From Questioning to Qualified: A Case Study of a Professional Development AI Literacy Module for Youth Educators

Aditya Jain[1] and Kimberly Stanke[2]

[1]Jeffrey S. Raikes School, The University of Nebraska - Lincoln, Lincoln, NE.
[2]4-H Youth Development, Department of Statistics, The University of Nebraska - Lincoln, Lincoln, NE.

Contributing authors: adityajain7@outlook.com; kstanke2@unl.edu;

Abstract

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1 Introduction

As Artificial Intelligence (AI) becomes increasing woven into everyday life, schools and educators face the challenge of preparing students to understand and engage with these new technologies. With the rapid pace of advancement of AI tools and integration in society, education surrounding AI is crucial, as technology is here to stay and transforms how we learn, work, and live.

Math education navigated a similar transformation in the late 1970s, upon the advent of the pocket calculator. Although there was initial uncertainty whether calculators should be introduced in classrooms, the push to prepare K-12 students for a future with calculators at work and in their daily lives resulted in a widespread effort to leverage the calculator as a learning tool in math education. Moreover, a 1979 study found that 84% of teachers wanted to use calculators in their classrooms. However, while the spirits to adopt and integrate were high, the relevant training to do so

was severely lacking. Only 3% of the teachers had any training or adequate support resources that would allow them to introduce calculators to their classrooms [4].

The introduction of AI in classroom is backed by several initiatives, most notably the AI4K12 project [1], which is a joint effort by The Association for the Advancement of Artificial Intelligence and the Computer Science Teachers Association. Such initiatives recognize AI's long-term presence and prominence in the workplace and daily life and more importantly, recognize the need for an effective introduction of AI to prepare youth with a foundation of clarity, responsibility, and literacy.

However, a gap exists - most youth educators lack the technical background and training to introduce the foundational concepts of AI to their students. An April 2025 survey discovered that 58% of K-12 teachers have yet to receive any training on AI [7]. A separate study found 70% of teachers had received no professional development for AI, and this lack of training and insufficient resources were the largest hurdles to AI integration in their teaching [9]. Moreover, several educator interviews have highlighted a desire for integration, as teachers express an urgent need to embrace hands-on use of the technology, shifting away from their mindset of uncertainty and caution [13]. Attitudes of uncertainty are heightened in non-technical educators as the facade of complexity and magic-like qualities of AI add to the challenge of understanding the technology, yet alone using it in their classrooms. This gap extends to informal learning environments, such as after-school programs, workshops, and educational camps, where content and learning typically takes an engaged, activity route over a traditional lecture style.

To address this gap, through Nebraska's 4-H extension program, we developed an online module "AI Foundations and Applications: A Youth Teaching Guide". It is an online, self-paced professional development (PD) course for educators, particularly non-technical educators. Upon successful completion of the module, a digital badge is granted that demonstrates readiness to teach AI fundamentals and implementations. Through this approach, we wanted to see what insights can be drawn from piloting an online, self-paced AI foundations PD module about its potential to prepare educators to introduce AI concepts to youth. In this commentary, we report on the design of our module, describe pilot educator feedback, and reflect on its implications for broader AI education efforts.

2 Module Overview and Development

The decisions guiding the creation of our module deliberately centered around principles of accessibility; comprehensibility; and transferable, ready-to-use content. Adherence to these principles from the beginning provided a clear goal and motive for the module of educator empowerment, which subsequently impacted the design of the module, related to the curriculum, structure and format.

2.1 Motivation

The module's goal is to equip educators with the knowledge and tools to introduce AI to a youth audience. By arming them with the knowledge and tools, we strive to give teachers the confidence and resources to teach foundational AI concepts clearly, lead

AI-related activities, and facilitate thoughtful discussion around AI. The Nebraska 4-H, which enabled the creation of the module, targets learners aged 8 - 18 years old [12]. However, our module honed in on the latter half of the 4-H target group, focusing on 13 - 18 year old learners. This translates to educators who teach late middle school and above: 7th grade onward. Given the landscape of technology, specifically laptops, in schools, grades 7th and above are when technology is increasingly leveraged in and out of the classroom for schoolwork and learning, Whether it be in the form of completing online assignments, writing essays, creating presentations, and conducting online research, at this stage students are using technology independently as a part of their education. Consequently, they start using more formal software like Microsoft Word, PowerPoint, Google Docs, search engines, and AI tools recently [5, 14]. As a result, we decided to position our module's end-goal audience as this pivotal age group to assist educators set up these students with the skillset and diligence to interact with AI productively.

This task, however, may appear daunting to teachers who do not come from a technical background. Thus, we decided on the three pillars of accessibility; comprehensibility; and transferable, ready-to-use content to motivate the design and serve as a conceptual cornerstone of our module.

- **Accessibility** as a guiding principle translates to lowering the barrier to understand AI concepts for educators who might not have a computer science, statistics, or data science background. To adhere to this principle, we intentionally limited the use of technical jargon throughout the content. Even so, when we introduced a new AI-related term, the definitions used plain-language in their explanations. Additionally, graphics, such as Figure 1, were often included to reinforce the meaning of a new concept or to make it easier to grasp. The deliberate simplicity in terms of language, explanations, and course content ensures the module remains approachable rather than intimidating. In turn, a broader group of educators, not just those with technical exposure can turn to our module as a feasible training to dive into AI education.
- **Comprehensibility** as a philosophical design pillar reflects the focus to create content that is easy-to-understand and internalize. This surfaces in our module by each lesson incorporating multiple mediums for conveying information: introductory texts, educational videos, supplementary notes, reflection prompts, and engaging hands-on activity suggestions. Through this variety of formats to convey content for each lesson, the module aims to be comprehensible, adapting to several styles to help the learner internalize the material with ease. Due to the technical depth that AI technologies, and subsequent AI education can possess, establishing a clear foundation of AI concepts in an educator will have positive ripple effects downstream as the learning is passed on. With this emphasis on comprehensibility, our module secures that educator's don't merely consume the material to earn the digital badge, but rather sit with and truly understand the content to eventually teach it forward.
- **Transferable, Ready-to-Use Content** is the final mainstay on which the module was developed. The principles of transferable content surfaces as practical elements in the module's lessons which can be used as teachable material for the educator to use in their youth classrooms. Every lesson ends with an engaging activity,

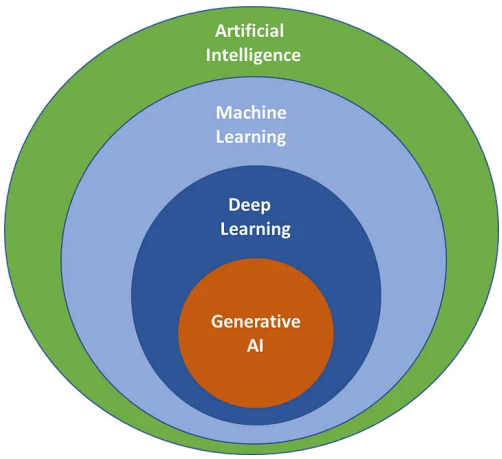

Fig. 1 A nested graphic included in a lesson to help visualize the relationships between new terms introduced

with outlined material, steps, and discussion prompts, so an educator can facilitate them seamlessly. Additionally, components such as the reflection prompts, and even the quiz questions included in each lesson can double as instructional material. This pillar closes the gap between theory and practice. With a range of transferable, ready-to-use content built into the module, educators walk away with a collection of classroom-ready material to complement their conceptual understanding of AI.

Anchored with these three motivating principles, the module's curriculum, lesson format, and instructional content were intentionally designed, the specifics of which are described in the proceeding section. Understanding the motivation behind the module's design sets the stage for exploring it's content.

Before doing so, it is noteworthy to acknowledge the contributions of Nebraska's 4-H in this project. The University of Nebraska's 4-H extension program was the ideal vehicle for the module's creation. Nebraska's 4-H program is directed at developing youth to be "Beyond Ready" for their future endeavors. 4-H's wings spread far as it conducts afterschool programs, recreational and educational camps, school enrichment experiences, and special-interest workshops [12].Through support from Nebraska's 4-H staff and faculty, this module was reviewed by a team of experts who not only lead learning experiences, but also provided an outlet to publish our online course as a part of UNL's Online Education platform as a Micro-credential badge [11].

2.2 Module Design

The structure of our module is broken into three core themes: (1) What is AI and How Does it Work?, (2) Hands-on Use and Exploration, and (3) Ethics, Bias, Safety, and Digital Responsibility. These three themes mirror a natural process of learning about a new technology, as students initially get a taste by learning about the novelty, prior to diving in and exploring, before finally understanding the implications and ramifications of the technology [6].

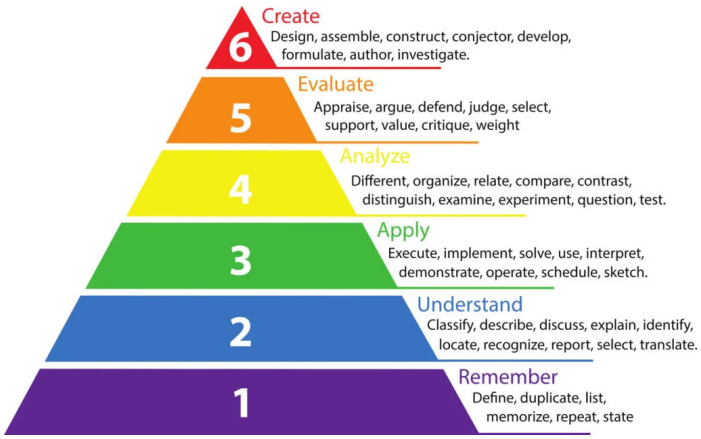

Fig. 2 A pyramid-shaped diagram illustrates Bloom's Taxonomy's cognitive domain, building from foundational to advanced thinking skills. Each level features example action verbs that correspond to that particular skill level.

Core theme 1: What is AI and How Does it Work? establishes baseline knowledge as it covers definitions, capabilities, AI training, and generative AI under the hood. This sparks initial curiosity and sets the groundwork for the second theme.

Core theme 2: Hands-on Use and Exploration facilitates experimental learning strategies allowing guided discovery of the realm of possible and potential student-centered applications specific to education. The second core theme considers prompt engineering, AI as a collaborator, as a creative assistant, as a learning coach, in business applications, and it's influence on what we see online. In this theme, the intent is not only to "wow", but also to realize current and future use cases.

Core theme 3: Ethics, Bias, Safety, and Digital Responsibility grounds the learner back to the reality of AI's present state and limitations, in an effort to foster a mindful intuition around AI use. This theme addresses bias, privacy, misinformation, safety guardrails, and trust.

Through a sequence of the three themes, the module's curriculum is designed to provide a holistic review of AI fundamentals, without getting into the weeds with any technical detail. In addition, it is suggested that youth educators follow this sequence of themes when teaching the content forward. With this, the progression of ideas remains sound, building in a constructivist manner, while also providing ready-to-use classroom material. Note, the three core themes are offered in a bulk course package, through UNL's Continuing Education platform, for an educator to enroll in, or each theme is also offered as a standalone course, allowing for further flexibility per the educator's preferences and motives.

2.2.1 Learning Objectives

Each core theme defines three to five learning objectives which utilize Bloom's Taxonomy [10], explicitly using verbs from different levels of Bloom's hierarchical taxonomy pyramid, as seen in Figure 2.

The learning outcomes for each core theme are defined as:
Core Theme 1: What is AI and How Does it Work?

- *Define* artificial intelligence, machine learning, and generative AI and *understand* how they relate
- *Explain* how machines "learn" from data
- *Analyze* AI decision-making and *compare* it to human-decision making

Core theme 2: Hands-on Use and Exploration

- *Create* effective prompts to interact with an AI tools
- *Evaluate* different responses from AI from different prompts or tools
- *Apply* AI as a collaborator for productive work (e.g., co-writing a story or providing tutoring feedback)
- *Analyze* how AI can have real-world applications in different domains

Core theme 3: Ethics, Bias, Safety, and Digital Responsibility

- *Explain* what bias in AI means and *describe* how biased data can lead to biased results
- *Distinguish* between original work and AI-generated content; *recognize* when attribution is needed
- *Critique* whether an AI application is being used responsibly and fairly
- *Evaluate* scenarios involving data privacy
- *Explain* the social implications of AI and *construct* arguments for responsible use

2.2.2 Lesson Content

There are a series of self-paced lessons within each core theme that build upon each other that conform to contructivist learning theory [3]. Each lesson consists of an introductory paragraph, educational video(s), video takeaway notes and supplement information, reflection prompts, activity, and a check-for-understanding quiz.

The videos selected for explaining the lesson's concepts were intentionally chosen from reputable sources on YouTube such as CrashCourse, IBM Technology, Code.org, and Google for Developers. Every video was screened upload our principle of accessibility for non-technical audiences. For a few lesson topics, more than one video was included, with one video introducing the concept and another illustrating an example of it. For instance, in the lesson titled "Misformation and Spotting AI-Generated Content", housed in the third core theme, the first explainer video is "What are deepfakes and are they dangerous?" [2] and the second application video is "How to spot AI and misinformation online" [8].

The reflection prompts included in each lesson are purposefully thought-provoking, rhetorical, and open-ended. They are positioned to force the learner to pause and think deeply about the video or supplemental information that was just consumed. These prompts can be easily presented down the line to a youth audience.

The classroom-ready, youth-targeted activities are one of the centerpoints of each lesson. From the minimal material requirement, detailed instructions, and timing suggestions, activities are designed to be fully abide by the principle of transferable content. Activities are engaging and hands-on, frequently choosing collaborative group work with markers, poster paper over individual effort on a computer. When AI tools are used in activities, most notably in the lessons in core theme 2, suggestions are made for youth-friendly AI tools such as Google's Teachable Machine or Canva AI. The simplicity in these activity are in an effort to break down the complexity of AI in a straightforward way.

Lastly, the quizzes included at the end of each lesson contain four multiple choice questions, typically pulled from the video takeaways and supplemental information. These questions check for comprehension and align with the at least one learning objective of the broader core theme the lesson is contained in. There is a set threshold of a minimum score needed to advance from lesson to lesson.

Recall, the three principles of accessibility, comprehensibility, and transferable content were the backbone informing the module's design decisions.

3 Pilot Implementation and Feedback

3.1 Testing Method

3.2 Feedback Results

4 Reflections

5 Looking Ahead

6 Conclusion

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