

Author Notes

- ✓ The type has been replaced in your figures; please proof the figures carefully for any errors.
- ✓ Please confirm all artwork in this article is either original or that permission for use has been obtained and credit given where needed.
- ✓ The last page contains pull quotes that might be used in the article, depending on design and spacing considerations. Are these pull quotes appropriate? If not, please provide several alternatives. Pull quotes should be concise and taken verbatim from article text.



The Invisible School According to Grok

Michael Zyda^{ID}, University of Southern California

In a past column **<AU: Please note that reference citations are not permitted in the abstract as per magazine style. Please check that the placement of reference 1 is acceptable.>**, I wrote about a project in Shanghai building the Invisible School. The question now is can we create the Invisible School using a large language model such as Grok?

In Zyda,¹ I posed the question “Do we need universities anymore?,” and in that article, I pointed out that a group of technologists in Shanghai were planning “the Invisible School,” a school where there were no longer lectures in classrooms but rather an online support structure that allowed students to learn things at their

own speed. Figure 1 shows what the planned Invisible School looked like when I drafted Zyda.¹

Now, the Invisible School project in Shanghai was focusing on K-12 education, and this column is going to focus on university education using a large language model (LLM), Grok. The reason I have chosen Grok is the owner of Grok has expressed disdain for university education in particular, and there seems to be a significant backlash against universities in the political system of the United States, so the real question is how close can we get to a university-level education by just using an LLM like Grok. We will see ...

HOW DO I USE GROK TO CREATE THE INVISIBLE SCHOOL?

We just ask Grok! The biggest assumption we have to make is that Grok has read my previous column.¹ We just have to give Grok the right prompt! So here is what I gave Grok:

Digital Object Identifier 10.1109/MC.2025.3610273



COMMENTS?

If you have comments about this article, or topics or references I should have cited or you want to rant back to me on why what I say is nonsense, I want to hear. Every time we finish one of these columns, and it goes to print, what I'm going to do is get it up online and maybe point to it at my Facebook (mikezyda) and my LinkedIn (mikezyda) pages so that I can receive comments from you. Maybe we'll react to some of those comments in future columns or online to enlighten you in real time! This is the "Games" column. You have a wonderful day.

Michael Zyda: How do I use Grok to create the Invisible School as described in the Michael Zyda column entitled "Do We Need Universities Anymore?" in *Computer*, May 2023?

Grok: The Invisible School, as Zyda describes it, is a decentralized, tech-driven learning model where knowledge is shared through informal networks, like online platforms, leveraging artificial intelligence (AI) and digital tools to bypass traditional university structures.

Grok: It's not a physical or hidden school but a flexible, virtual community of learners, mentors, and experts collaborating globally. To create something like Zyda's

Invisible School using me, Grok, here's how you'd do it:

Grok: First, I can help design a curriculum or learning path. You'd say, "Grok, create a course outline for, with modules, resources, and discussion prompts." I'd generate a detailed structure, complete with lesson plans or even scripts for virtual sessions. For example, I could whip up a PDF with a 10-week course in minutes.

Grok: Second, use me to facilitate collaboration. You could ask, "Grok, draft a plan for a virtual study group on X, including guidelines for secure discussions." I'd suggest setting up a private X Space or group chat for learners to share ideas with rules to keep it focused and

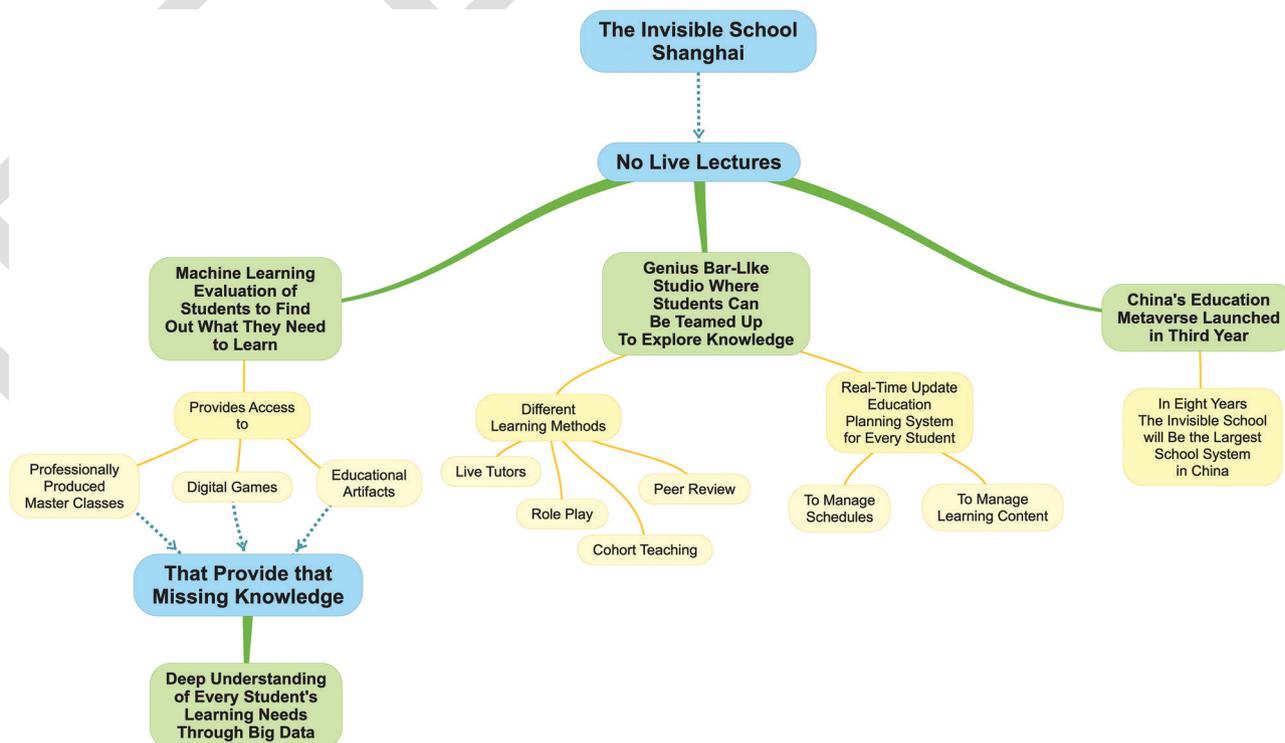


FIGURE 1. The Invisible School.

safe, mimicking the Invisible School's community vibe.

Grok: Third, I can generate content or answer questions in real-time for learners. For instance, if your group's studying quantum computing, you could ping me with, "Explain quantum entanglement to a beginner," and I'd break it down clearly for your Invisible School members. You'd host this on platforms like X, Discord, or a custom site, keeping it "invisible" by using private channels or invite-only groups, as Zyda's idea emphasizes accessibility without formal gatekeeping. If you want, I can start by drafting a sample course outline or discussion plan right now—just name the subject! Any specific topic or focus from Zyda's paper you're thinking of?

So, Grok had read my previous column (or it read it just now)! I guess Grok trained on *Computer*! Grok is an additional reader I did not know about! So, Grok gave me a structure for the

Invisible School! Cool! See Figure 2. **<AU: Please check if this figure cite is OK.>**

LET'S CREATE A COMPLETE UNIVERSITY DEGREE!

Well, I wanted to test Grok a bit more. I wanted to have it think about creating a complete degree program for an undergraduate degree in artificial intelligence with a strong focus on generative AI. I needed to choose a university where this degree program could reside, so we could see if Grok got all the required courses and prerequisites right. I chose the University of California San Diego (UCSD) Revelle College for this program primarily as I attended Revelle College at UCSD some ages ago and had a vague memory of what courses were required. Here are my prompts and Grok's responses.

Zyda: Design the classes that would be in a four-year bachelor's degree, similar to the one offered by the Revelle College at the University of California, San Diego, including all the humanities and

mathematics and other courses required by that school. The undergraduate degree should be in artificial intelligence, with a strong focus on generative AI and its application.

Grok: Based on what's out there for UC San Diego, especially the Jacobs School of Engineering and related AI programs, and inspired by the liberal arts vibe of Revelle College, I've crafted a four-year bachelor's degree in Artificial Intelligence with a focus on generative AI and its applications. Revelle College emphasizes a broad education, so this curriculum includes their required humanities sequence, mathematics, natural sciences, and social sciences, alongside a robust AI core.

Grok: Since Revelle doesn't offer an AI degree directly, I'm modeling this on UCSD's general structure, the Data Science program from Halicioğlu Data Science Institute, and AI courses available to undergrads,

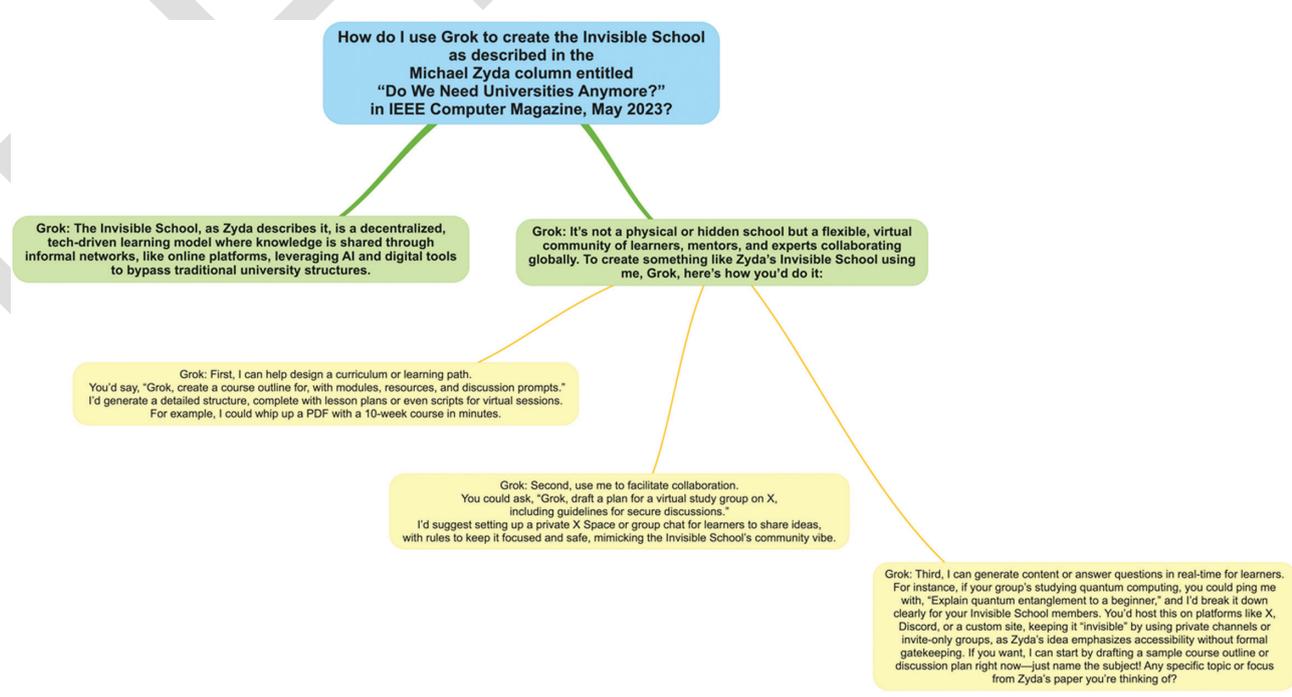


FIGURE 2. How do I use Grok to create the Invisible School as described in Zyda?¹

with an emphasis on generative AI. It's a 180-unit program, split roughly into 72 units of general education (per Revelle's requirements) and 108 units for the major, assuming a standard four-year pace of 45 units per year (Figure 3) <AU: Please check if this figure cite is OK.>

And then Grok generated Fall/Winter/Spring class titles for the four-year

degree program! It built this using online real classes offered by UCSD! Grok did fail to list the foreign language requirement Revelle College has, though ...

Grok ends by asking if I need more help in a very kind way.

Grok: This wraps up the 180-unit degree, balancing Revelle's general education (72 units) with a 108-unit AI major

emphasizing generative AI. Want me to adjust anything or dive into a specific course?

LET'S ASK GROK FOR THE COURSE SYLLABI!

While we have Grok at our beck and call, let's ask it to list all the classes and then maybe give us some help on creating the syllabi (Figure 4) <AU: Please check if this figure cite is OK.>

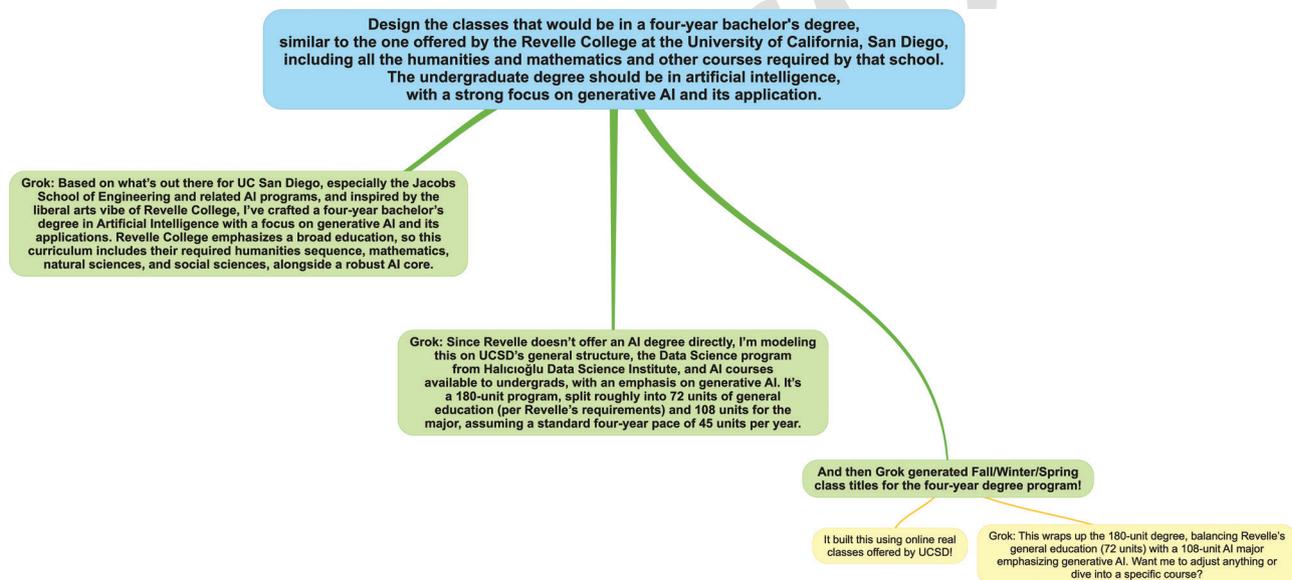


FIGURE 3. Let's create a complete university degree!

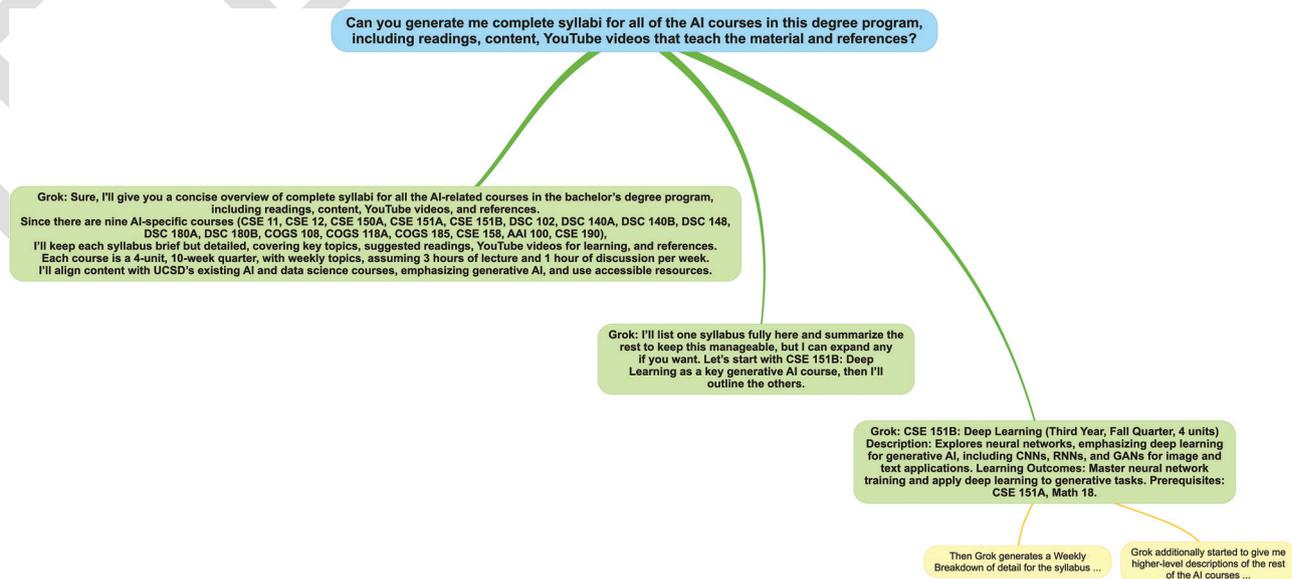


FIGURE 4. Let's ask Grok for the syllabi!

GAMES, FILM, & GENERATIVE AI

Zyda: Can you generate me complete syllabi for all of the AI courses in this degree program, including readings, content, and YouTube videos that teach the material and references?

Grok: Sure, I'll give you a concise overview of complete syllabi for all the AI-related courses in the bachelor's degree program, including readings, content, YouTube videos, and references.

Since there are nine AI-specific courses (CSE 11, CSE 12, CSE 150A, CSE 151A, CSE 151B, DSC 102, DSC 140A, DSC

140B, DSC 148, DSC 180A, DSC 180B, COGS 108, COGS 118A, COGS 185, CSE 158, AAI 100, CSE 190), I'll keep each syllabus brief but detailed, covering key topics, suggested readings, YouTube videos for learning, and references.

Each course is a four-unit, 10-week quarter, with weekly topics, assuming 3 h of lecture and 1 h of discussion per week. I'll align content with UCSD's existing AI and data science courses, emphasizing generative AI, and use accessible resources.

Grok: I'll list one syllabus fully here and summarize the rest to keep this manageable,

but I can expand any if you want. Let's start with CSE 151B: Deep Learning as a key generative AI course, then I'll outline the others.

Grok: CSE 151B: Deep Learning (Third Year, Fall Quarter, four units) Description: Explores neural networks, emphasizing deep learning for generative AI, including CNNs, RNNs, and GANs for image and text applications. Learning Outcomes: Master neural network training and apply deep learning to generative tasks. Prerequisites: CSE 151A, Math 18.

TABLE 1. Listing of Grok-generated syllabus for CSE151B.

CSE 151B: Deep Learning (Third Year, Fall Quarter, four units) Description: Explores neural networks, emphasizing deep learning for generative AI, including CNNs, RNNs, and GANs for image and text applications. **Learning Outcomes:** Master neural network training and apply deep learning to generative tasks. **Prerequisites:** CSE 151 A, Math 18.

Weekly Breakdown

Week 1	Intro to Neural Networks Content: Perceptrons, activation functions, backpropagation. Reading: Goodfellow et al., <i>Deep Learning</i> , Ch. 6. Video: 3Blue1Brown, "What is a Neural Network?" (~15 min, YouTube). Reference: Goodfellow, I., Bengio, Y., and Courville, A. (2016). <i>Deep Learning</i> . MIT Press.
Week 2	Feedforward Neural Networks Content: Multilayer perceptrons, gradient descent. Reading: Goodfellow et al., Ch. 6. Video: StatQuest, "Gradient Descent, Step-by-Step" (~20 min). Reference: Same as Week 1.
Week 3	Convolutional Neural Networks (CNNs) Content: Convolution, pooling, image generation basics. Reading: Goodfellow et al., Ch. 9. Video: Computerphile, "Convolutional Neural Networks" (~15 min). Reference: Same as Week 1.
Week 4	Recurrent Neural Networks (RNNs) Content: RNNs, LSTMs, text generation. Reading: Goodfellow et al., Ch. 10. Video: StatQuest, "Recurrent Neural Networks (RNNs)" (~25 min). Reference: Same as Week 1.
Week 5	Generative Adversarial Networks (GANs) Content: GAN architecture, training challenges. Reading: Goodfellow et al., Ch. 20. Video: Two Minute Papers, "Deep Learning: Generative Adversarial Networks" (~5 min). Reference: Goodfellow, I., et al. (2014). <i>Generative Adversarial Nets</i> . NIPS.
Week 6	Variational Autoencoders (VAEs) Content: VAEs for generative modeling. Reading: Kingma and Welling, "Auto-Encoding Variational Bayes" (arXiv). Video: Arxiv Insights, "Variational Autoencoders Explained" (~10 min). Reference: Kingma, D. P., and Welling, M. (2013). arXiv:1312.6114.
Week 7	Training Deep Networks Content: Regularization, optimization techniques. Reading: Goodfellow et al., Ch. 7. Video: DeepLearningAI, "Practical Aspects of Deep Learning" (~20 min). Reference: Same as Week 1.
Week 8	Applications in Image Generation Content: DCGANs, StyleGAN for realistic images. Reading: Radford et al., "Unsupervised Representation Learning with DCGANs" (arXiv). Video: Two Minute Papers, "StyleGAN Explained" (~10 min). Reference: Radford, A., et al. (2015). arXiv:1511.06434.
Week 9	Text Generation with Deep Learning Content: Transformers, GPT models. Reading: Vaswani et al., "Attention is All You Need" (arXiv). Video: Yannic Kilcher, "Attention is All You Need Explained" (~20 min). Reference: Vaswani, A., et al. (2017). arXiv:1706.03762.
Week 10	Ethics and Future of Deep Learning Content: Bias in generative models, societal impacts. Reading: Crawford, <i>Atlas of AI</i> , Ch. 4. Video: TED, "The Ethics of AI" by Timnit Gebru (~15 min). Reference: Crawford, K. (2021). <i>Atlas of AI</i> . Yale University Press.
Assessment:	Weekly assignments (30%), midterm (30%), final project (40%, implement a GAN or VAE).

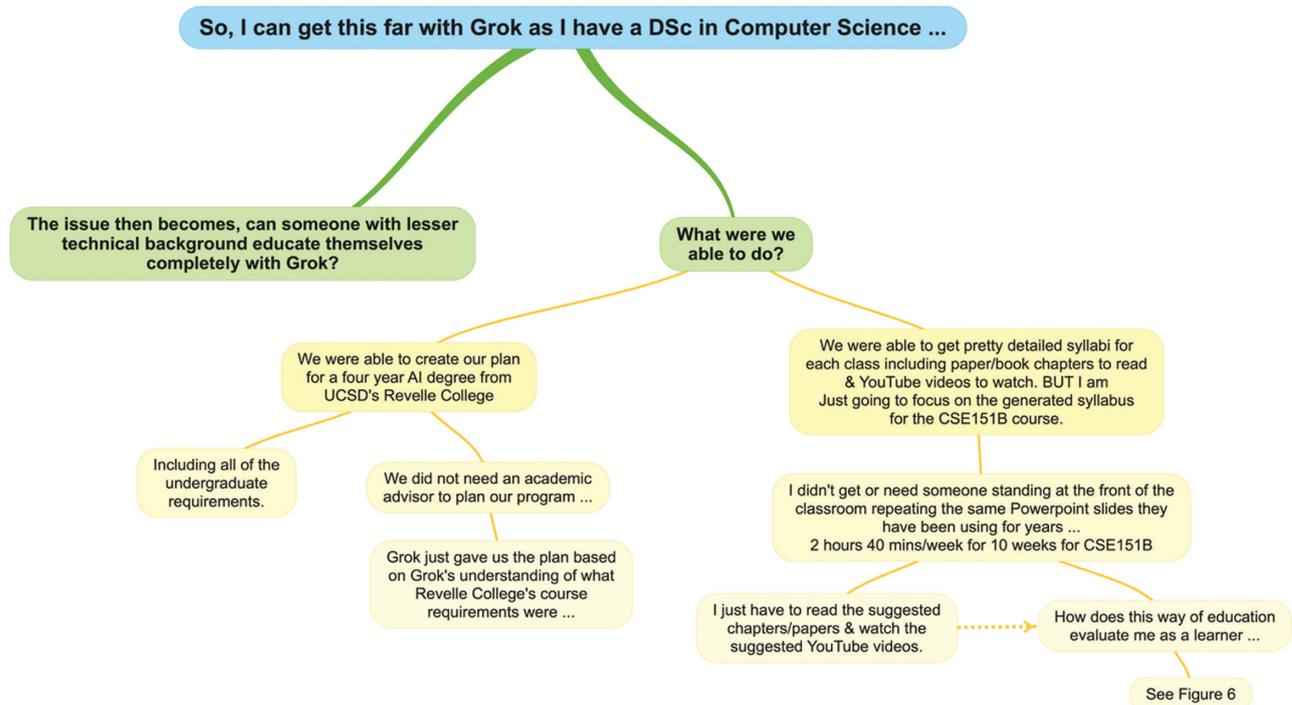


FIGURE 5. So, I can get this far with Grok as I have a D.Sc. in computer science ...

Then Grok generates a weekly breakdown of detail for the syllabus. Grok additionally started to give me higher-level descriptions of the rest of the AI courses ... Table 1 <AU: Figure 7 was converted into Table 1. Please check if this is OK.> is the listing of the CSE 151B syllabus.

SO, I CAN GET THIS FAR WITH GROK AS I HAVE A D.Sc. IN COMPUTER SCIENCE

The issue then becomes, can someone with lesser technical background educate themselves completely with Grok? What were we able to do? We were able to create our plan for a four-year AI degree from UCSD's Revelle College, including all of the undergraduate requirements. We did not need an academic advisor to plan our program; Grok just gave us the plan based on Grok's understanding of what Revelle College's course requirements are (Figure 6) <AU: Please check if this figure cite is OK.>

We were able to get pretty detailed syllabi for each class, including paper/

book chapters to read and YouTube videos to watch. But, I am just going to focus on the generated syllabus for the CSE151B course.

I didn't get or need someone standing at the front of the classroom repeating the same PowerPoint slides they have been using for years (2 h 40 mins/week for 10 weeks for CSE151B). I just must read the suggested chapters/papers and watch the suggested YouTube videos.

The big question then is how does this way of education evaluate me as a learner?

HOW DOES THIS WAY OF EDUCATION EVALUATE ME AS A LEARNER?

What does the Grok-created syllabus say about evaluation for the CSE151B course?

Desired Learning Outcomes

I want to master neural network training and apply deep learning to generative tasks. This is an excellent desired learning outcome! So, how is this measured? What does Grok say?

Grok: Course Assessment: Weekly assignments 30%, Midterm 30%, Final Project 40% (Implement a GAN or VAE).

This is lame, but it is what Grok gave me ... Weekly assignments is very lightweight and unspecified. Midterm is a very old-fashioned way to assess what a student has learned. Basically, a midterm shows how well the student slept the previous night and how much anxiety they suffered preparing for the exam ...

Final Project 40%: Implement a GAN or VAE ... We can just ask Grok to get us the source code! So lame, completely lame.

A BETTER WAY TO DO ASSESSMENT

A better way is to have each student or student group propose a semester-long project to the instructor. Student groups are preferred as that is how the students will work in industry. With semester-long projects, we have the students do a live demo at midterm and

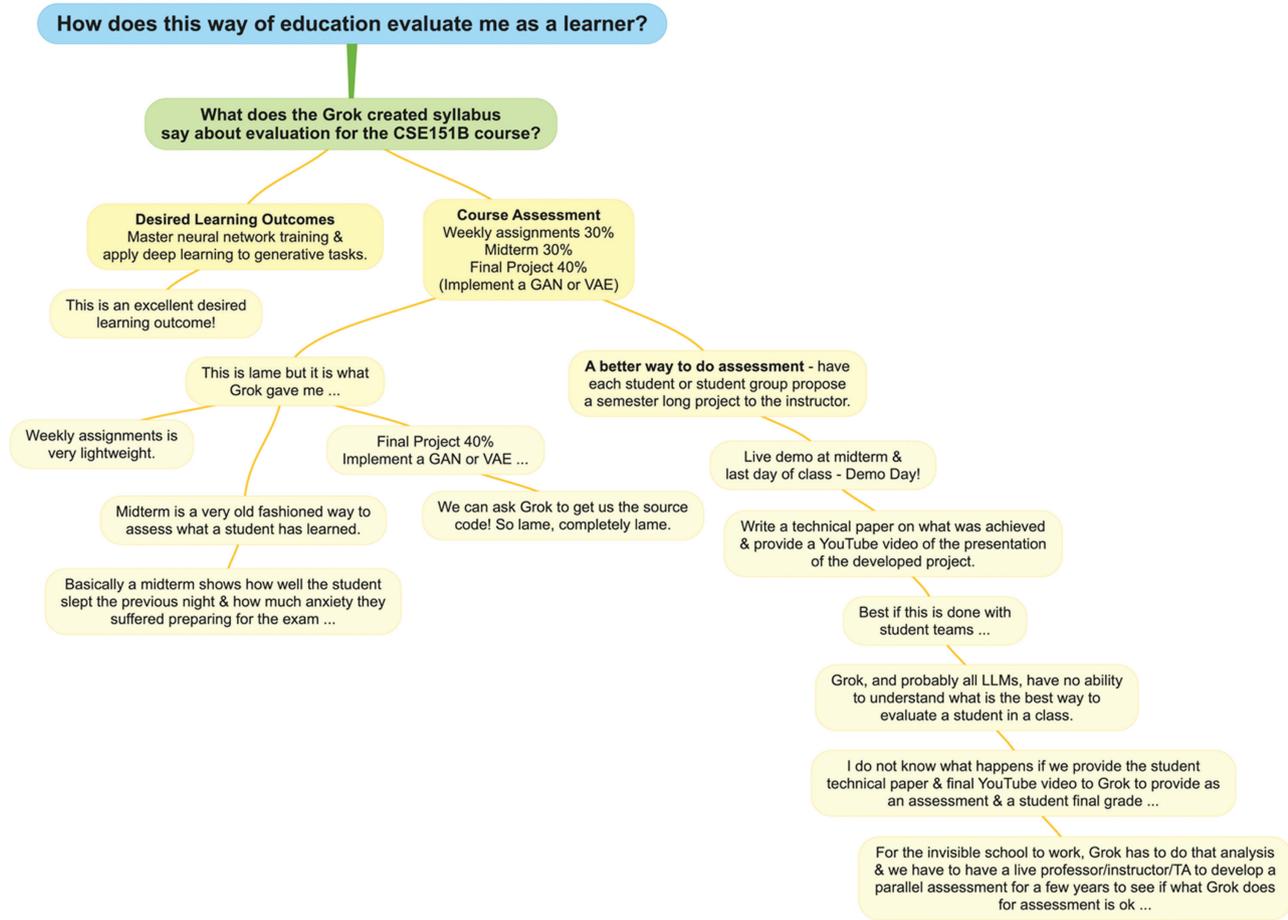


FIGURE 6. How does this way of education evaluate me as a learner?

on the last day of class—Demo Day! We have the students write a technical paper on what was achieved and provide a YouTube video of the presentation of the developed project.

Grok, and probably all LLMs, have no ability to understand what the best way is to evaluate a student in a class. I do not know what happens if we provide the student technical paper and final YouTube video to Grok to provide as an assessment and a student final grade.

For the Invisible School to work, Grok must do that analysis and we have to have a live professor/

instructor/teaching assistant to develop a parallel assessment for a few years to see if what Grok does for assessment matches what we believe to be correct. So, imagine that we are going to have professors detail how they arrived at the grade for each student and then hand that assessment off to Grok to learn so that it can grade students in the future ... I'm not sure this is going to work, though (Figure 6). **■**

ACKNOWLEDGMENT

The author would like to thank those readers who have gotten to the end of this bimonthly column without finding all of the deliberate and accidental errors. And I apologize for my personal

commentaries, but I think they are very important for our futures. The Invisible School is most definitely part of our future!

REFERENCE

1. M. Zyda, "Do we need universities anymore?" *Computer*, vol. 56, no. 5, pp. 145-150, May 2023, doi: 10.1109/MC.2023.3247239.

MICHAEL ZYDA is an emeritus professor of engineering practice with the University of Southern California, Los Angeles, CA 90089 USA. Contact him at zyda@mikezyda.com.

I wanted to have it think about creating a complete degree program for an undergraduate degree in artificial intelligence with a strong focus on generative AI.

I needed to choose a university where this degree program could reside, so we could see if Grok got all the required courses and prerequisites right.

The undergraduate degree should be in artificial intelligence, with a strong focus on generative AI and its application.

While we have Grok at our beck and call, let's ask it to list all the classes and then maybe give us some help on creating the syllabi.

I do not know what happens if we provide the student technical paper and final YouTube video to Grok to provide as an assessment and a student final grade.