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**K-12 Education in the Age of Artificial Intelligence (AI): Measuring the Impact of AI
Literacy Curricula in California Public School Districts**

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Abstract

The impact of artificial intelligence (AI) in modern K-12 education is extraordinary, with California school districts increasingly adopting AI literacy curricula. California Assembly Bill (AB) 2876 mandates AI literacy into K-12 curricula; however, it remains understudied whether AI literacy can improve student academic outcomes across the state. This paper examines the relationship between California K-12 public school districts' adoption of AI literacy curricula and student academic outcomes, as measured by the California Assessment of Student Performance and Progress (CAASPP). For this research, I created a cross-sectional AI Literacy Curricula Adoption Index (CAI) to code observational data from 167 California K-12 public school districts during the 2024-2025 academic year. Subsequently, I utilized Microsoft Excel to analyze my dataset and identified a moderate, but statistically significant, positive correlation between CAI scores and CAASPP outcomes. In my analysis, I found that districts with strong implementation of AI literacy curricula are associated with better CAASPP results, suggesting that AI literacy adoption may lead to measurable gains in student outcomes. However, this study cannot establish causality using CAI scores, as numerous variables affect CAASPP scores, and the observational design limits the ability to determine whether AI literacy curricula adoption can directly drive CAASPP scores. Collected data may serve as a basis for further policy research on AI literacy curricula and the outcomes of California K-12 students.

Keywords: Artificial Intelligence (AI) Literacy • K-12 Education • California • Public School Districts • California Assessment of Student Performance and Progress (CAASPP)

Introduction

Artificial intelligence (AI) is transforming the future of teaching and learning. California Assembly Bill (AB) 2876 aims to equip educators and students in the public education system for an AI-driven future. The bill, authored by Assemblymember Marc Berman, required the Instructional Quality Commission (IQC) to consider adopting AI literacy in the K-12 mathematics, science, and history-social science curriculum and instructional materials to the California State Board of Education (SBE).¹ California Governor Gavin Newsom signed AB 2876 into law, and it went into effect on January 1st, 2025, thereby ensuring that public school districts have state-level guidance to teach students to be safe, ethical, and successful users of AI as it becomes central to the future.² While AB 2876 has made AI literacy a core part of California's public education system, it's reasonable to ask about whether this expansion of the state's curricula will meaningfully improve student outcomes or risk exacerbating existing problems associated with AI use.

The focus of my research is to evaluate, broadly, whether integrating AI literacy into California K-12 curricula results in measurable improvements to academic performance. My project aims to better understand the preliminary impacts of AI literacy through my AI Literacy Curricula Adoption Index (CAI), crafted to answer the following research question: “Do California K-12 public school districts that implement AI literacy curricula, since the enactment of AB 2876, during the 2024-2025 academic year, witness a statistically significant improvement in students’ academic performance, measured by the California Assessment of Student

¹ California Assembly. AB 2876, *Pupil Instruction: Media Literacy, Artificial Intelligence Literacy, Curriculum Frameworks, Instructional Materials*, 2023–2024 Regular Session (2024). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240AB2876.

² See note 1 above

Performance and Progress (CAASPP).” To answer this question, I critically coded the quality of school districts’ (n = 167) adoption of AI literacy curricula for educators and students, creating my CAI dataset, and I ran a simple linear regression (SLR) against composite 2024-2025 CAASPP data. I find that the integration of advanced-to-moderate levels of AI literacy curricula adoption is correlated with higher CAASPP composite scores, suggesting that the AB 2876 mandate for AI literacy curricula adoption may be associated with improved student academic performance.

Context and Significance

The State of California’s public education system is the largest in the nation, serving nearly six million K-12 students, underscoring the critical policy intervention that AB 2876 represented to nudge public school districts to embed AI literacy competencies across subjects and grade levels.³ AB 2876 amended Section 33548 of the California Education Code to establish a definition that is:

“Artificial Intelligence (AI) literacy” means the knowledge, skills, and attitudes associated with how artificial intelligence works, including its principles, concepts, and applications, as well as how to use artificial intelligence, including its limitations, implications, and ethical considerations.⁴

The state-mandated definition of AI literacy for K-12 public school districts, which encourages the adoption of new curricula and instructional materials, is substantiated by the advent of readily available generative AI (GenAI) tools that are transforming the very fabric of the education system itself. K-12 students are increasingly using GenAI tools for their schoolwork,

³ California Department of Finance. “Public K–12 Graded Enrollment.” <https://dof.ca.gov/forecasting/demographics/public-k-12-graded-enrollment/>.

⁴ CA Educ. Code § 33548 (2024).

notably Large Language Models (LLMs) such as OpenAI's ChatGPT, as well as other free-to-use AI platforms, more than ever before in educational settings.⁵ New research published by the College Board indicates that the percentage of high school students who have reported using GenAI tools for schoolwork has risen from 79% to 84% between January and May 2025.⁶ This being said, the rising trend in student use of GenAI occurs in the context of AI's dual-use nature, as these technologies can benefit learning but also pose a source of academic dishonesty and skill atrophy when K-12 students become overly dependent on them as learning resources.

Comprehensively, then, the policy stakes of AB 2876 are high because of the dual-use threat AI poses to K-12 education. California has paved the way for school districts to adopt AI literacy. Still, the state's future as a leader in public education remains unclear, particularly whether AB 2876 will improve student academic performance across school districts or merely deepen existing disparities in California K-12 public education, as measured by CAASPP.

Literature Review

Experimentation with the downward effects of AI underscores how fundamentally AI has, for better or for worse, affected all aspects of K-12 education. The widely used GenAI platform among students, ChatGPT, can serve as a learning tool for a variety of academic tasks, such as studying for exams and drafting essays. However, cause-and-effect experiments show that overuse of ChatGPT can lead to harmful downward effects, notably weaker neural activity⁷ A group of researchers from the Massachusetts Institute of Technology (MIT) conducted a series

⁵ College Board. "New Research: Majority of High School Students Use Generative AI for Schoolwork." <https://newsroom.collegeboard.org/new-research-majority-high-school-students-use-generative-ai-schoolwork>.

⁶ See note 5 above

⁷ Kosmyrna Nataliya, Eugene Hauptmann, Ye Tong Yuan, Jessica Situ, Xian-Hao Liao, Ashly Vivian Beresnitzky, Iris Braunstein, and Pattie Maes. "Your Brain on ChatGPT: Accumulation of Cognitive Debt When Using an AI Assistant for Essay Writing Task." 2025, 126. <https://doi.org/10.48550/arxiv.2506.08872>.

of experiments to examine the downward cognitive effects of overusing ChatGPT for a simple essay-writing task. Using electroencephalography (EEG) to assess participants' cognitive engagement during an essay-writing task with LLM assistance, their findings indicate a statistically significant drop in self-efficacy and learning performance associated with using ChatGPT as an AI assistant.⁸ However, the more concerning finding of their experiments is that LLM overuse contributes to the accumulation of “cognitive debt,” in which individuals exhibit a pattern of learning that is biased and superficial, reflecting a forfeiture of independent thinking, a crucial component of education.⁹ Considering these cause-and-effect experimental findings by MIT researchers, which illustrate how AI is quite literally eroding students' critical thinking, it is understandable to be curious about how AI literacy can possibly be linked to higher academic performance.

Qualitative studies conducted by researchers from seven countries found that students and professionals who used ChatGPT while understanding digital literacy skills to use the new technology appropriately reported significant improvements in problem-solving, organization, and writing skills.¹⁰ One standout from their qualitative research findings is that, in K-12 education settings, educators cite that ChatGPT can personalize the learning experience by tailoring to students' unique needs, demonstrating that, when appropriately completed with digital literacy, AI has enormous potential to enhance the quality of the learning experience.¹¹ The practical change that made AI in K-12 education a benefit rather than a burden for student

⁸ Kosmyrna et al., 12.

⁹ Kosmyrna et al., 14.

¹⁰ Mogavi Reza Hadi, Chao Deng, Justin Juho Kim, Pengyuan Zhou, Young D. Kwon, Ahmed Hosny Saleh Metwally, Ahmed Tlili, et al. “ChatGPT in Education: A Blessing or a Curse? A Qualitative Study Exploring Early Adopters' Utilization and Perceptions.” *Computers in Human Behavior: Artificial Humans* 2, no. 1 (2024), 13, <https://doi.org/10.1016/j.chbah.2023.100027>.

¹¹ Mogavi et al., 10.

learning was the digital literacy caveat taught to some ChatGPT users in the researchers' qualitative studies. Overall, the potential for students to benefit from digital literacy by engaging with AI responsibly and effectively outweighs the potential downward effects, helping explain why school districts nationwide plan to adopt AI tools.

The American nonprofit policy think tank, RAND Corporation, has conducted extensive surveys of AI literacy adoption across 231 public school districts, demonstrating that it is the next frontier for K-12 education. The RAND Corporation's key survey results showcase that the overwhelming majority of school districts, roughly 60%, plan to integrate the responsible use of AI in the classroom for students.¹² However, the bigger takeaway from their survey findings is that school districts found that restricting students from using AI tools is far too impractical to manage with an academic-use policy alone; instead, district leaders mentioned that AI literacy pilot programs and student-facing AI activities would better support their students' learning outcomes.¹³ Convincingly, then, California's public school districts are involved in the nationwide push for adopting AI literacy curricula, since the impact of AI on K-12 education is inevitable, and in fact is already a reality for tens of thousands of teachers and students.

Numerous California K-12 public school districts have spearheaded AI literacy during the 2024-2025 academic year to enable their students to interact with AI technologies in the classroom, under adult supervision. Researchers from the Center on Reinventing Public Education (CRPE) wrote a policy report on a cohort of California schools that are rapidly

¹² Diliberti Melissa K., Lisa Berdie, Heather L. Schwartz, and Claude Messan Setodji. "Using Artificial Intelligence Tools in K-12 Classrooms." *RAND Corporation*, 2024, 10, https://www.rand.org/pubs/research_reports/RRA956-21.html.

¹³ Diliberti et al., 13.

adopting AI literacy, in collaboration with the Silicon Valley Schools Fund.¹⁴ The AI literacy program evaluation findings from the California schools CRPE analyzed showed that students participating in AI literacy programs developed stronger English writing and mathematical computation skills, among other learning gains.¹⁵ The results of AI literacy programs have been favorable for both teachers and students, with one school even reporting a 43% drop in disciplinary actions while simultaneously seeing a noticeable increase in student academic engagement since the start of its program.¹⁶ Thus, CRPE's extensive findings across the cohort of California school districts suggest that during the 2024-2025 academic year, AI literacy curricula produced better academic outcomes for students who would otherwise have performed suboptimally. Along with this on-the-ground policy report in California on the positive impacts of AI literacy, the Biden administration's U.S. Department of Education supports the CRPE's substantive findings, which underscore the urgent need for state guidelines on AI literacy as the backbone for school districts.

The California school district-level efforts to build AI literacy are remarkable; however, the U.S. Department of Education outlined in its 2023 policy brief considerable risks and unexpected challenges that arise for educators when developing curricula for AI-enabled technology. A key policy brief recommendation is for policymakers to develop top-down, education-specific guidelines for how educators can reasonably integrate AI literacy curriculum frameworks and instructional materials, as it's challenging for local school district leaders to

¹⁴ Waite Whitney, Alice Opalka, Travis Pillow, et al. "What California Teachers Are Trying, Building, and Learning with AI." *Center on Reinventing Public Education*, 2025, 1. <https://crpe.org/what-california-teachers-are-trying-building-and-learning-with-ai/>.

¹⁵ Waite et al., 3.

¹⁶ Waite et al., 8.

make informed decisions about implementing AI tools.¹⁷ The report's recommendation for states to develop the backbone of guidelines for AI literacy in K-12 public school districts is precisely what California has accomplished with AB 2876, which made AI literacy a core curriculum for school districts' use. That said, it's unclear whether AB 2876's intent to assist school districts in implementing AI literacy will translate into measurable learning gains for students.

In summary, my review of the literature makes it abundantly clear that new research is warranted to determine whether California AB 2876's mandate for AI literacy curricula will improve academic outcomes for K-12 students. The existing literature illustrates the dual-use nature of AI in K-12 education, as it can both benefit and harm students' outcomes. However, the literature also makes a strong case that AI literacy can mitigate the downward effects of AI and may even improve K-12 students' academic performance. Overall, AB 2876 has brought the State of California into the nationwide push for AI literacy, which underscores the urgency of researching whether this policy will translate into measurable gains for students.

Theory and Hypotheses

I hypothesize that California K-12 public school districts with higher scores from my AI Literacy Curricula Adoption Index (CAI) will achieve higher composite California Assessment of Student Performance and Progress (CAASPP) scores from the 2024-2025 academic year. The theoretical basis of my conceptual hypothesis is that school districts with greater adoption of AI literacy experience a spillover effect, with students mastering grade-level English language arts (ELA) and math standards as they learn to use AI tools effectively and responsibly for their education. Thus, AI literacy is a causal mechanism that improves students' outcomes in regard to

¹⁷ United States Department of Education, Office of Educational Technology. Artificial Intelligence and the Future of Teaching and Learning. 2023, 60, <https://www.ed.gov/sites/ed/files/documents/ai-report/ai-report.pdf>.

CAASPP, which measures ELA and mathematics as core assessments of student academic achievement. However, I must note that my theory of AI literacy as a causal mechanism for improved CAASPP outcomes is tempered by the reality that school districts with greater depth of AI literacy adoption may already have a socioeconomic advantage, positioning their students to better understand how to use AI tools for educational purposes. In contrast, socioeconomically disadvantaged school districts that still adopt AI literacy may be constrained because their students have limited access to AI-enabled educational technology in the first place.

The theoretical difference in how AI literacy adoption can shape CAASPP outcomes may stem from high-income area school districts having teachers and students with greater financial resources to enhance their education than middle- to low-income area school districts, which, comparatively speaking, cannot afford additional spending on AI literacy-related education. Furthermore, school districts in middle- to low-income areas may have a significant percentage of English learners (ELs), preventing a large portion of their student population from gaining the full value of AI literacy. Overall, my theory of AI literacy as a causal mechanism for improved student academic outcomes, as measured by CAASPP, shows that socioeconomic status and the percentage of ELs are significant control variables that affect school districts' CAI scores and composite CAASPP scores.

In operational terms, I hypothesize that California K-12 districts with greater adoption of AI literacy curricula, as measured by CAI (1-5), will exhibit higher composite CAASPP scores in the 2024-2025 academic year than districts with lower AI literacy adoption. Each one-point increase in CAI should correspond to a statistically significant increase in a district's composite

CAASPP score. Overall, my operational hypothesis predicts that district-level AI literacy adoption is correlated with improved student academic outcomes, as measured by CAASPP.

Research Design and Methods

Measurement of Variables and Relationships

The unit of analysis in my research design is California K-12 public school districts, with a temporal scope of the 2024-2025 academic year, allowing me to capture variation in AI literacy curricula adoption and CAASPP data during the initial rollout of AB 2876.

The independent variable (X) of my research design is my AI Literacy Curricula Adoption Index (CAI), built on a 1 to 5 scale and derived from four weighted subcomponents I coded with an analytical scoring guide: [1] AI Literacy Curriculum Modules Adopted (35%), [2] Maturity of District Level AI Literacy Policy Framework (35%), [3] Teacher AI Training Provided (15%), [4] Technology/Digital Infrastructure (15%).¹⁸ These four subcomponents are what I use to operationalize CAI because they best showcase the mechanisms by which districts meaningfully implement AI literacy. I weigh [1] and [2] more because of the number of AI literacy modules across grade bands (e.g., grades 9-11 vs. grades 6-12) and the age (e.g., 2022 vs. 2025) when districts adopt an AI literacy policy are quite impactful. Comparatively, I weigh [3] and [4] less because, while still relevant, teacher AI training (e.g., 2 hours vs. 4 hours) and technology/digital infrastructure (e.g., mediocre broadband vs. high-quality broadband) may not directly shape the impact of AI literacy curricula.

The final CAI composite score I calculated by multiplying each of the four component scores by their respective weights and summing the results. Districts whose final CAI composite

¹⁸ See Appendix 1

scores are 1-2, I categorized as Low AI Literacy Adoption, 3 as Moderate AI Literacy Adoption, and 4-5 as Advanced AI Literacy Adoption. Index subcomponents [1], [2], and [3] are specific to the 167 school districts for which I found observational data on, by visiting district-run webpages and searching for terms such as “AI literacy administration details,” “AI literacy student resources,” and “AI literacy programs.”¹⁹ Additionally, I obtained observational data for subcomponent [4] from the 2023 California Department of Technology broadband access map report and cross-analyzed it with districts where I had already found AI literacy adoption data.

The dependent variable (Y) of my research design is the 2024-2025 CAASPP composite scores (English Language Arts + Math), covering grades 3 through 8 and grade 11. I understand that these grades do not reflect the full outcomes of the K-12 public education system; however, since the State of California has used these grade bands’ testing data as a comprehensive view of student achievement, I find them an acceptable operationalization for my research. All of the CAASPP observational data I pulled from the publicly available dataset published by the California Department of Education (CDE).

The two control variables (Z) I am measuring that may influence the relationship between my CAI scores and composite CAASPP scores are the percentage of English learners (ELs) and socioeconomic status of the school district, measured by the percentage of students eligible for free or reduced-price lunch (FRPL) (i.e., < 15% eligibility is high income < 25% eligibility is upper-middle income, > 50% eligibility is lower middle income, > 75% eligibility low income). I chose to operationalize these two Z variables because, for my research, they are the highly relevant factors that can influence the relationship between my independent and dependent

¹⁹ See Appendix 2

variables: socioeconomic status and the percentage of ELs can both affect the quality of a school district's implementation of AI literacy curricula and CAASPP composite scores. I understand there may be hundreds of Z variables that go into CAI or CAASPP reporting; however, for my specific research purposes, I find these two to be the most relevant, and, as such, I control for them in my research design. I also obtained all data on ELs and FRPL eligibility by pulling observational data from the CDE's published datasets.

Analysis and Design Structure

My research is a large- n , cross-sectional study because I aim to identify a correlation between CAI scores across CAASPP performance, while also controlling for ELs and socioeconomic status, measured by FRPL eligibility. I uploaded all my collected data into Microsoft Excel, in both numerical and text formats, organized it into tables, and ran several statistical tests to find results for each dataset.

To measure my X and Y variables, I used a simple linear regression (SLR) to estimate how much CAASPP scores change for a one-point increase in my CAI scores. I also used a t -test to determine the p -value for a potential difference in CAASPP scores based on CAI. The t -test was used to find out whether the difference is statistically significant and unlikely to be random.

For both my Z variables, I used Pearson's r to estimate the relationship between CAASPP scores and the percentages of ELs and FRPL-eligible students. I complemented my use of Pearson's r with t -tests to determine p -values for the two Z variables, again to assess whether the differences are statistically significant and unlikely to be random. After completing the statistical tests in Microsoft Excel for all my variables, I created graphs to display my results and provide an interpretation of the key findings.

Results

AI Literacy Curricula Adoption Index (CAI) Findings

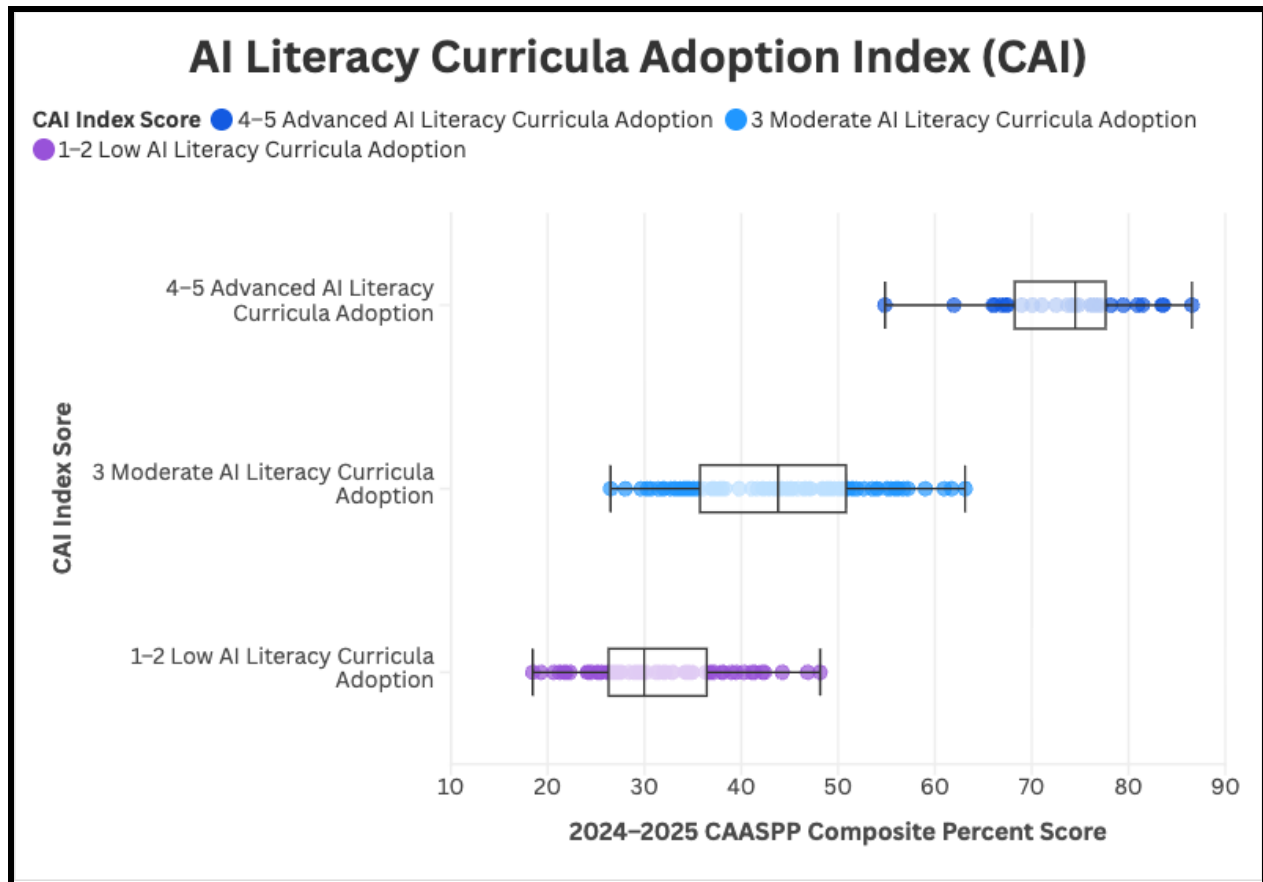


Figure 1. *AI Literacy Curricula Adoption Index (CAI) by 2024-2025 CAASPP Composite Percent Scores*

Sources: *Researcher Coded Data Source, CDE Data Quest 2025, CA Broadband Access 2023*

This figure presents CAI scores and CAASPP composite scores for school districts, grouped by Low, Moderate, and Advanced categorizations. Simple linear regression (SLR) results show that every 1-point increase in CAI is associated with roughly a 10.8% gain in CAASPP scores, and t-test results show the correlation is significant at $p = 0.014$, meaning there is a 1.4% chance that my observations are entirely random. My categories display what may be a pattern of CAI scores and CAASPP scores in relation to one another: Low CAI (1-2 scoring)

cluster around lower CAASPP scores, Moderate CAI (3 scoring) hovers around the low-to mid-range of CAASPP scores, and Advanced CAI (4-5 scoring) achieves high CAASPP scores.

My interpretation of the key finding from CAI is that there is a moderate-to-statistically significant positive correlation between the adoption of AI literacy curricula and improved CAASPP scores, which may lend weight to my theory that AI literacy creates a spillover effect that can drive student achievement. However, my CAI findings cannot establish a causal relationship between AI literacy curricula and CAASPP outcomes. Nevertheless, the positive correlation may be the strongest finding of my research, as high CAI scores can be associated with better CAASPP outcomes for school districts.

English Learners (ELs) Findings

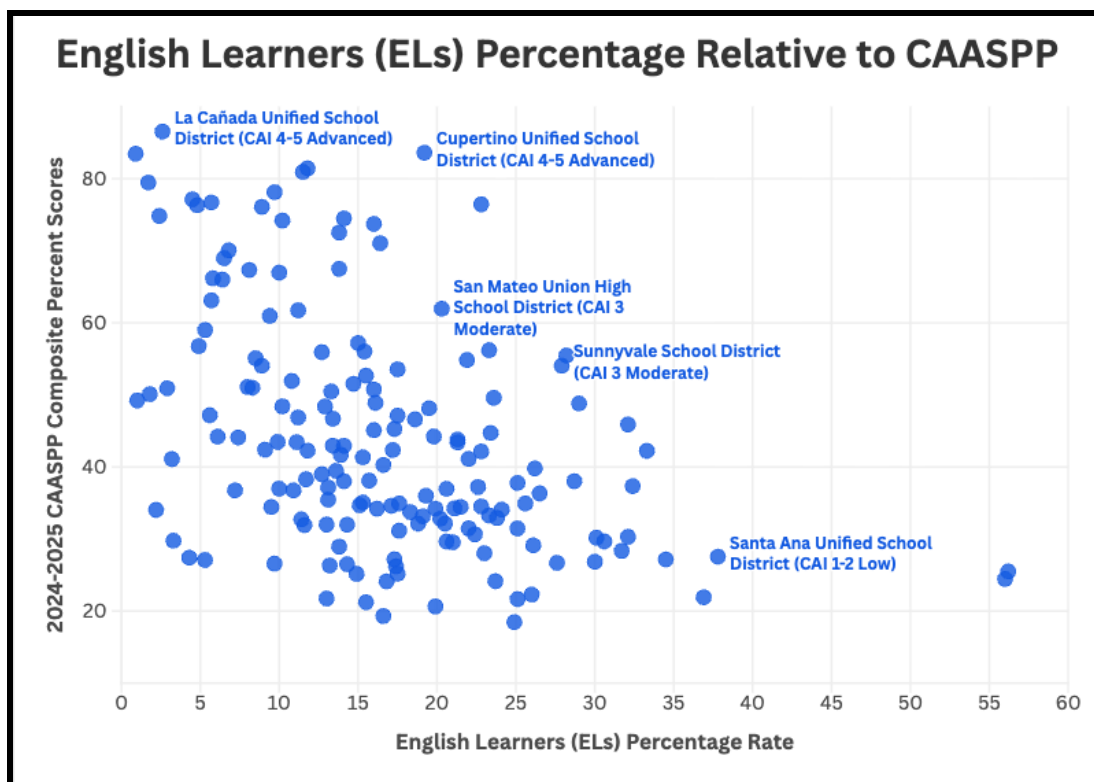


Figure 2. English Learner (EL) Percentage by 2024-25 CAASPP Composite Percent Scores

Sources: CDE Data Quest 2025

This figure illustrates the percentage of ELs in a district and the CAASPP composite scores, with labels of five school districts that reflect the spread of CAI scores. Pearson's r shows a negative correlation of $r = -0.62$, which indicates a strong likelihood that districts with higher percentages of ELs will have lower CAASPP outcomes. My result is statistically significant at $p = 0.017$, meaning there is a 1.7% chance that my observations are random.

My key takeaway from the ELs control findings is that there may be a correlation between school districts with a high percentage of ELs and generally low CAASPP outcomes. Since this appears to be the case, my interpretation of this correlation is that ELs are thus a notable control variable for CAASPP. My figure visually reinforces this correlation as the school districts with high percentages of ELs skew toward the lower end of CAASPP scores, while districts with middle- to low-percentage ELs are mostly in the middle- to high-range of CAASPP scores. Overall, the final takeaway is that AI literacy may not be impactful to better student academic performance, as measured by CAASPP, when a district has a high percentage of ELs.

Free or Reduced-Price Lunch Eligibility (FRPL) Findings

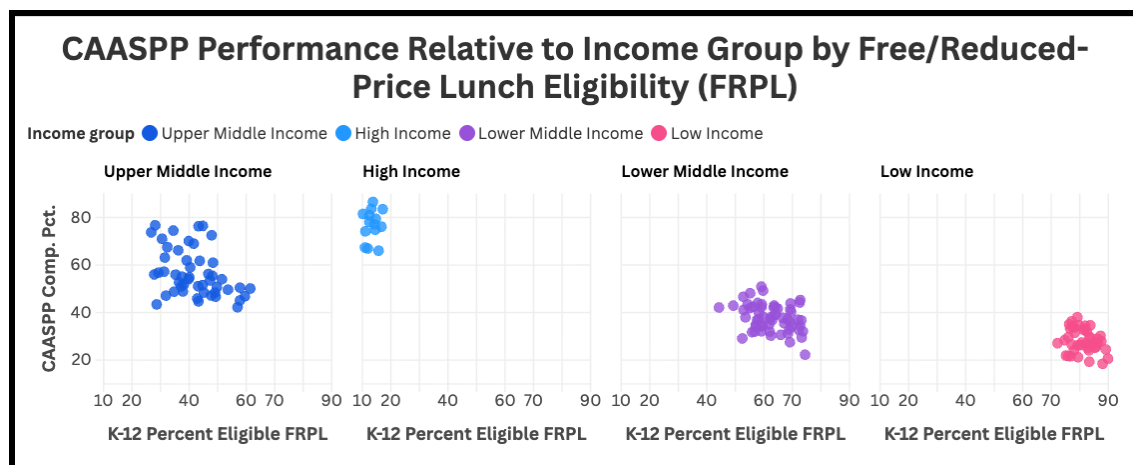


Figure 3. *Free or Reduced-Price Lunch Eligibility (FRPL) by 2024-25 CAASPP Composite Percent Scores*

Sources: CDE Data Quest 2025

This figure presents income-level categories based on the relationship between the percentage of students eligible for free or reduced-price lunch (FRPL) and CAASPP scores within a school district. Results from Pearson's r show a very strong negative correlation ($r = -0.71$), suggesting that income level may explain differences in school district performance on CAASPP. My t-test results show $p = 0.013$, indicating a 1.3% chance that the correlation is random, so the relationship between FRPL and CAASPP scores is statistically significant.

The key takeaway from these findings is that there is strong correlational evidence that FRPL eligibility is associated with CAASPP outcomes. Overwhelmingly, high-income districts clustered at much higher CAASPP scores, while middle- to low-income districts clustered at average or lower CAASPP scores. Ultimately, my interpretation of the FRPL control findings is that AI literacy curricula will not significantly improve student academic outcomes, as measured by CAASPP, particularly in districts with many students from low-income backgrounds.

Discussion and Research Implications

My study of AI literacy curricula adoption was crafted to answer whether California K-12 public school districts that implement AI literacy curricula, since the enactment of AB 2876, during the 2024-2025 academic year, witness a statistically significant improvement in students' academic performance, as measured by CAASPP composite scores? The results of my research suggest that the answer to this question is likely yes; however, several caveats arising from my control variables prevent me from being confident in this affirmative answer.

Across my large-n, cross-sectional study of 167 districts, I found that the degree of AI literacy implementation was associated with meaningfully higher CAASPP scores. The simple linear regression (SLR) test I ran demonstrated that each one-point increase in CAI corresponds

to a roughly 10.8% gain in CAASPP scores, and the t-test confirmed the difference as statistically significant at a 1.4% chance of this outcome as random. These key findings support my original hypothesis that integrating AI literacy would result in substantially stronger academic performance than in districts with minimal AI literacy adoption. However, my analysis of the control variables, percentage of ELs, and FRPL eligibility complicates my correlational interpretation of CAI and CAASPP.

The Pearson's r tests I ran showed negative correlations between CAASPP scores and both the percentage of ELs ($r = -0.62$) and socioeconomic status measured by FRPL eligibility ($r = -0.71$). Since I found that the relationship between these two control variables and CAASPP was unexpectedly strong, they suggest that part of my observed correlation between CAI and CAASPP may have been driven by preexisting district advantages rather than AI literacy as a causal mechanism for the better scores. Therefore, an alternative explanation is that my CAI scores partially capture the broader impact of resource-rich school districts on student achievement. I say this because districts with Advanced CAI scores (4-5) tended to have students from high-income backgrounds and fewer ELs, which may explain their better CAASPP outcomes beyond the impact of AI literacy. Nevertheless, because the districts already positioned to achieve better CAASPP outcomes are also correlated with greater depth of AI literacy adoption, I still believe there is ample evidence from my study for future policymakers to strengthen the AB 2876 mandate for AI literacy curricula by ensuring equity in implementation.

Comprehensively, while my study supports the hypothesis that AI literacy adoption since the enactment of AB 2876 correlates with better student performance, as measured by CAASPP, it also suggests something more critical. Equitable implementation, not merely adoption, of AI

literacy will determine whether school districts' new curriculum frameworks become an engine for student academic improvement or simply drive deeper disparities in the California K-12 public education system. Hence, my study supports policymakers in going beyond the scope of the AB 2876 mandate by introducing new legislation, perhaps targeted AI curricula grants, to support the implementation of AI literacy in school districts that serve students from disadvantaged backgrounds. My final implication is that, so far, AB 2876 has been associated with better student outcomes; however, California policymakers should examine how the AI literacy curricula mandate can be made equitable across all K-12 public school districts.

Research Limitations and Research Extensions

All things considered, my study provided evidence of a correlation between AI literacy adoption and improved academic performance, but several limitations should be acknowledged as room for improvement. Chiefly, my study cannot establish the causal effect of AI literacy as an independent academic accelerator of student achievement, primarily because of my observational design. Not to mention that, although my study controlled for two key variables (ELs and FRPL eligibility), CAASPP outcomes can be shaped by hundreds of factors. To name a few, I would have liked to include controls for district-level student-to-teacher ratios, chronic absenteeism rates, and race/ethnicity demographics in this study. As a result of not accounting for these controls, some of my correlations between CAI scores and CAASPP performance may reflect unmeasured district characteristics, which brings in the need for future improvement by adding additional controls to isolate the impact of AI literacy curricula on student outcomes.

In addition, my study's analysis covers only the 2024-2025 academic year, the first year of AB 2876's enactment, raising questions about how many districts were still in the early stages

of AI literacy implementation when I coded them into CAI. To address this major temporal shortcoming and also my lack of controls, I recommend future multi-year research that follows school districts over several cycles of CAASPP reporting as AI literacy expands statewide. Future multi-year studies could track whether CAASPP gains persist, grow stronger, or plateau as AI literacy curricula adoption expands across public school districts. Overall, while my study offered meaningful correlation insights about AI literacy curricula adoption, my limitations of a narrow temporal scope and lack of controls underscore the need for multi-year research to fully understand AI literacy's role in California's K-12 educational landscape, and potentially determine a causal relationship, rather than correlation alone.

Conclusion

Comprehensively, my study provides early correlational evidence that California school districts adopting AI literacy curricula since the enactment of AB 2876, during the 2024-2025 academic year, see students improve academically, as measured by CAASPP performance. The key findings of this study show that a 1-point increase in CAI is associated with a roughly 10.8% increase in CAASPP scores. While my study cannot establish a causality of AI literacy functioning as an independent academic accelerator for student success, given the pattern of better CAASPP outcomes for high-adopting districts and the AI dual-use nature in education, the overall impact of my work supports California policymakers to look into expanding the AB 2876 mandate for AI literacy curricula. Altogether, my research underscores the need for future multi-year research on AI literacy curricula and on how policymakers could equitably push for AB 2876's changes across California's K-12 public education system.

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Appendix 1: AI Literacy Curricula Adoption Index (CAI) Analytic Scoring Guide

Component	Description	1	2	3	4	5
AI Literacy Curriculum Modules Adopted	Measures the Extent to Which the District has Implemented Formal AI Literacy Content in the K-12 Curriculum	No Modules Adopted	Pilot AI Literacy Modules in One Grade or Subject	Partial Adoption of AI Literacy in Some Grades or Subjects	Nearly Full Adoption of AI Literacy Across Grades and Subjects	Full Integration of AI Literacy for K-12 and Subject Offering
Maturity of District-Level AI Literacy Policy Framework	Assesses When the District Developed, Approved, and Operationalized Policies Supporting AI Literacy, with Maturity Measured in the Age of the District's Policy Framework	No Policy or Planning Operations	Draft Policy, but no Official AI Literacy Operation	Policy Approved but Mediocre Operations	Policy Approved with Better-than-Average Operations	Complete Operational and Advanced Policy for AI Literacy Curricula Operations
Teacher AI Training Provided	Captures Professional Development (PD) and Instructional Training for Teachers on AI Tools.	None	Instructive/Optional Teacher AI Literacy Workshops Only	1-2 Hours of PD AI Literacy training for Teachers	3-4 Hours of PD AI Literacy training for Teachers	5+ Hours of PD AI Literacy training for Teachers
Technology/Digital Infrastructure	Evaluates District Capacity to Support AI Education, and Measures Local Broadband Access	Poor Broadband 10 Mbps Down / 1 Mbps Up	Below Average Broadband < 25 Mbps Down / 3 Mbps Up	Average Broadband $\geq$ 25 Mbps Down / 3 Mbps Up	Average Broadband Access AND Well Qualified School Technology Resources	Average Broadband Access AND Very Well Qualified School Tech Resources

Appendix 2: 167 California K-12 Public School Districts Observed

School District Name	2024–2025 CAASPP Composite Percent Score	CAI Index Score
Irvine Unified School District	72.52%	4–5 Advanced AI Literacy Curricula Adoption
San Ramon Valley Unified School District	77.13%	4–5 Advanced AI Literacy Curricula Adoption
Capistrano Unified School District	67.33%	4–5 Advanced AI Literacy Curricula Adoption
Cupertino Unified School District	83.60%	4–5 Advanced AI Literacy Curricula Adoption
Poway Unified School District	70.06%	4–5 Advanced AI Literacy Curricula Adoption
Fremont Unified School District	71.04%	4–5 Advanced AI Literacy Curricula Adoption
Palo Alto Unified School District	80.94%	4–5 Advanced AI Literacy Curricula Adoption
Dublin Unified School District	76.70%	4–5 Advanced AI Literacy Curricula Adoption
South Pasadena Unified School District	81.45%	4–5 Advanced AI Literacy Curricula Adoption
Oak Park Unified School District	76.32%	4–5 Advanced AI Literacy Curricula Adoption
Lammersville Joint Unified School District	73.73%	4–5 Advanced AI Literacy Curricula Adoption
La Cañada Unified School District	86.55%	4–5 Advanced AI Literacy Curricula Adoption
Beverly Hills Unified School District	66.96%	4–5 Advanced AI Literacy Curricula

		Adoption
Laguna Beach Unified School District	74.83%	4-5 Advanced AI Literacy Curricula Adoption
Piedmont City Unified School District	83.46%	4-5 Advanced AI Literacy Curricula Adoption
Pacific Grove Unified School District	66.00%	4-5 Advanced AI Literacy Curricula Adoption
Pleasanton Unified School District	76.09%	4-5 Advanced AI Literacy Curricula Adoption
Walnut Valley Unified School District	74.49%	4-5 Advanced AI Literacy Curricula Adoption
Palos Verdes Peninsula Unified School District	78.13%	4-5 Advanced AI Literacy Curricula Adoption
Fremont Union High School District	76.45%	4-5 Advanced AI Literacy Curricula Adoption
Milpitas Unified School District	67.50%	4-5 Advanced AI Literacy Curricula Adoption
Santa Clara Unified School District	54.84%	4-5 Advanced AI Literacy Curricula Adoption
San Dieguito Union High School District	74.19%	4-5 Advanced AI Literacy Curricula Adoption
Santa Monica-Malibu Unified School District	66.18%	4-5 Advanced AI Literacy Curricula Adoption
Berkeley Unified School District	68.97%	4-5 Advanced AI Literacy Curricula Adoption
Manhattan Beach Unified School District	79.46%	4-5 Advanced AI Literacy Curricula Adoption
San Mateo Union High School District	61.96%	3 Moderate AI Literacy Curricula Adoption
Elk Grove Unified School District	48.89%	3 Moderate AI Literacy Curricula Adoption

Los Angeles Unified School District	46.61%	3 Moderate AI Literacy Curricula Adoption
Sacramento City Unified School District	36.00%	3 Moderate AI Literacy Curricula Adoption
San Diego Unified School District	50.74%	3 Moderate AI Literacy Curricula Adoption
San Francisco Unified School District	49.61%	3 Moderate AI Literacy Curricula Adoption
Long Beach Unified School District	45.11%	3 Moderate AI Literacy Curricula Adoption
Anaheim Union High School District	34.24%	3 Moderate AI Literacy Curricula Adoption
Oakland Unified School District	30.29%	3 Moderate AI Literacy Curricula Adoption
Corona-Norco Unified School District	50.48%	3 Moderate AI Literacy Curricula Adoption
San Bernardino City Unified School District	29.65%	3 Moderate AI Literacy Curricula Adoption
Placentia-Yorba Linda Unified School District	61.73%	3 Moderate AI Literacy Curricula Adoption
Saddleback Valley Unified School District	55.92%	3 Moderate AI Literacy Curricula Adoption
San Marcos Unified School District	51.93%	3 Moderate AI Literacy Curricula Adoption
Folsom-Cordova Unified School District	51.52%	3 Moderate AI Literacy Curricula Adoption
Conejo Valley Unified School District	60.96%	3 Moderate AI Literacy Curricula Adoption
San Jose Unified School District	45.89%	3 Moderate AI Literacy Curricula Adoption
Glendale Unified School District	56.20%	3 Moderate AI Literacy Curricula Adoption
Santa Barbara Unified School District	46.69%	3 Moderate AI Literacy Curricula Adoption
Fullerton Joint Union High School District	54.05%	3 Moderate AI Literacy Curricula Adoption
Rocklin Unified School District	63.12%	3 Moderate AI Literacy Curricula Adoption
Whittier Union High School District	50.99%	3 Moderate AI Literacy Curricula Adoption
San Juan Unified School District	34.04%	3 Moderate AI Literacy Curricula Adoption
Orange Unified School District	52.66%	3 Moderate AI Literacy Curricula Adoption
Mt. Diablo Unified School District	43.41%	3 Moderate AI Literacy Curricula Adoption

Natomas Unified School District	35.45%	3 Moderate AI Literacy Curricula Adoption
Chico Unified School District	47.17%	3 Moderate AI Literacy Curricula Adoption
La Mesa-Spring Valley School District	42.35%	3 Moderate AI Literacy Curricula Adoption
Monterey Peninsula Unified School District	34.50%	3 Moderate AI Literacy Curricula Adoption
Sequoia Union High School District	57.20%	3 Moderate AI Literacy Curricula Adoption
Campbell Union School District	48.81%	3 Moderate AI Literacy Curricula Adoption
Pleasant Valley School District	55.08%	3 Moderate AI Literacy Curricula Adoption
Claremont Unified School District	59.00%	3 Moderate AI Literacy Curricula Adoption
Paso Robles Joint Unified School District	36.96%	3 Moderate AI Literacy Curricula Adoption
Travis Unified School District	41.09%	3 Moderate AI Literacy Curricula Adoption
Tulare Joint Union High School District	38.28%	3 Moderate AI Literacy Curricula Adoption
Kerman Unified School District	34.08%	3 Moderate AI Literacy Curricula Adoption
Lodi Unified School District	33.74%	3 Moderate AI Literacy Curricula Adoption
Montebello Unified School District	31.47%	3 Moderate AI Literacy Curricula Adoption
Hacienda la Puente Unified School District	45.26%	3 Moderate AI Literacy Curricula Adoption
Norwalk-La Mirada Unified School District	42.93%	3 Moderate AI Literacy Curricula Adoption
Napa Valley Unified School District	37.21%	3 Moderate AI Literacy Curricula Adoption
Oxnard Union High School District	32.00%	3 Moderate AI Literacy Curricula Adoption
Simi Valley Unified School District	43.44%	3 Moderate AI Literacy Curricula Adoption
Tracy Joint Unified School District	34.44%	3 Moderate AI Literacy Curricula Adoption
South San Francisco Unified School District	44.71%	3 Moderate AI Literacy Curricula Adoption
Azusa Unified School District	28.02%	3 Moderate AI Literacy Curricula Adoption
El Rancho Unified School District	34.67%	3 Moderate AI Literacy Curricula Adoption
San Leandro Unified School District	33.26%	3 Moderate AI Literacy Curricula Adoption

Pomona Unified School District	30.64%	3 Moderate AI Literacy Curricula Adoption
Rialto Unified School District	33.14%	3 Moderate AI Literacy Curricula Adoption
Visalia Unified School District	38.01%	3 Moderate AI Literacy Curricula Adoption
Temecula Valley Unified School District	56.77%	3 Moderate AI Literacy Curricula Adoption
Newport-Mesa Unified School District	56.02%	3 Moderate AI Literacy Curricula Adoption
Fairfield-Suisun Unified School District	35.07%	3 Moderate AI Literacy Curricula Adoption
Ontario-Montclair School District	39.78%	3 Moderate AI Literacy Curricula Adoption
Redlands Unified School District	44.08%	3 Moderate AI Literacy Curricula Adoption
Oceanside Unified School District	36.99%	3 Moderate AI Literacy Curricula Adoption
Newark Unified School District	43.81%	3 Moderate AI Literacy Curricula Adoption
Shasta Union High School District	50.10%	3 Moderate AI Literacy Curricula Adoption
Oakdale Joint Unified School District	43.47%	3 Moderate AI Literacy Curricula Adoption
Lompoc Unified School District	26.50%	3 Moderate AI Literacy Curricula Adoption
El Tejon Unified School District	32.73%	3 Moderate AI Literacy Curricula Adoption
Nevada Joint Union High School District	49.22%	3 Moderate AI Literacy Curricula Adoption
Gridley Unified School District	41.67%	3 Moderate AI Literacy Curricula Adoption
West Sonoma County Union High School District	50.91%	3 Moderate AI Literacy Curricula Adoption
Ventura Unified School District	42.94%	3 Moderate AI Literacy Curricula Adoption
Western Placer County Unified School District	51.09%	3 Moderate AI Literacy Curricula Adoption
Hawthorne School District	37.78%	3 Moderate AI Literacy Curricula Adoption
Ocean View School District	53.55%	3 Moderate AI Literacy Curricula Adoption
El Monte City School District	42.23%	3 Moderate AI Literacy Curricula Adoption
Liberty Union High School District	44.21%	3 Moderate AI Literacy Curricula Adoption
Novato Unified School District	47.12%	3 Moderate AI Literacy Curricula Adoption

Centinela Valley Union High School District	31.98%	3 Moderate AI Literacy Curricula Adoption
Lennox School District	37.33%	3 Moderate AI Literacy Curricula Adoption
Sunnyvale School District	54.04%	3 Moderate AI Literacy Curricula Adoption
Pasadena Union School District	42.25%	3 Moderate AI Literacy Curricula Adoption
Garden Grove Unified School District	55.46%	3 Moderate AI Literacy Curricula Adoption
Downey Unified School District	48.39%	3 Moderate AI Literacy Curricula Adoption
Monrovia Unified School District	48.41%	3 Moderate AI Literacy Curricula Adoption
San Jacinto Unified School District	25.15%	1-2 Low AI Literacy Curricula Adoption
Perris Union High School District	28.92%	1-2 Low AI Literacy Curricula Adoption
Woodland Joint Unified School District	32.81%	1-2 Low AI Literacy Curricula Adoption
Bakersfield City School District	21.66%	1-2 Low AI Literacy Curricula Adoption
Hesperia Unified School District	24.11%	1-2 Low AI Literacy Curricula Adoption
Morongo Unified School District	29.77%	1-2 Low AI Literacy Curricula Adoption
Newman-Crows Landing Unified School District	30.18%	1-2 Low AI Literacy Curricula Adoption
Ocean View Unified School District	25.18%	1-2 Low AI Literacy Curricula Adoption
Dos Palos Oro Loma Joint Unified School District	18.45%	1-2 Low AI Literacy Curricula Adoption
Cotati-Rohnert Park Unified School District	34.61%	1-2 Low AI Literacy Curricula Adoption
Kern High School District	34.44%	1-2 Low AI Literacy Curricula Adoption
Twin Rivers Unified School District	31.48%	1-2 Low AI Literacy Curricula Adoption
West Contra Costa Unified School District	29.66%	1-2 Low AI Literacy Curricula Adoption
Hemet Unified School District	26.31%	1-2 Low AI Literacy Curricula Adoption
Madera Unified School District	26.69%	1-2 Low AI Literacy Curricula Adoption

Val Verde Unified School District	32.13%	1-2 Low AI Literacy Curricula Adoption
Salinas Unified School District	31.15	1-2 Low AI Literacy Curricula Adoption
Porterville Unified School District	34.93%	1-2 Low AI Literacy Curricula Adoption
Yucaipa-Calimesa Joint Unified School District	36.74%	1-2 Low AI Literacy Curricula Adoption
Morgan Hill Unified School District	41.34%	1-2 Low AI Literacy Curricula Adoption
Lincoln Unified School District	36.74%	1-2 Low AI Literacy Curricula Adoption
Lucia Mar Unified School District	46.86%	1-2 Low AI Literacy Curricula Adoption
Gilroy Unified School District	36.33%	1-2 Low AI Literacy Curricula Adoption
Bellflower Unified School District	38.09%	1-2 Low AI Literacy Curricula Adoption
West Covina Unified School District	42.39%	1-2 Low AI Literacy Curricula Adoption
Rowland Unified School District	42.15%	1-2 Low AI Literacy Curricula Adoption
Panama-Buena Vista Union School District	39.46%	1-2 Low AI Literacy Curricula Adoption
Grossmont Union High School District	38.99%	1-2 Low AI Literacy Curricula Adoption
Central Unified School District	37.15%	1-2 Low AI Literacy Curricula Adoption
Oxnard School District	21.74%	1-2 Low AI Literacy Curricula Adoption
Baldwin Park Unified School District	34.93%	1-2 Low AI Literacy Curricula Adoption
Antioch Unified School District	20.64%	1-2 Low AI Literacy Curricula Adoption
Cajon Valley Union School District	27.15%	1-2 Low AI Literacy Curricula Adoption
Old Adobe Union School District	48.14%	1-2 Low AI Literacy Curricula Adoption
Yosemite Unified School District	27.40%	1-2 Low AI Literacy Curricula Adoption
Windsor Unified School District	34.21%	1-2 Low AI Literacy Curricula Adoption
Pajaro Valley Unified School District	21.90%	1-2 Low AI Literacy Curricula Adoption
Patterson Join Unified School District	28.35%	1-2 Low AI Literacy Curricula Adoption
Colton Join Unified School District	26.20%	1-2 Low AI Literacy Curricula Adoption

Lake Elsinore Unified School District	31.93%	1–2 Low AI Literacy Curricula Adoption
Hayward Unified School District	26.85%	1–2 Low AI Literacy Curricula Adoption
Palm Springs Unified School District	29.11%	1–2 Low AI Literacy Curricula Adoption
Antelope Valley Union High School District	26.58%	1–2 Low AI Literacy Curricula Adoption
Escondido Union High School District	38.02%	1–2 Low AI Literacy Curricula Adoption
Calexico Unified School District	24.45%	1–2 Low AI Literacy Curricula Adoption
El Monte Union High School District	44.23%	1–2 Low AI Literacy Curricula Adoption
Moreno Valley Unified School District	27.18%	1–2 Low AI Literacy Curricula Adoption
Fontana Unified School District	32.92%	1–2 Low AI Literacy Curricula Adoption
Sweetwater Union High School District	41.12%	1–2 Low AI Literacy Curricula Adoption
Riverside Unified School District	40.27%	1–2 Low AI Literacy Curricula Adoption
Santa Maria-Bonita School District	21.22%	1–2 Low AI Literacy Curricula Adoption
Fresno Unified School District	32.13%	1–2 Low AI Literacy Curricula Adoption
Stockton Unified School District	24.14%	1–2 Low AI Literacy Curricula Adoption
Paramount Unified School District	34.20%	1–2 Low AI Literacy Curricula Adoption
Santa Ana Unified School District	27.54%	1–2 Low AI Literacy Curricula Adoption
Manteca Unified School District	29.53%	1–2 Low AI Literacy Curricula Adoption
Alisal Union School District	25.50%	1–2 Low AI Literacy Curricula Adoption
Vallejo City Unified School District	22.29%	1–2 Low AI Literacy Curricula Adoption
Kelseyville Unified School District	19.31%	1–2 Low AI Literacy Curricula Adoption
Warner Unified School District	27.09%	1–2 Low AI Literacy Curricula Adoption