

AI Education Across the Curriculum: Design and Pilot Study of a Cross-Disciplinary Module Set

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Abstract

Artificial intelligence (AI) education has garnered growing attention from both educational researchers and practitioners in recent years. Among the various emerging approaches, integrating AI education across the curriculum—particularly within core disciplines—offers distinct advantages. This strategy foregrounds the inherently interdisciplinary nature of AI and enables students to investigate its connections with subjects such as mathematics and English language arts (ELA). Furthermore, it holds promise for broadening participation by engaging all students, including those historically underrepresented and underserved in the field of AI. To date, most efforts to integrate AI education have been situated within individual classrooms, often led by a single teacher. While such initiatives provide valuable entry points, they overlook the reality that students' learning experiences span multiple classrooms and disciplines. As students transition between subjects, they inevitably synthesize ideas—both consciously and unconsciously—from diverse instructional contexts. Recognizing this, we take a whole-school perspective that considers the cumulative and interconnected nature of students' learning experiences. With this perspective, we explore a coordinated, cross-disciplinary approach in which students engage with AI through a set of curriculum modules spanning mathematics, ELA, and social studies. Each module is discipline-specific yet designed to contribute to a cohesive, cross-disciplinary exploration of AI. These modules are further framed by a self-paced introductory unit, which establishes foundational concepts, and a culminating application-and-reflection unit, which supports integration and transfer of learning. This paper describes the design of the AI Education Across the Curriculum module set and reports preliminary findings from a pilot implementation conducted in Spring 2025. By examining both the pedagogical design and initial findings, we aim to contribute to the growing body of research on scalable, equitable, and interdisciplinary models for AI education.

Introduction

Artificial Intelligence (AI) is transforming numerous industries and generating enormous wealth. However, the advancement in AI is reshaping the workforce, impacting people whose jobs can be replaced or redefined by AI systems. The wealth generated by AI advancement is unevenly distributed across different demographic groups, exacerbating existing inequities in society (Bircan & Özbilgin, 2025). Inequalities arising from current AI development are partially rooted in unequal access to AI educational opportunities.

K-12 is the critical stage for young people to develop foundational knowledge and interest in AI-related careers. At a minimum, students need to understand that the current approach to AI development is based on machine learning from data and that data needs to be structured in ways such that machines can learn meaningful patterns (Touretzky et al., 2019). Ultimately, students should understand the roles and responsibilities of AI developers and potential pathways for their own participation in AI development.

The increased awareness of AI's impact on daily life, education, and the workforce has led to the emergence of a broad and expanding range of opportunities for AI learning. Digital resources, including online courses, recorded lectures, and tutorials on social media, have proliferated (e.g., MIT Open Learning, 2024; Standard Online, n.d.). Extracurricular opportunities such as after-school programs, summer camps, and student-driven clubs have experienced significant growth (e.g., AI4All.org, n.d.; MIT RAISE, n.d.). Standalone AI electives are now being offered in some K-

12 educational settings (e.g., Touretzky et al., 2025; Zhao et al., 2024). Many computer science (CS) curricula have incorporated AI as a core unit (e.g., Code.org, n.d.; ECS, n.d.).

But AI education does not need to be limited to out-of-school settings and CS or dedicated AI courses. The core disciplines in a typical American school curriculum also offer abundant opportunities to incorporate AI topics. AI is a highly interdisciplinary field. It builds on mathematical foundations and relies on disciplinary knowledge about the type of intelligence to simulate. Many AI innovations stem from the attempt to solve problems in domains outside CS. In the workplace, it is very common for non-CS professionals to learn and apply AI knowledge and skills and collaborate with computer scientists to solve problems in their own domains. In the same way, AI education can happen in a variety of settings where the problems of interest call for AI solutions.

Integrating AI education into the core curriculum also has the potential to offer equitable and inclusive AI learning opportunities to all students, especially those most underrepresented and underserved in the field of AI. Additionally, this approach can mobilize all teachers, not just those in CS, technology, or librarianship, to help students develop competencies required by the age of AI.

The call to incorporate AI topics into school curriculum has been advocated for some years (Zhou et al., 2020). However, progress in this area has initially been limited. A systematic review of research on AI education in K-12 classrooms from 2018 to 2023 revealed a notable gap in AI curricula explicitly designed for standard classroom coursework (Lee & Kwon, 2024).

In the past two years, there has been a steady increase in research efforts in this area. Many studies have investigated methods for incorporating AI topics into English Language Arts (ELA) (Delaney et al., 2025; Ritchie et al., 2025 July), mathematics (e.g., Jones, 2021; Nti-Asante, E., 2024; Delaney, V. L., 2024), social studies (Nocera et al., 2024), and science (Jiang et al., 2023). The development of these curricula often involves participatory design and iterative improvement processes, drawing on the expertise of subject area teachers and incorporating feedback from students (DiPaola et al., 2023 March; Xie et al., 2024 March; Manilla et al., 2025 May; Wermie & Latulipe, 2025). However, these initiatives have been mainly confined to individual classrooms.

While such initiatives provide valuable entry points into AI education, they overlook the broader reality that students' learning experiences span multiple classrooms and disciplines. As students transition between subjects, they inevitably synthesize ideas, both consciously and unconsciously, from diverse instructional contexts. Meanwhile, AI learning experiences developed by different subject-area teachers can be diverse but fragmented due to teachers prioritizing different disciplinary learning goals (Adisa et al.,

2025). The entirely teacher-driven approach likely misses the opportunity to support students in developing AI literacy with a coherent and in-depth learning experience. Recognizing this potential opportunity, we adopted a whole-school perspective that considered the cumulative and interconnected nature of students' learning experiences.

A Cross-Disciplinary Approach

Our quest for a cross-disciplinary approach to AI education started in 2020. Through a multi-year design-based research project, we developed and tested learning tools and curriculum modules that integrated AI topics into the ELA (Chao et al., 2023) and social studies classrooms (Nocera et al., 2024). Research showed evidence that the interdisciplinary learning experiences raised students' awareness and interest in AI development and applications, developed their understanding of fundamental AI concepts, and simultaneously enhanced their learning of the subject matters, with a more substantial impact on girls who were typically underrepresented in the field of AI (Zhang et al., 2025 June; Jiang et al., under review).

Building on the initial success, we initiated a new project that elevated the focus onto the school level, aiming to offer a more extensive and coherent interdisciplinary learning experience through a collective effort among teachers from different departments. The key to this approach is to situate student learning in scenarios where disciplinary insights are critical for AI development and/or AI applications give rise to new disciplinary practices. By leveraging the intrinsic connections between AI and disciplines already taught in schools, we envision a series of learning opportunities, presenting discipline-specific scenarios for students to dive deep into aspects of AI and to develop awareness and interest in various AI applications and careers.

Module Set

To bring this vision to life, we have developed three curriculum modules for high school mathematics (Chao et al., 2025 July), English Language Arts (Smyslova et al., in press), and social studies classes (Nocera et al., 2024). Each module is discipline-specific yet designed to contribute to a cohesive, cross-disciplinary exploration of AI. These modules are further framed by a self-paced introductory unit, which establishes foundational concepts, and a culminating application-and-reflection unit, which supports integration and transfer of learning. Together, the module set addresses many learning goals outlined in the AI4K12 guidelines, including Big Idea 2 Representation and Reasoning, Big Idea 3 Machine Learning, Big Idea 4 Natural Interaction, and Big Idea 5 Societal Impact (AI4K12.org, n.d.). The module set

can be accessed on the Concord Consortium’s learning platform via this link: learn.concord.org/storyq. Additional teacher support materials can be accessed when logged in with a free teacher account.

Module 1: AI is Everywhere

In this 2-hour self-paced, choice-based module, students explore a wide range of real-world AI applications. This cross-disciplinary module supports the project’s ELA, history, and math modules by providing students with foundational AI literacy to accompany the more subject-specific activities. Teachers may assign it as in-class work or as homework. Students can make choices based on their interests while being encouraged to explore a variety of AI topics. A checklist helps students track their selections and ensure they complete a balanced set of activities listed below:

Perspectives on AI: Students watch a video presenting three societal perspectives on AI (positive, negative, and neutral) and take notes. Students have the option to create a poster comparing these views.

AI in the Workforce: Students select from six short videos highlighting AI applications in different careers. Students answer questions about the job that sounds most interesting. Students then have the option to design a job advertisement or write a cover letter for the role that sounds most appealing.

AI Innovators: Students explore TIME magazine’s list of 100 AI leaders, choose one person to research, and summarize their contributions. As an extension, students are encouraged to create a textbook-style biography or timeline of their chosen innovator.

Text Classification Models: Students choose to explore one of six online AI demos that showcase uses of text classification. Students describe how the models work, the data they require, and their potential real-world applications. Students may also create an advertisement promoting one of the models.

Natural Language Generation Models: Students watch project-generated videos explaining natural language generation (NLG) and explore models such as restaurant review generators. Students choose one NLG to answer targeted questions about and then optionally draft an advertisement explaining why someone might use it.

Portfolio and Self-Assessment: Students compile their work into a portfolio and optionally complete a self-assessment using a provided rubric.

Module 2: AI Text Generation for ELA

The ELA module supports students in exploring how humans and AI systems generate text, focusing on authorship, structure, and creativity. The module is designed as a three-activity sequence totaling approximately 220 minutes of class time. It is intended for flexible use across four to five

class periods and includes pre- and post-assessments to measure student learning gains.

Activity 1: Determining Authorship. The first activity invites students to reflect on the writing choices humans make when addressing different audiences. Students examine six writing scenarios, such as leaving a sticky note, writing a diary entry, or drafting a letter to a principal. Students discuss how tone, language, and structure shift depending on audience and purpose. Students next predict whether AI could write each of these well. Students then write their own examples for one or two of the scenarios, following specific templates to keep their identities hidden. These student-generated texts are combined with AI-generated samples produced by ChatGPT, seeded with 9th-grade voice cues. Students then analyze the full set of anonymous texts, annotating features they believe reveal human or AI authorship. After this, students review all AI samples together to identify stylistic patterns across them. Teachers have access to a sample annotated version created by the project to support facilitation. The activity concludes with reflection questions and feedback collection.

Activity 2: How Do We Generate Text? Building on the authorship investigation, students consider how writers make word choices in context. Students begin by constructing sentences from a “word salad,” which is a collection of words arranged by part of speech. Students reflect on the choices they made and which combinations they avoided. Students are then introduced to representing text as a Markov chain in a bubble-and-arrow diagram, which prepares students for using the project’s interactive Markov chain tool (Ellis et al., 2025; Martin, 2025). The tool then uses the students’ input text to generate sentences, which the students explore to observe how the model follows statistical patterns similar to their own decision-making, but also produces unexpected or repetitive outputs. Students then examine a model built from a larger dataset to learn that increasing data size alone does not fully resolve the limitations of Markov chains. They explore context windows by listening to audio clips with increasing context to discover how more context narrows prediction possibilities. Students then interact with a Carnegie Mellon demo to compare bigram, trigram, and tetragram models, observing trade-offs between coherence and creativity. The activity concludes with students reflecting on the strengths and limitations of Markov chain models and how these models relate to human writing.

Activity 3: Concepts and Associations. The final activity pushes students to think beyond word-level predictions to broader conceptual associations. Using phrases from *The Great Gatsby*, students rewrite selected lines in three ways: maintaining the original meaning with different wording, offering an opposite meaning, and creating a completely new opening. Working in groups, students arrange these rewritten phrases spatially based on similarities and differences, exploring multiple dimensions of meaning. This leads to the

introduction of the project’s t-SNE plot interactive, which generates a color-coded graph to visualize clustered relationships among text using embeddings. Students add their own phrases to the graph and analyze their placement relative to the preloaded data.

Students learn how embeddings convert words and phrases into numerical representations that capture relationships beyond surface-level patterns. They compare this approach to Markov chain models, discussing how embedding-based methods can better manage synonyms and varied phrasing while supporting more creative text generation. The activity concludes with synthesis questions about creativity, authorship, and writing in the age of AI.

This three-activity module engages students in hands-on exploration of text generation through human and AI lenses. It balances writing, reflection, and computational thinking, helping students build critical AI literacy. Teachers can adjust pacing based on classroom needs, and the included pre- and post-assessments support evaluation of student learning.

Module 3: Math & AI

The Math & AI curriculum module introduces students to the applications of mathematics in AI development. The module comprises five activities, totaling 5 hours.

Activity 1. Sentiment Analysis. The first activity familiarizes students with sentiment analysis and presents the challenge of developing a sentiment analysis model using a computing tool with limited language processing capabilities (i.e., the StoryQ app). The subsequent four activities introduce a series of small datasets, each designed to illustrate a key concept in text classification models. *Activity 2. Finding Keywords* introduces the concept of feature, which is the characteristic of text that can indicate the target class (e.g., the occurrence of “best” in a customer review indicates positive sentiment). *Activity 3. Creating Lists* introduces the concept of a feature space, which consists of multiple features combined to make predictions. *Activity 4. Balancing Opposites* explores methods to combine features that indicate target and non-target classes. *Activity 5. Weighting Influences* introduces feature weights and linear threshold functions as a way to incorporate the directions and strengths of features. Throughout the four activities, students are challenged to design or redesign their models to accommodate the challenging cases in the small datasets. Then, they test their revised models using a larger real-world dataset and interpret the results, which involve multiple statistics and graphs. To provide targeted instruction, a fictitious student team called Team Q presents their models in each activity for students to interpret, analyze, and critique. At the end of each activity, students reflect on the limitations and underlying assumptions of their models or Team Q’s model.

Module 4: AI-Powered Historians

This three-activity curriculum module combines U.S. history—specifically the history of redlining—with AI literacy to build students’ skills in analyzing primary sources, identifying language patterns, and understanding how AI models process text data.

Activity 1: The History of Redlining and Mapping Inequality introduces students to the origins and mechanisms of redlining. They examine how Home Owners’ Loan Corporation (HOLC) and Federal Housing Administration (FHA) policies, developed during the Great Depression and New Deal, influenced mortgage lending and neighborhood development. Students learn key terms such as “suburbanization,” “white flight,” and “housing segregation,” explore historical maps, and place redlining within a broader historical and economic context.

Activity 2: Exploring Mapping Inequality with StoryQ connects history and AI by having students analyze HOLC neighborhood descriptions using the “Mapping Inequality” archive and the StoryQ tool. Students compare language patterns between “A”-rated and “D”-rated neighborhoods, investigate how certain words (features) appear in the data, and explore how these linguistic patterns relate to neighborhood classification in historical maps.

Activity 3: Becoming Powered Users—Understanding Context and Feature Weights in AI focuses on how machine learning models interpret text data. Students work with logistic regression models to explore feature frequency, co-occurrence, and weight changes, learning how features influence predictions. They apply this understanding to historical datasets, interpreting how specific language elements contribute to classification outcomes.

This integrated approach helps students develop skills in working with digital archives using AI tools and knowledge in machine learning concepts. By linking historical primary source analysis with AI techniques, the curriculum equips students to interpret computational outputs, understand how AI models handle real-world data, and recognize both the potential and constraints of using AI for historical inquiry. Students also learn that while AI tools can efficiently identify patterns in large datasets, nuanced interpretation and contextual understanding ultimately depend on human reasoning.

Module 5: AI for the Real World

The last module wraps up the module set by inviting students to apply what they have learned to real-world problems.

Activity 1: Real People, Real Jobs. Students explore profiles of 27 professionals who use data in their work. They select one profile and reflect on how AI could support that career. Students also have the option to draft an op-ed for a newspaper on AI’s role in the workforce.

Activity 2: AI for Social Good: Students identify a real-world or personal problem and propose how AI could help address it, drawing on what they learned in the module.

Setup and Resources Required

The module set is delivered through a full-featured online learning and teaching platform. The student interface integrates all multimedia elements in one single stream with a layout designed to minimize extraneous cognitive load and for various types of devices that students may use. The StoryQ app, Markov Chains app, and t-SNE interactive visualizations are embedded in the curriculum pages and autosave students' work. The teacher presentation slides parallel the student interface but include the purpose of the activity for teachers, background knowledge, just-in-time teaching tips (e.g., grouping ideas or scaffolding questions), and exemplar answers. Our participating teachers found the presentation slides helpful in implementation planning.

Computers and Internet access are required to implement the modules. The platform is compliant with WCAG 2.0 accessibility standards in most respects, providing an equitable learning experience for students with special needs and those using suboptimal computer devices. To use the modules, teachers need to create a teacher account on the platform and add their students to their classes.

Implementation Results

We conducted a pilot study in Spring 2025 in a STEM-focused high school situated in a midsize Northern California city. The school's student body is 95.8% minority, primarily Hispanic (80.4%), followed by Asian (9.3%), White (4.2%), Black (3.7%), American Indian/Alaska Native (1.6%), and Two or More Races (0.8%). With 73% economically disadvantaged students, accessible and empowering educational programs are crucial. Gender distribution is 61% male and 39% female.

Through prior experience working with schools, we gained valuable insights into supporting teacher professional learning across different school and district contexts. One key factor was the importance of securing multi-level buy-in to support successful implementation. In California, we worked closely with the district's administration, school leaders, and the school board. This broad engagement helped align all stakeholders and build momentum for the study. The district's commitment grew so strong that administrators pledged to continue supporting teacher participation, even if external funding became unavailable, demonstrating sustained investment in teacher professional learning and AI literacy.

Teacher Professional Development

We trained a team of three 11th-grade teachers in ELA, history, and math through a one-day, in-person workshop that introduced the modules and the overall project, followed by one-on-one training sessions.

Professional development was delivered through a hybrid model that combined virtual and in-person activities and included both group-based and individualized training sessions. As school teaching teams, the teachers were introduced to the key concepts of the project. They participated as students in essential activities from each module to become familiar with the core learning goals and planned student experiences for each subject area. The teachers engaged in group discussions to further unpack the learning goals and develop a shared understanding of the learning process. The teachers also received one-on-one instruction on the specifics of their subject area module, where they were guided through each page of the module, with particular attention to the core concepts and implementation strategies. During this time, the teachers enhanced their content knowledge and asked clarifying questions to ensure a deeper understanding. They then reconvened as a group to share what they had learned, which began to establish their expertise in their respective modules. Once they were familiar with the entire learning process, our project team facilitated a discussion to plan for implementation, managing both learning goals and logistical constraints.

Participating Students

The pilot study included 20 11th-grade students (65% male, 35% female). 85% identified as Hispanic or Latinx (65% solely, 15% multiracial). Other participants included one Black/African American student (5%), one Asian student (5%), and one Middle Eastern/North African student (5%). Post-high school plans showed 55% intended a 4-year college, 40% a 2-year college, 5% the workforce, and 5% the military. Overall, 95% planned to pursue higher education.

Classroom Implementation

All the participating students shared the same English and history teacher, but not the same math teacher. Fortunately, there was a math teacher who co-led the advisory period, and he agreed to allocate some of his advisory time to implement the math module. However, the school's advisory period served many purposes; therefore, securing sufficient dedicated class time for high-fidelity implementation was not possible. Additionally, the school encountered several unforeseen disruptions, including classroom flooding and surprise field trips, which further limited the time available for implementation and stretched out the time between activities. We consequently transitioned the math module partway through from being teacher-led to self-paced, with the math teacher acting as a facilitator. Ultimately, the junior

class did experience all three subject area modules, but the implementation differed from the project's original intent.

Data Collection and Analysis

We collected multiple types of data to capture the implementation process and assess the impacts of the program on the participating school, teachers, and students.

Teacher data. Detailed notes were taken for planning meetings with the regional computing education partner and the participating school's leadership. Teacher professional development sessions were video recorded. Each teacher created a classroom implementation plan and completed teaching logs as they implemented the module. During implementation, the teachers met with the project coordinator regularly to discuss progress and support needed. Each teacher was interviewed for one hour by project researchers after they completed their implementation.

Student data. Students completed an entry survey before starting the module set and an exit survey upon completion. The entry and exit surveys collected the students' demographic and academic background information, their prior familiarity with AI and machine learning, assess general AI literacy with five multiple choice questions adapted from a validated AI literacy test (Hornberger et al., 2025), a 4-item likert scale measuring Empowerment in Using AI for Problem-Solving adapted from a validated instrument (Kong et al., 2025), perceived connection between AI and a variety of fields (Arts and Humanities, Health and Medicine, etc.), and their expectancies for success, subjective task value, and intention to engage with regard to a hypothetical free, one-week AI summer program. In addition, students also took pre- and post-assessments before and after each discipline-specific module. Their activity records within the modules were also captured via system logs. Two student volunteers were interviewed together for one hour by a project researcher upon completion of the entire module set.

Preliminary Findings

Impacts on Teachers. We have conducted the first round of screening of teacher data to obtain a high-level impression of teachers' experiences. Through the teacher PD video recordings, planning and check-in meeting notes, and post-implementation interviews, we observed that the participating teachers expanded their instructional practices and professional leadership. The teachers collaborated across subject areas, breaking down traditional departmental silos. They coordinated with colleagues they might not otherwise engage with, building stronger cross-disciplinary relationships as they integrated AI literacy into their school's curriculum. By learning to integrate AI literacy into their instruction, the teachers began to position themselves at the forefront of a growing movement to bring AI education to K-12 classrooms. They now have access to new content, digital tools,

and teaching strategies for helping students understand and engage with AI technologies, further enhancing their professional expertise and classroom practice.

Student interviews. Two student volunteers were interviewed together by a project researcher via online conference. Reflecting on their journeys through the program, both interviewees acknowledged that they had a vague impression that AI was probably related to the subject areas such as ELA and math. One of them said that ELA was the foundation for AI systems imitating natural language capabilities, and that mathematics was involved in building AI models. Their general understandings were substantially expanded and deepened through the program. After completing the program, they were able to articulate the connections between AI and each subject area with specific examples. For example, they described how the patterns and structures in English writing were connected with how language models generate text. They also described mathematics as the link between raw text and the sentiment analysis model built from it. Both interviewees attributed their newly gained insights to the varied opportunities to engage with AI concepts in each disciplinary context.

AI literacy test. To assess students' conceptual understanding of foundational AI principles, we administered a multiple-choice AI Literacy Test consisting of five items adapted from Hornberger's (2023) validated AI literacy instrument. Each item presents a conceptual question with four answer choices. The items focus on core constructs aligned with the AI4K12 framework: 1) Understanding Intelligence: What makes AI intelligent? 2) Representations: What are knowledge representations in the field of AI? 3) Decision-Making: What AI models rely on to make decisions; 4) Programmability: What determines an AI model's behavior; 5) Learning from Data: Why machine learning models perform effectively

Students' responses to the five items were scored dichotomously (correct = 1, incorrect = 0). One of the items was excluded from the subsequent analysis due to its poor performance in item analysis. The remaining four items' scores were summed to create a composite score (range: 0–4). This composite score was analyzed using a paired-sample t-test to assess pre–post changes in overall conceptual understanding. The overall composite score improved from $M = 2.385$ ($SD = 0.768$) at entry to $M = 3.154$ ($SD = 1.440$) at exit. The Wilcoxon test approached significance ($p = .052$), and the effect size was large ($r = 0.717$), indicating meaningful overall growth in students' conceptual understanding of AI.

We are currently conducting additional analyses of students' survey responses, discipline-specific pre-/post assessments, and activity records to gain deeper insights into students' engagement with each module and the additive effects of the module set. We will present these additional re-

sults at the conference to inform the community of the program's impacts and considerations for its usage in the classrooms.

Discussions

The initial findings provided early evidence of the positive impact of a cross-disciplinary approach to integrating AI education across the curriculum on schools, teachers, and students. Since this study involved a team of teachers from various departments, school leadership needed to get involved to grant administrative approval and offer necessary support. These interactions within the school increased the visibility of the research study and raised awareness of the AI education initiative among the school community. Teachers also significantly enhanced their professional skills and leadership by participating in a joint professional development workshop to learn not only content specific to their subject areas but also material in other areas, thereby gaining a broader understanding of their students' learning experiences. Students improved their AI literacy and developed a deeper understanding of the connections between AI and the core subjects in their school curriculum. This multi-level impact on the school community differs from existing work that typically focuses on individual subject areas. The expanded faculty capacity to teach AI topics is shared across the school community and, as a result, is more resilient to individual teachers' departure or reassignment.

However, this approach requires a high level of awareness and motivation from school leadership and teachers, making it more difficult for many schools to adopt. Ideally, three subject-area teachers teach the same grade level (for example, 9th or 10th grade students), and this team of teachers can collectively implement the module set with the same cohort of students. However, in reality, schools have idiosyncratic teaching assignments, making it difficult to implement the module set fully. For instance, in a midsize high school with 200 students in one grade level assigned to 8 sections, the math, ELA, and social studies teachers might each teach two sections, but these sections may not overlap. As a result, each student is only exposed to one module instead of the entire set.

Fortunately, from the students' perspective, getting exposure to any AI topics is more beneficial than getting no exposure at all. In our broader project research, two other participating schools could only implement part of the module set for various reasons. The participating teachers and students shared positive experiences with the parts of the module set they worked on.

Informed by these experiences, we began to recruit schools that can send either a full team of ELA, math, and social studies teachers or a partial team with the potential to expand the team in the future. For those interested in using

this module set, we recommend adopting a flexible approach and starting with any parts that align with the school curriculum and interest one or more subject-area teachers.

Conclusion

This paper describes a cross-disciplinary approach to the integration of AI education across the K-12 school curriculum. It details a set of five curriculum modules designed for high school ELA, math, and history classes, as well as for independent study. A pilot study of the module set showed initial evidence of the approach's positive multi-level impacts on students, teachers, and school leadership. A key contribution of our work is advancing the understanding of how AI education can be integrated into the K-12 school curriculum, not only promoting the synergistic learning of AI concepts and disciplinary knowledge, but also fostering a culture of AI education in the whole school community.

Acknowledgments

This material is based upon work supported by the National Science Foundation under Grant No. DRL-2241669. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

This project's vision was brought to life by a highly experienced team composed of developers and researchers from the Concord Consortium (CC), Carnegie Mellon University (CMU), and North Carolina State University (NCSSU). The San Joaquin County Office of Education (SJCCE) in California and the Maryland Center for Computing Education (MCCE) generously supported the project through school recruitment and teacher training. We also thank all the teachers, school leaders, and students who participated in our studies.

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