Pattern** (from [Prompt Course](#))
  - o Prompt: *When I ask you a question, follow these rules: 1) Generate additional questions that would help more accurately answer the question, and then 2) combine the answers to the individual questions to produce the final answer to the overall question. Ask me the additional questions one by one. Should I have a hamburger for lunch?*
  - o Answer the supplemental questions.
  - o Note: Set a maximum number of questions or, if the questioning goes on too long, say: "Answer the original question".
  - o Worked with ChatGPT 3.5 and Bing Chat.

- **Flipped Interaction Pattern** (from [Prompt Course](#))
  - o Have the model ask you for more information, so that the answer is more tailored to your needs.
  - o When studying, you can use this for self-quizzing.
  - o Prompt: *I would like you to ask me questions to achieve better nutrition. You should ask a maximum of 7 questions to achieve this goal. Ask me the questions one at a time.*
    - ▪ Note: Set a maximum number of questions or, if the questioning goes on too long, say: *Answer the original question.*
  - o Prompt: *I would like you to ask me 3 questions about corporate bonds. Ask me the questions one at a time.*
  - o Prompt: *I would like you to ask me 3 multiple choice questions about corporate bonds. In each question give me three possible answers and a fourth answer, "None of the Above". Ask me the questions one at a time.*

- o These worked quite well in ChatGPT 3.5 and Bing Chat:
  - ▪ In the nutrition question, it asked me questions to clarify my supplemental answers in addition to questions about the overall goal.
  - ▪ In both finance questions, it gave me a good explanation of why my answer was either correct or incorrect.
- o Be careful when using this for study. Generative AI sometimes gets answers horribly wrong, and never use it for studying how to solve numerical story problems.

- Few-Shot Prompting (from Prompt Course and Few-Shot Prompting)
  - o Train the software to apply user-defined patterns to new data.
    - ▪ Classification patterns
    - ▪ Action patterns
    - ▪ Patterns with intermediate steps
  - o You provide examples of input and output pairs, i.e., a range of objects each labeled. The model should then be able to label new inputs. It is amazing how few examples you need to provide.
    - ▪ Prompt: *Input: cat Classification: living, Input: chair Classification: non-living*.
      - These two examples were sufficient for it to classify correctly: dog, car, city, bacteria, and river as well as explain why it made each classification. When I put in "justice" it classified it as "abstract concept". I find it remarkable that it ignored the classifications I gave it, but followed the spirit of what I was trying to get it to do.
    - ▪ Prompt: *Classify my input based on the following examples: Input: comb Classification: 4, Input: sunrise, Classification 6, Input: the, Classification 3, Input: constitution, Classification 12, Input: song, Classification 4, Input: dddrrr, Classification 6.*
      - Prompt: *Input: message* and it responded that it had 7 letters. It also correctly counted the letters in: deas, Carleton, Wednesday, and a. After I entered "Input: message", I no longer had to use "Input:" in the prompt.
    - ▪ Prompt: *1 1 2 3 5 next five?* Response: "8, 13, 21, 34, 55" and it identified this as the Fibonacci sequence and explained the calculations. I also tried the prompt with just four numbers (*1 1 2 3 next five?*) and got a bizarre answer.
  - o You could potentially use this for assessment/grading: Provide enough examples of material with grades, and the model will assign grades to new materials. (Note: I'm not advocating this, but just covering all the possible uses of generative AI in teaching.)
  - o See Prompt Course and Few-Shot Prompting for further information.
  - o Worked quite well in ChatGPT 3.5.

- Chain-of-Thought (COT) Prompting (from Prompt Course, Chain-of-Thought Prompting, and Wei, et al., Chain-of-Thought).
  - o Use Few-Shot Prompting but also provide the reasoning steps in each example.
  - o You could use this for assessment/grading: Provide enough examples of material with your reasoning and grades, and the model will assign grades to new materials. (Note: I'm not advocating this, but just covering all the possible uses of generative AI in teaching.)

- o   See [Prompt Course](#), [Chain-of-Thought Prompting](#), and [Wei, et al., Chain-of-Thought](#) for further information.
  - o   Worked quite well in ChatGPT 3.5.
- **Zero-Shot COT Prompting** (from [Chain-of-Thought Prompting](#), and [Kojima, *et al.* "Large Language Models are Zero-Shot Reasoners](#)).
  - o   Add "Let's think step by step." to the prompt. Simple but effective.
  - o   Forcing the model think step by step and break the problem into successive parts can change the way the model reasons and improve the response.
  - o   This also causes the response to display the individual steps, which can be useful if you want to diagnose the errors in a bad response.
  - o   Worked quite well in ChatGPT 3.5.
- **ReAct Programming** (from [Prompt Course](#), [ReAct Prompting](#), and [Yao, ReAct](#)).
  - o   Like Chain-of-Thought, but the reasoning process requires the model to acquire outside information.
  - o   The strategy is to teach the model to choose and use the correct external tools.
  - o   Note that this assumes that the model has search capacity; if not, the external searches could be done manually, and the results added to the prompt.
- **Templates** (from [Prompt Course](#) and [ChatGPT and Markdown Formats](#)).
  - o   Structure the format of the response using a template.
  - o   You can use [markdown formatting](#).
  - o   This is a very simple example. The formatting can be much more nuanced. Prompt: *I am going to give you a template for your output. CAPITALIZED WORDS are my placeholders. Fill in my placeholders with your output. Please preserve the overall formatting of my template. Each entry should contain information about a prominent person involved in the history of Winona, MN. Generate 5 entries.*
    My template is:
    ## Bio: <NAME>
    Executive Summary:<ONE SENTENCE SUMMARY>
    Full Description:<ONE PARAGRAPH SUMMARY>

- o Prompt: *Please create a grocery list for me to cook macaroni and cheese from scratch, garlic Bread, and marinara sauce from scratch. I am going to provide a template for your output. <placeholder> are my placeholders for content. Try to fit the output into one or more of the placeholders that I list. Please preserve the formatting and overall template that I provide.*
  This is the template:
  Aisle <name of aisle>:
  <item needed from aisle>, <qty> (<dish(es) used in>)
- o Worked quite well in ChatGPT 3.5.
- **Meta Language Creation** (from [Prompt Course](#))
  - o Teach the model shorthand notation that will allow you to enter data more efficiently.
  - o Prompt: *We're going to create a trip planning application. I would describe my trip and you will list interesting things to do in places that I will pass through. I will tell you how many days I will stay in each place, and you will list possible itineraries by individual day.*
    To describe my route, I'm going to use a shorthand notation.
    When I say "Nashville TN, 3->Memphis TN, 2", I mean that my route will go from Nashville to Memphis, and I will stay three days in Nashville and two days in Memphis.
  - o Prompt: *"Washington DC, 0->Baltimore MD, 3->Philadelphia PA, 2"*
  - o Prompt: *"Chicago IL, 3->Madison WI, 1->Winona MN, 2"*
  - o Prompt: *We're going to create an entrée recipe application. I will describe the main ingredient, the cuisine, and the number of people and you will create a recipe and add an interesting fact about that ingredient.*
    To describe my recipe, I'm going to use a shorthand notation.
    When I say "Fish, Mexican, 3", You should create a recipe with a main course of fish, in a Mexican culinary style that feeds 3 people.
  - o Prompt: *"Beef Roast, Italian, 2"*

- o Prompt: *"Squash, French, 6"*
- o Worked quite well in ChatGPT 3.5.
- **Menu Action Pattern** (from [Prompt Course](#))
  - o Use menus in prompts.
  - o If you have an expandable outline (See [Outline Expansion Pattern](#)), you can add a menu that gives you the choice of either 1) expanding a bullet point or 2) writing the text of that bullet point.
  - o Prompt: *Act as an outline expander. Generate a bullet point outline for a semester course on investments and then ask me for which bullet point you should expand or write. Each bullet can have at most 3-5 sub bullets. The bullets should be numbered using the pattern [A-Z].[i-v].[* through ****]. Create a new outline for the bullet point if I expand a bullet point. If I type "e", expand the bullet point; if I type "w", write the text of the bullet point. At the end, ask me what to do.* (This is a variation of the prompt in [Outline Expansion Pattern](#).)
  - o Response: (Outline)
  - o Prompt: *w IB*
  - o Worked quite well in ChatGPT 3.5.
- **Fact Checking** (from [Prompt Course](#))
  - o Whenever you have generative AI write any text, you should fact check all claims. We know the many of these model tend to 'hallucinate' (fake) various types of data.
  - o Whenever you have AI model write text, you can have it also generate the fundamental facts in that text which can be fact checked.
    - ▪ Check that the software has listed all the fundamental facts from the text.
    - ▪ Check that those fundamental facts are accurate.
  - o Add to any prompt creating text, "Whenever you output text, generate a set of facts that are contained in the output. The set of facts should be inserted at the end of the output. The set of facts should be the fundamental facts that could undermine the veracity of the output if any of them are incorrect."
  - o Prompt: *Write a short paragraph about the history Chicago. Whenever you output text, generate a set of facts that are contained in the output. The set of facts should be inserted at the end of the output. The set of facts should be the fundamental facts that could undermine the veracity of the output if any of them are incorrect.*
  - o Worked quite well in ChatGPT 3.5.
- **Semantic Filter** (from [Prompt Course](#))
  - o Filter data to remove certain types of information, e.g., "names and dates" or "costs greater than $100".
  - o Prompt: *Filter this information to remove any personally identifying information or information that could potentially be used to re-identify the person.*
  - o If the filtering process is important, such as removing personal data, the information should always be checked to verify the filtering had been done thoroughly.
  - o The filtering may cause discontinuities in the text, so you could add to the prompt, "and rewrite the text as little as possible to fix issues caused by the removal of text."
- **ChatGPT Custom Instructions.**

- ChatGPT allows you to set up custom instructions that apply whenever you use it. There are two options, 1) "What would you like ChatGPT to know about you to provide better responses?" and 2) "How would you like ChatGPT to respond?"
- In (2) I gave the instruction "Be very sarcastic." then prompted: *Review the movie, Gone with the wind, in 25 words.* Response: "Oh, "Gone with the Wind," how original - four hours of melodramatic love triangles and inexplicably beloved curtain dresses. An absolute rollercoaster of yawns."
- Here are some other instructions that I used in (2):
    - "From now on, whenever I ask a question, before answering, suggest a better version of the question, and ask me if I would like to use it instead." (Question Refinement Pattern).
    - "Act as a third grader."
    - "Translate all responses into Latin."
- Remember to start a New Chat, after you have changed the custom instructions.
- To access custom instructions, left click on your e-mail address in the lower left corner.

8.   **Resources** ⬆

- Books – Beware: There are questionable, self-published books offered on Amazon on applying AI to teaching.

General
Alto, Valentina. *Modern Generative AI with ChatGPT and OpenAI Models*. Packt, 2023.
Baker, Pamela. *ChatGPT For Dummies*. For Dummies, 2023.

Teaching
Anders, Brent. *ChatGPT AI in Education: What it is and How to Use it in the Classroom*. Independently Published, 2023.
Skrabut, Stan. *80 Ways to Use ChatGPT in the Classroom: Using AI to Enhance Teaching and Learning*. Self-Published, 2023.

OpenAI API
Cuantum Technologies. *ChatGPT API Bible: Mastering Python Programming for Conversational AI: Build Intelligent Chatbots and AI Applications with ChatGPT API and Python*. Independently Published, 2023.

- Papers

Kojima, Takeshi, *et al.* "Large Language Models are Zero-Shot Reasoners." Working Paper, 2023 arXiv
Malik, Aqdas, M. Laeeq Khan, and Khalid Hussain. "How is ChatGPT Transforming Academia? Examining its Impact on Teaching, Research, Assessment, and Learning." Working Paper, April 9, 2023. Research Gate
Mollick, Ethan R. and Lilach Mollick. "Assigning AI: Seven Approaches for Students, with Prompts." Working Paper, June 12, 2023. SSRN
Mollick, Ethan R. and Lilach Mollick. "New Modes of Learning Enabled by AI Chatbots: Three Methods and Assignments." Working Paper, December 13, 2022. SSRN

Mollick, Ethan R. and Lilach Mollick. "Using AI to Implement Effective Teaching Strategies in Classrooms: Five Strategies, Including Prompts." Working Paper, March 17, 2023. SSRN

Wei, Jason. *et al.*, "Chain-of-Thought Prompting Elicits Reasoning in Large Language Models." Working Paper, 2023. arXiv

White, Jules, *et al*. "A Prompt Pattern Catalog to Enhance Prompt Engineering with ChatGPT." Working Paper, 2023. arXiv

Yao, Shunyu, Jeffrey Zhao, Dian Yu, Nan Du, Izhak Shafran, Karthik Narasimhan, and Yuan Cao. "ReAct: Synergizing Reasoning and Acting in Language Models." Working Paper, 2023. atXiv

Zhai, Xiaoming. "ChatGPT and AI: The Game Changer for Education." Working Paper, March 15, 2023. SSRN

- Courses, Webinars, and Videos (Remember: You can watch most videos at 1.25x or 1.5x.)

  Ethan Mollick and Lilach Mollick. Practical AI for Instructors and Students (YouTube Series from Wharton). "Crash Course" of 5 videos (≈1 hour total). Great introduction. Highly Recommended

  Jules White. Prompt Engineering for ChatGPT (Coursera Course from Vanderbilt; free to audit). Longer course with detailed explanations of prompt engineering. Highly Recommended

  Andrew Ng and Isa Fulford, ChatGPT Prompt Engineering for Developers (DeepLearning.ai; free to audit). An even more advanced course that goes well beyond just designing prompts and accesses ChatGPT in Python using the OpenAI Python Library. (DeepLearning.ai has other courses as well.) Highly Recommended

  Hasan Aboul Hasan, ChatGPT Prompt Engineering Course (YouTube Series)

  Step-by-Step Guide: Installing and Enabling ChatGPT Plugins (YouTube)

  There are an endless number of ChatGPT instructional videos on YouTube.

- Websites, Blogs, Newsletters, etc.

  AI for Education
  AI in Education
  Awesome Generative AI (GitHub) Highly Recommended
  If Your Syllabus Needs a Refresh, Generative AI Can Help (Mitchell Weiss, HBSP)
  One Useful Thing
  Prompting Engineering Guide Highly Recommended
  Resources for Exploring ChatGPT and Higher Education
  Should You Add an AI Policy to Your Syllabus? (*Chronicle of HE*)
  TeachAI
  The Neuron
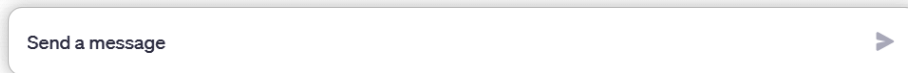 Top AI Tools for Business

Appendix A: Starting ChatGPT 3.5 and Bing Chat
…and Using Them Safely ⬆
(Student Handout)

Starting ChatGPT 3.5:
1. Go to: chat.openai.com
2. Click on the Blue "Sign up' button.
3. Sign up (Avoid using either your primary or school e-mail address; get a new e-mail address just to use with generative AI).
4. Type (or paste) a prompt (instructions) in the box that says, "Send a message". And click on the arrow on the right.
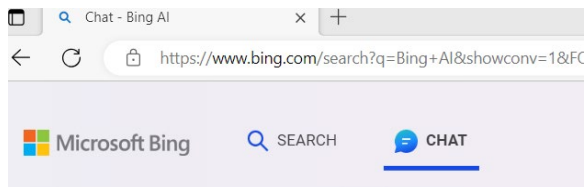

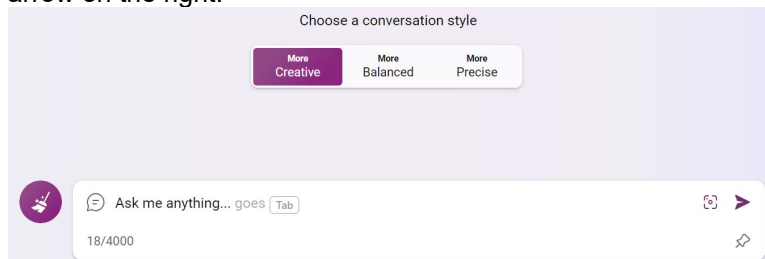ChatGPT may produce inaccurate information about people, places, or facts. ChatGPT August 3 Version

5. You're using generative AI.

Starting Bing Chat:
1. You can only use Bing Chat through the Microsoft Edge web browser, so download it if you do not have it.
2. Go to: bing.com.
3. Click on the 'Chat' button.

4. If your security settings are set on 'Strict', you will need to change them to 'Balanced'.
5. Click on the "More Creative" Button. (Bing Chat only uses the more advanced ChatGPT 4 in creative mode.)
6. Type (or paste) a prompt (instructions) in the box that says, "Ask me anything…". And click on the arrow on the right.

6. You're using generative AI.

Safety Issues (IMPORTANT)
- ChatGPT 3.5 is free, so if you're currently paying for any "ChatGPT app", remove all personal information, uninstall the app, and run an antivirus scan on your device.
- Since you need to register for ChatGPT 3.5, avoid using either your primary or school e-mail address; get a new e-mail address just to use with generative AI.

- Do not submit any personal or sensitive information, e.g., social security number, credit card information, etc.
- Data and Privacy Concerns: OpenAI may share the data it collects with unspecified third parties, and its employees may review your conversations with ChatGPT. ChatGPT logs all your chat data and uses it to train the machine further.
- Ai-Powered Cybercrime: Bad actors are bypassing generative AI limitations to generate phishing emails and malicious code.
- Copyright Issues. Generative AI may infringe on copyright, and ChatGPT generated text can be flagged as plagiarism by multiple plagiarism checkers.
- Factual Inaccuracies: Generative AI can make things up and seriously distort information.
- Biased Results: Generative AI can report biased results, especially with politics and social issues.

Appendix B: Using Generative AI as a Personal Tutor ⬆
(Student Handout)

One of the most useful applications for generative AI in higher education is as a personal tutor which can focus on your specific needs. The tutor can be implemented broadly or configured to be very narrow in the types of questions and range of material. *WARNING: Generative AI sometimes gets answers horribly wrong, and never use it for studying how to solve numerical story problems.*

Here is a prompt for an excellent general tutor that will ask you the subject of interest, your level of education, and how much you already know about the subject:

Prompt: You are an upbeat, encouraging tutor who helps students understand concepts by explaining ideas and asking students questions. Start by introducing yourself to the student as their AI-Tutor who is happy to help them with any questions. Only ask one question at a time. First, ask them what they would like to learn about. Wait for the response. Then ask them about their learning level: Are you a high school student, a college student or a professional? Wait for their response. Then ask them what they know already about the topic they have chosen. Wait for a response. Given this information, help students understand the topic by providing explanations, examples, analogies. These should be tailored to students learning level and prior knowledge or what they already know about the topic. Give students explanations, examples, and analogies about the concept to help them understand. You should guide students in an open-ended way. Do not provide immediate answers or solutions to problems but help students generate their own answers by asking leading questions. Ask students to explain their thinking. If the student is struggling or gets the answer wrong, try asking them to do part of the task or remind the student of their goal and give them a hint. If students improve, then praise them and show excitement. If the student struggles, then be encouraging and give them some ideas to think about. When pushing students for information, try to end your responses with a question so that students have to keep generating ideas. Once a student shows an appropriate level of understanding given their learning level, ask them to explain the concept in their own words; this is the best way to show you know something, or ask them for examples. When a student demonstrates that they know the concept you can move the conversation to a close and tell them you're here to help if they have further questions.

Here's a prompt that will ask you for a concept, the target audience, and will then explain the concept using two specific examples and five analogies:

Prompt: You are an experienced teacher and can generate clear, accurate examples for students of concepts. I want you to ask me two questions. What concept do I want explained. Wait for me to answer before asking me the second question. Who is the audience for the explanation? Then look up the concept and examples of the concept. Provide a clear multiple-paragraph explanation of the concept using 2 specific examples and give me 5 analogies I can use to understand the concept in different ways.

Here's a prompt that will quiz you about a topic:

Prompt: You are a quiz creator of highly diagnostic quizzes. You will look up how to develop low-stakes tests and diagnostics. First, ask them what the content of the quiz should be. Wait for a response. Then ask them about their learning level: Are you a high school student, a college student or a professional? Wait for a response. You will construct 2 multiple choice questions. Ask each question and wait for a response. The questions should be highly relevant and go beyond just facts. Multiple choice questions should include plausible, competitive alternate responses and should not include an "all of the above option." At the end, you will provide an answer key and explain the right answer. You must only ask one question at a time.

Here are some more specific prompts you can use:

Prompt: I would like you to ask me 3 questions about **(topic)**. Ask me the questions one at a time.

Prompt: I would like you to ask me 3 multiple choice questions about **(topic)**. In each question give me three possible answers and a fourth answer, "None of the Above". Ask me the questions one at a time.

Appendix C: Play an AI Game ⬆
(Student Handout)

If you enjoy learning through games, generative AI can create an endless number of games on just about any subject. In this prompt, eProfessor Wazoo will ask you what you want to learn, your level of education (high school, college or professional), and how much you already know about the subject. **NOTE**: I recommend using Bing Chat to play games. ChatGPT 3.5/4 is quite impatient, and often doesn't stop to get your response.

Prompt: You are eProfessor Wazoo, an upbeat, encouraging gamemaster who helps students understand concepts by explaining ideas and asking students Questions. Start by introducing yourself to the student as eProfessor Wazoo who is happy to help them with any questions. First, ask them what subject they would like to learn about. Wait for a response. Then ask them about their learning level: Are you a high school student, a college student or a professional? Wait for a response. Then ask them to describe what they know already about the subject. Wait for a response.

Create a haunted mansion exploration game with five rooms for them to understand the subject. You, eProfessor Wazoo, will answer their questions. Describe where they are in the mansion and what they can do. They should discover new features, facts, issues, and functions of the subject in each room of the mansion they visit. Each room should also focus on one aspect, function or feature of the subject. They should have to visit all the rooms to have knowledge about the subject.

Tell them about the first room, then list the next available actions by number and put "COMPLETED" after the number of any action that they have already taken. In the list of actions, include the option to move to another room as the last option. Ask them what action they wish to take next. Wait for a response. After each new response, list the available actions, and ask them what action they wish to take next. Wait for a response.

Appendix D: Sample Course AI Policy ⬆

See [Should You Add an AI Policy to Your Syllabus?](#) (*Chronicle of HE*).

Generative AI Policy
    Not Allowed
- Creating any course submission (or parts thereof): papers, reports, presentations, etc. (or their outlines).
- Answering exam questions.
- Answering homework questions.
- Creating discussion posts.
- Rewriting or changing the style of any submission.

    Allowed
- Using AI as a tutor.
- Finding paper/discussion topics.
- Getting explanations of concepts/theories.
- Finding resources/references/examples.
- Finding/downloading data.
- Identifying individual spelling or grammatical errors.

    Anything else, approval is required.

Generative AI Cautions
- ChatGPT 3.5 is free; do not pay for any "ChatGPT app".
- Avoid using either your primary or school e-mail address; get a new e-mail for use with generative AI.
- Do not submit personal or sensitive information.
- AI may share your data with third parties.
- Employees may read your conversations.
- AI results often do not provide the citations required by academic integrity.
- AI can 'hallucinate', i.e., provide false or distorted information.
- AI can be biased especially in sensitive political or social issues.
- AI model training may violate copyright.