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Coursemojo Efficacy Study

Grade 6, 2024–2025
Aimsweb & TCAP

Authors:

Rachel Schechter, Ph.D.
Michaela Gulemetova, Ph.D.
Colin Ackerman, Ph.D.
Laura Janakiefski, Ph.D.

JULY 2025

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MODERATE

LXD Research Recognition for Coursemojo

Coursemojo

This product has been rigorously evaluated and is hereby acknowledged for meeting the educational impact criteria of the Every Student Succeeds Act (ESSA), warranting a **Level 2** for "**Moderate**" Evidence. This recognition is based on its proven effectiveness in enhancing grade-level learning outcomes.

REVIEWED BY THE LXD RESEARCH EXPERT REVIEW PANEL

Rachel Schechter, Ph.D.
Founder of LXD Research

July 2025

DATE

Understanding ESSA Evidence

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Educators search for high-quality research and evidence-based solutions to strengthen grant applications, to support comprehensive and targeted instruction, or to implement new programming in their schools. Evidence requirements under the Every Student Succeeds Act (ESSA) are designed to ensure that states, districts, and schools can identify programs, practices, products, and policies that work across various populations.

Educational programs document their evidence of design, effectiveness, and impact in order to be eligible for federal funding. While there is no singular authority that determines a program's tier, the Department of Education's Office of Educational Technology provides standards to assess the varying levels of strength of research for education products.

The categories for ESSA Evidence are: strong (Tier 1), moderate (Tier 2), and promising (Tier 3) evidence of effectiveness, or demonstrates a rationale to be effective (Tier 4).

This product meets the requirements for Tier 2:

- In a quasi-experimental design, students who used the program are examined against a comparison group who did not use the program.
- At least one quasi-experimental study with the proper design and implementation with at least two teachers and a multi-site sample of 350 students showed statistically significant, positive findings.
- The study uses a program implementation that could be replicated.
- A third-party research organization has reviewed the documentation for ESSA validation.

When product designers leverage learning sciences to design and evaluate the effectiveness of their programs, educators can better target instruction, and students' skills soar. A quasi-experimental study design using standardized assessment data, an analysis of student growth, and educator feedback demonstrates this product's efficacy, meeting the criteria for LXD Research's ESSA Tier 2 Evidence.

– Rachel Schechter, Ph.D., Founder of LXD Research

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EFFICACY STUDY SUMMARY
GRADE 6
2024–2025

ESSA MODERATE II LXD RESEARCH

Coursemojo

PROGRAM DESCRIPTION

Coursemojo is an innovative teaching and learning assistant designed to meet the diverse needs of all learners. As a curriculum-aligned tutor for students, Mojo takes the texts and tasks from the curriculum and transforms them into interactive and differentiated experiences for students. Mojo also provides real-time data visibility for teachers into student misconceptions so teachers can be more strategic with their conferencing and class discussions. This platform is aligned specifically with top-rated, middle school English Language Arts curricula. Importantly, Coursemojo prioritizes the social experience of learning rather than promoting isolated screen time.

STUDY DETAILS

Sample Description

- Sample: 2,203 6th-graders in 12 schools, 8 educational leaders, 36 teachers
- Location: Large County in Tennessee

Time Frame

- August 2024 - May 2025

Methodology

- Design: Quasi-experimental with matched treatment (n=1,017) and comparison (n=1,186) groups, surveys, interviews
- Assessment Measure: Aimsweb reading, TN Ready benchmarks, and TCAP state test
- Statistical Controls: School characteristics, student demographics, special education status, socioeconomic factors, and baseline achievement

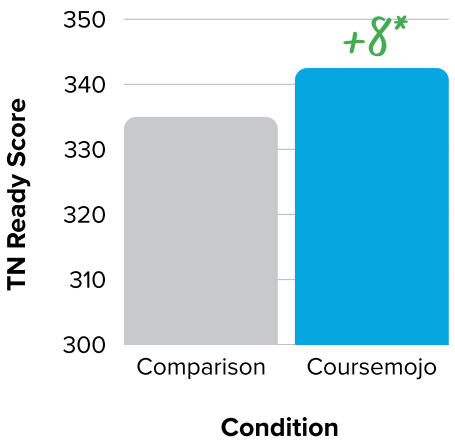
STUDY SUMMARY

Coursemojo has partnered with districts to implement the program in sixth grade classrooms in Tennessee. LXD Research conducted a quasi-experimental study to examine the impact of Coursemojo's AI-powered teaching platform on student English Language Arts (ELA) achievement using multiple measures. This study focuses on large, diverse school district in Tennessee where six schools using Coursemojo were compared to six comparison schools. Individual student data from the 2024-2025 school year was used to estimate program impacts. To assess program implementation, teachers and students completed surveys to provide feedback and reflections on their experience. LXD Research conducted interviews with district and school leaders at the end of the year. Student data, survey results, and interview findings were triangulated to provide a comprehensive evaluation of Coursemojo.

KEY FINDINGS

- Coursemojo led to significantly higher ELA scores on Aimsweb and TN Ready benchmarks throughout the year, culminating with higher performance on the state TCAP assessment.
- Coursemojo's AI-powered instruction successfully differentiated to meet students needs and accelerate their growth.
- Coursemojo helped special education students and economically disadvantaged students close achievement gaps.

State Test (TCAP) Performance



Coursemojo users outperformed the comparison group. Frequent users had the highest performance.

*Note: Means are estimated marginal means after conducting a 2-level HLM model controlling for student and school characteristics; (β = 7.461, p < .001, Cohen's d = 0.12).

COURSEMOJO STUDY DESIGN

2,203 Students 6th Grade → Fall 2024 Literacy Assessments → Coursemojo → 9 months of Coursemojo Use in 6 out of 12 Schools → Spring 2025 Literacy Assessments → Analysis of Results

HOW COURSEMOJO WORKS

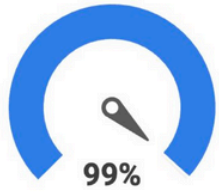
The platform integrates seamlessly with existing high-quality instructional materials, in this district the core curriculum was Wit & Wisdom. Teachers were asked to incorporate AI-powered activities daily as part of independent practice during the literacy period. Students engage with texts through a structured three-tiered approach that builds comprehension and writing skills systematically. The AI assistant provides immediate, personalized feedback during activities while collecting data to help teachers facilitate more effective whole-class discussions.

Activity Types

Coursemojo offers four primary activity types designed to develop different literacy skills.

- **GIST Activities** (99% student participation): Focus on reading comprehension, asking students to identify main ideas and key details from texts they read
- **Close Read Activities** (96% participation): Emphasize vocabulary development and deeper textual analysis, guiding students through strategic reading of complex passages
- **Writing Activities** (66% participation): Support students through the complete writing process, from planning to revision, with AI-powered scaffolding
- **Close Read with Quick Write** (50% participation): Combine vocabulary work with brief writing responses, connecting reading and writing skills

Each activity provides embedded accessibility features including read-aloud functionality, voice-to-text options, and support in over 50 languages, ensuring all students can access grade-level content regardless of their individual needs.



GIST

Close Read

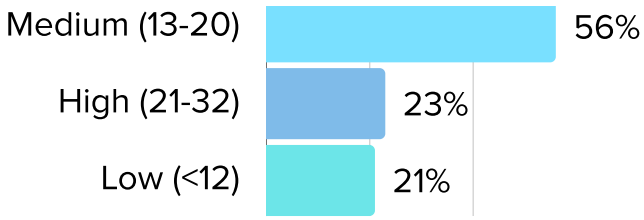
Close Read with Quick Write

Writing

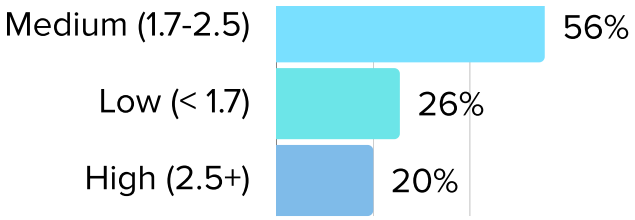
USAGE FREQUENCY

Students engaged in an average of 42 activities during the school year, with a large variation (some students did as little as 4 activities while others did as many as 122 activities). Typically, students did one activity each day they used Coursemojo and some did up to 2. In an average week, students did 2 to 3 activities, with some students doing as many as 7 different Coursemojo activities per week. Most students used the program for about half of the weeks throughout the year and 1-2 days per week on the weeks that they used it.

Weeks Across the Year

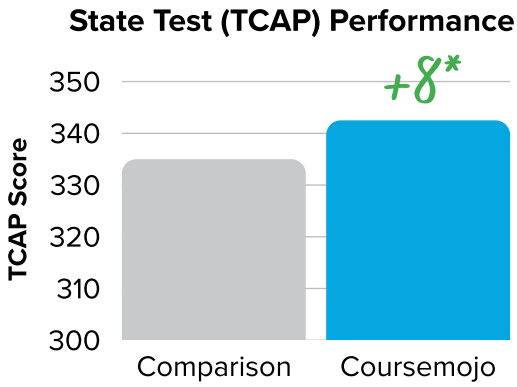


Days Per Week



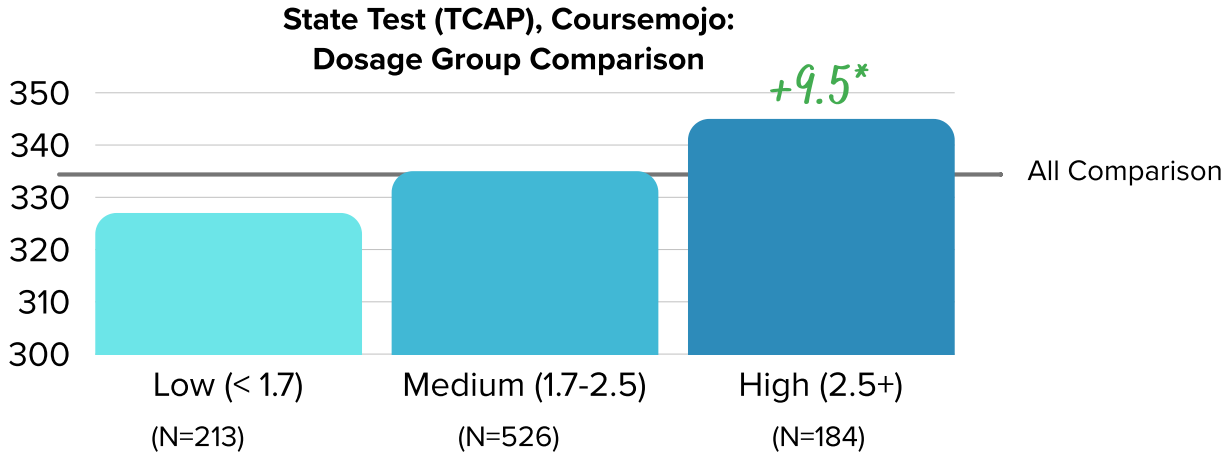
END OF YEAR RESULTS

The Tennessee Comprehensive Assessment Program (TCAP) state test provided the most comprehensive measure of Coursemojo's impact, as it assessed students' mastery of the entire year's curriculum rather than semester-specific content. Coursemojo students significantly outperformed their comparison peers with an 8-point advantage on the TCAP ELA assessment (β = 7.461, p < .001, Cohen's d = 0.12). This state test result represents the culmination of the consistent progress demonstrated throughout the year on both TN Ready interim benchmarks and Aimsweb reading assessments, with gains in the Coursemojo group that translated to 49.0% of students performing on grade level compared to 39.5% state-wide. The TCAP findings validate that the systematic improvements observed in shorter-term assessments translated into comprehensive mastery of grade-level ELA standards. The statistical significance and effect size of this result provide robust evidence that Coursemojo's AI-powered approach to literacy instruction produced meaningful learning gains that persisted across the full academic year and were measurable on high-stakes state assessments.



END OF YEAR BY USAGE

Analysis of dosage effects within the Coursemojo student group revealed that implementation frequency directly determined academic outcomes on the state test. Students were categorized into three usage groups based on days per week of engagement, on the weeks that they used Coursemojo: low usage (less than 1.7 days), medium usage (1.7-2.5 days), and high usage (2.5+ days). The results showed a dramatic 18-point difference between low and high usage groups on TCAP scores, with high-usage students scoring 9.5 points higher than comparison students ($F(2, 920) = 11.45$, $p < .001$). Most significantly, medium usage students performed similarly to non-Coursemojo comparison students, while low usage students actually scored slightly below the comparison group. This pattern demonstrates that the overall 8-point advantage for all Coursemojo students was driven primarily by those with consistent, frequent engagement. The findings suggest that occasional or sporadic use of the platform may actually be counterproductive, while sustained, regular implementation of 2.5+ days per week unlocks the platform's full potential for accelerating student achievement.

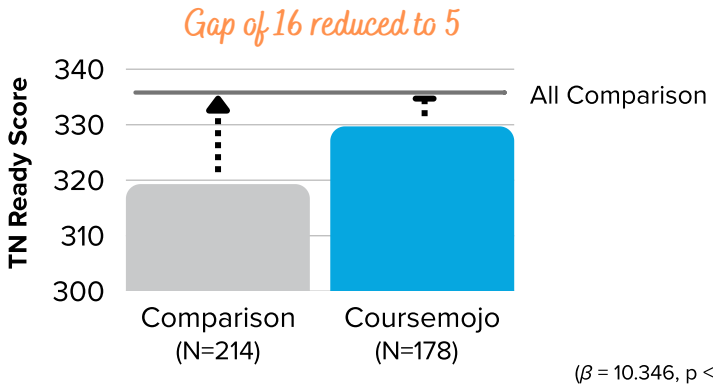


*Note: Means are estimated marginal means after conducting a 2-level HLM model controlling for student and school characteristics.

END OF YEAR RESULTS: SPECIAL EDUCATION

Students receiving special education services demonstrated remarkable gains through Coursemojo implementation, with the platform substantially reducing longstanding achievement gaps. On the TCAP state test, students with disabilities using Coursemojo scored 10.4 points higher than their peers in comparison schools. The achievement gap between students with disabilities and their general education peers was dramatically reduced through Coursemojo use. Using Coursemojo reduced the gap between students with disabilities and comparison peers from 16 points to only 5 points—effectively cutting the achievement gap by two-thirds. This pattern suggests that the platform's systematic support and individualized scaffolding created the conditions for substantial growth by year's end.

State Test (TCAP) Performance: SPED Student Group

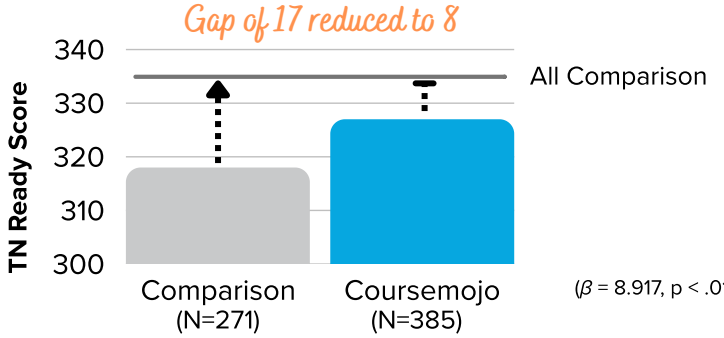


(β = 10.346, p < .05, Cohen's d = 0.16)

END OF YEAR RESULTS: ECONOMIC DISADVANTAGE

Students from economically disadvantaged backgrounds showed strong and consistent gains throughout the year with Coursemojo implementation. By the end of the school year, students with economically disadvantaged status using Coursemojo achieved an 8.9-point advantage on the TCAP state test compared to their peers in comparison schools. This pattern suggests that the platform's immediate feedback and individualized support helped these students build foundational skills rapidly, creating a strong base for continued growth throughout the year. Using Coursemojo reduced the gap between students with an economic disadvantage and comparison peers from 16 points to only 5 points—effectively cutting the achievement gap by two-thirds.

State Test (TCAP) Performance: Econ Dis. Student Group

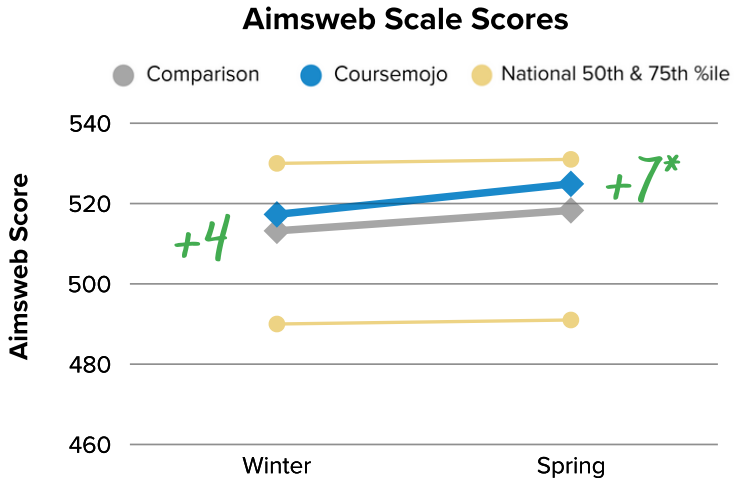


(β = 8.917, p < .01, Cohen's d = 0.14)

*Note: Means are estimated marginal means after conducting a 2-level HLM model controlling for student and school characteristics.

AIMSWEB READING PERFORMANCE: WINTER TO SPRING

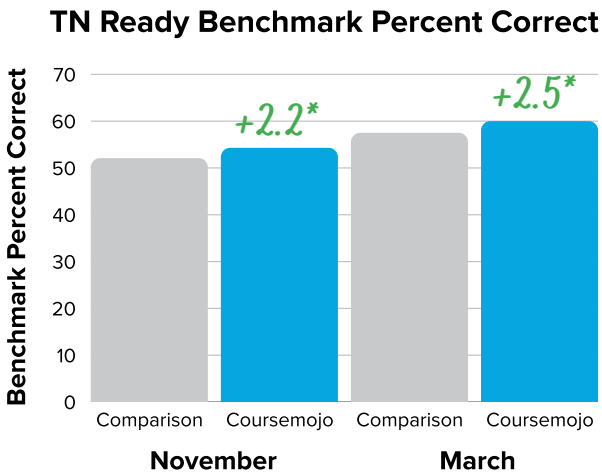
Aimsweb reading assessments revealed that Coursemojo students made significantly greater progress than their comparison peers, with the advantage growing stronger over time. This analysis establishes the groups with similar Fall baseline scores. Students showed a 7-point advantage on Spring Aimsweb reading assessments, representing meaningful academic growth. To put this in context, the Aimsweb norms table shows that the normed 50th and 75th percentiles increase by just one point from winter to spring. The Coursemojo advantage represents substantial progress, with students' mean scores moving toward higher percentile ranges. This pattern mirrors the interim benchmark results, showing an initial positive effect that ramped up and became more pronounced by spring, suggesting that sustained use of the platform led to accelerated reading growth that exceeded typical developmental expectations.



(β = 6.598, p < .05, Cohen's d = 0.10)

TN READY BENCHMARK PERFORMANCE: FALL TO SPRING

Coursemojo students demonstrated consistent advantages on Tennessee's interim benchmark assessments throughout the school year. On the first TN Ready benchmark in November, students showed a 2.2-point advantage over comparison students This early positive trend continued and strengthened by spring, with Coursemojo students achieving a 2.5-point advantage on the second TN Ready benchmark in March. The consistency of these results across assessment periods demonstrates that Coursemojo's impact was sustained throughout the academic year, with students maintaining their performance advantages from late fall through spring. This pattern suggests that the platform's systematic approach to literacy instruction created durable learning gains that persisted across both assessment cycles.



November: (β = 2.22, p < .05, Cohen's d = 0.03).

March: (β = 2.52, p < .01, Cohen's d = 0.04)

EDUCATOR VOICES

To complement the quantitative assessment data, LXD Research gathered comprehensive feedback from both students and teachers through structured surveys administered throughout the implementation period. These survey instruments captured perceptions of learning effectiveness, engagement levels, and overall satisfaction with the Coursemojo platform. The convergent findings from student and teacher perspectives provide crucial validation for the academic gains observed in standardized assessments, while also revealing insights into the classroom dynamics and instructional benefits that contributed to these outcomes.

Survey Results Summary

The survey data reveals a consistent pattern of positive responses across multiple dimensions, with particularly strong indicators in areas directly related to student engagement and teacher instructional capacity. Student responses demonstrated high levels of sustained effort and persistence when using Coursemojo, suggesting that the platform's interactive features successfully maintained motivation throughout challenging learning activities. Meanwhile, teacher feedback confirmed that the platform enhanced their ability to provide individualized support and feedback at scale, addressing a longstanding challenge in middle school English Language Arts instruction.

Key survey insights include:

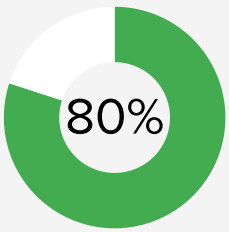
- **Student learning validation:** Student perceptions strongly supported learning effectiveness, with 53% providing high positive ratings for learning impact (average 3.5/5), while teacher professional judgment confirmed superior effectiveness compared to traditional methods (75% rating Coursemojo higher than handouts/worksheets).
- **Teacher satisfaction and workload benefits**: Educators reported positive implementation experiences with 69% expressing high enjoyment levels (average 3.8/5) and positive workload impact ratings (average 3.7/5), validating interview findings about reduced teacher burden.
- **Student effort and persistence:** High student engagement translated to notable effort levels, with 80% of students providing high positive ratings for effort in Coursemojo activities (average 4.2/5) and strong persistence when facing challenges (average 3.9/5).

Teachers found that Coursemojo provided effective support (3.75/5) for:

- Multi-Language Learners
- Below Grade Level Students

Teachers had strong confidence (3.75/5) in Coursemojo's ability to:

- Check student understanding
- Provide feedback



Students expressed high engagement and persistence, with 80% of students providing high positive ratings for effort in Coursemojo activities.

INTERVIEWS

Year-end interviews with district and school-level leaders and coaches provided rich qualitative evidence supporting the quantitative findings. These conversations captured the transformative impact of Coursemojo on classroom dynamics and revealed the specific practices that contributed to the platform's success across diverse student populations.

Key implementation insights include:

- **Enhanced learning outcomes**: Multiple schools achieved accelerated academic progress, with pilot schools hitting annual targets months ahead of comparison schools: "After the second benchmark, I believe we had 3 schools that have hit their AMO... and the non-Coursemojo group, none of them had hit their AMO still." - *Instructional Coordinator*
- **Instructional transformation**: Teachers experienced shifts in classroom practice, creating co-teaching environments that enhanced their capacity to serve all students: "It instantly creates a co-teaching environment where you've got Coursemojo providing feedback to everybody so that they can engage further, whereas the teacher could not do that alone." - *Assistant Principal*
- **Universal student engagement:** Platform achieved high participation rates across all student populations: "Coursemojo is requiring every student to think and every student to participate." - *Instructional Coordinator*

Additional Quotes from Interviewees

"At the beginning kids were giving very surface level answers... Well, now they know Mojo is going to make me answer this question fully. So their initial answers now are much deeper than what they were starting out at the beginning of the year."

English Department Head

"For students with disabilities, their engagement went up immediately... the ability for Coursemojo to provide responses to their responses at their level allowed them to really scaffold and then build towards the total goal."

Assistant Principal

"We have anywhere from 25 to 35 middle schoolers in one classroom. So the opportunity to get that level of feedback consistently without Coursemojo is just impossible."

Language Arts Program Director

CONCLUSION

The study provides robust evidence that Coursemojo's AI-powered approach enhances student learning and teacher effectiveness while significantly advancing equity outcomes. Across multiple assessments—from interim benchmarks to progress monitoring to comprehensive state tests—Coursemojo students consistently outperformed their peers, with gains that grew stronger throughout the academic year. Most notably, Coursemojo demonstrates exceptional effectiveness in closing achievement gaps for historically underserved populations, with students with disabilities and those from economically disadvantaged backgrounds reducing longstanding achievement gaps by two-thirds and more than half, respectively.

The dosage analysis reveals that implementation quality matters significantly—consistent use of 2.5+ days per week on the weeks the program is used unlocks the platform's full potential, while sporadic use provides minimal benefit. This finding underscores the importance of systematic implementation and suggests that schools can achieve substantial gains when Coursemojo becomes an integral part of regular ELA instruction rather than an occasional supplement.

Study Limitations

While this study provides compelling evidence for Coursemojo's effectiveness, several limitations should be considered. The quasi-experimental design cannot establish causation with the same certainty as a randomized controlled trial. The study was conducted in a single district using the Wit & Wisdom curriculum, which may limit generalizability to schools with different demographics, curricula, or implementation conditions. Additionally, the one-year timeframe captures immediate academic impacts but does not address longer-term retention, and the study focused exclusively on sixth-grade students, leaving questions about effectiveness across other grade levels.

Recommended Next Steps

To build on these promising findings, future research should examine Coursemojo's effectiveness across multiple grade levels and different ELA curricula to establish broader generalizability. User research and additional co-design focusing on the platform's writing instruction components could identify areas for improvement, and studies examining optimal implementation practices would help districts maximize the platform's potential for accelerating student achievement. A multi-site randomized controlled trial would provide more definitive causal evidence, while longitudinal studies would illuminate whether observed gains persist over time.

This brief summarizes findings from the LXD Research Coursemojo Real-Time Efficacy Study conducted during the 2024-2025 school year. Full methodology and detailed results are available in the complete research report.

The Impact of Coursemojo's AI-Powered Literacy Instruction in Improving ELA Outcomes and Reducing Achievement Disparities

A Multi-School Quasi-Experimental Study

Conducted by Rachel Schechter, Ph.D., Colin Ackerman, Ph.D., Michaela Gulemetova, Ph.D. & Laura Janakiefski, Ph.D.
LXD Research at Charles River Media Inc.

Abstract

This quasi-experimental study examined the impact of Coursemojo's AI-powered teaching platform on sixth-grade English Language Arts achievement in a large, diverse Tennessee school district during the 2024-2025 school year. The study involved 2,203 students across twelve schools, with 1,017 students using Coursemojo and 1,186 serving as comparison students. Results demonstrated significant positive effects across multiple assessment measures. Coursemojo students outperformed comparison students by 8 points on the state standardized test (TCAP) (β = 7.461, p < .001, Hedges' g = 0.12). The platform also showed evidence of supporting more equitable outcomes, reducing achievement gaps for students with disabilities by two-thirds (from 16 to 5 points) and for economically disadvantaged students by more than half. Dosage analysis revealed that more sustained implementation of 2.5+ days per week on the weeks the program was used was critical for maximizing benefits. Survey data from 851 students and 22 teachers, along with interviews with 4 educational leaders, provided convergent evidence of positive learning impacts and effective instructional integration. Student surveys revealed that 39.7% rated Coursemojo as helping them learn "quite a bit" or "very much," while 80.0% provided high effort ratings, with persistence scores averaging 4.03 out of 5. These findings suggest that AI-powered literacy support can enhance middle school English Language Arts instruction while advancing equity outcomes for historically underserved populations.

Keywords: educational technology, differentiated instruction, AI tutoring, reading comprehension

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APA Citation: Schechter, R., Ackerman, C., Gulemetova, M., & Janakiefski, L. (2025). *The Impact of Coursemojo AI-Powered Literacy Instruction on Sixth-Grade English Language Arts Achievement: A Quasi-Experimental Study*. LXD Research.

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Introduction

AI Technology as a Response to Middle School Literacy Challenges

Today's middle school literacy landscape faces a significant challenge. The 2022 National Assessment of Educational Progress shows that 69% of eighth-grade students read below proficiency levels, representing millions of young people who struggle with grade-level text. This situation has been intensified by the COVID-19 pandemic's impact on elementary education. Research by Kuhfeld et al. (2023) documents that current middle school students, who were in elementary school during the pandemic, experienced substantial reading achievement declines, with high-poverty schools showing learning losses 2.5 times greater than low-poverty schools. These students come to middle school classrooms with foundational skill gaps, where existing educational structures face challenges in addressing their needs.

The situation is further complicated by constraints in both instructional time and teacher preparation related to reading and writing instruction. Middle school English Language Arts classes typically run 40-50 minutes, compared to elementary schools' 90-minute literacy blocks—less than half the instructional time these students previously received. According to Rouse et al. (2021), more than two-thirds of elementary teachers report receiving minimal to no college preparation on using writing to support student learning. Middle school teachers, trained primarily as content specialists rather than reading instructors, encounter classrooms where reading abilities can span five or more grade levels. Across the board, middle school teachers face challenges in differentiating instruction for diverse student needs and addressing fundamental literacy gaps while teaching grade-level content.

In this context, AI technology offers potential for supporting instructional differentiation when implemented effectively. Coursemojo's product "Mojo" addresses these challenges through an AI-powered assistant that supports educators in differentiating instruction by identifying individual student gaps and providing targeted Socratic support. The platform is designed to increase the quality and quantity of student feedback while providing teachers with real-time insights into student understanding and needs, facilitating more inclusive classroom discussions and helping identify areas requiring additional support.

What is Coursemojo?

Coursemojo is an innovative AI-powered teaching and learning platform designed specifically for middle school English Language Arts instruction. The platform serves as an intelligent assistant (named Mojo) that works alongside classroom teachers to provide individualized support to every student while maintaining the collaborative, social nature of classroom learning. Rather than replacing traditional instruction, Coursemojo is designed to "supercharge the work that is already

happening in classrooms" through seamless integration with existing curricula and teaching practices.

Core Design Philosophy

Coursemojo's instructional approach is built around four foundational benefits that address key challenges in middle school literacy education:

Integrated Design

The platform integrates directly into existing classroom routines and can be implemented in both Tier 1 (general education) and Tier 2 (intervention) settings. Coursemojo aligns with district text selections and scope and sequence plans, ensuring that AI-powered support enhances rather than disrupts established instructional frameworks.

Inclusive Learning

Every student is equipped with tools needed for success, regardless of their current literacy level. The platform ensures that all students can contribute meaningfully to classroom discussions, including typically quieter students who may hesitate to participate. Speech recognition and read-aloud functionality give students agency over their learning experience, while the platform's ability to communicate in over 50 languages supports diverse learners and English language learners.

Smart Supports

Coursemojo uses AI-powered graphic organizers and scaffolding to break down complex literacy tasks and provide targeted assistance when students encounter difficulties. Students can highlight text to identify key passages and text evidence, access an embedded dictionary for improved comprehension, and receive immediate feedback when Mojo detects misunderstandings. The AI provides appropriate scaffolds and corrections tailored to each student's specific needs and responses.

Stronger Outcomes

The platform enhances both classroom discussions and individual student work by ensuring all students are prepared to participate meaningfully in whole-group conversations. Coursemojo provides guidance and feedback on student writing to support the revision process, while also helping teachers redirect off-task behavior and keep students focused on learning objectives.

Instructional Model

Coursemojo's lesson structure follows a systematic three-phase approach designed to build comprehension and engagement:

1. **Gist Activities:** These activities occur after the first read to support literal comprehension, helping students solidify their understanding of the text before moving on to deeper analysis. Students are asked developmentally appropriate questions about the text they just read.
2. **Close Read Sessions:** Students engage in guided practice with reading strategies, receiving individualized AI support as they analyze texts, identify key details, and develop deeper comprehension skills.
3. **Write Components:** Students synthesize their understanding through various writing tasks, with AI providing real-time feedback, suggestions, and scaffolding to support the writing process from planning through revision.

Throughout each phase, the Mojo provides Socratic questioning, individualized feedback, and adaptive support that responds to each student's specific needs, misconceptions, and level of understanding. This creates what educators describe as a "co-teaching environment" where human teachers can focus on facilitating discussions and providing targeted support while the AI ensures every student receives consistent, individualized guidance.

Technology and Accessibility

Coursemojo operates through standard classroom technology, typically using tablets or laptops with internet connectivity. The platform's user-friendly interface requires minimal technical expertise from teachers or students, allowing for smooth integration into existing classroom routines. The AI's multilingual capabilities and accessibility features ensure that students with diverse learning needs can access and benefit from the platform's support systems.

The platform prioritizes maintaining the social aspects of learning by facilitating rather than replacing peer interaction and class discussion. Students work with Mojo individually during certain activities but come together for collaborative discussions, peer sharing, and teacher-led instruction, creating a balanced learning environment that combines the benefits of personalized AI support with essential social learning experiences.

Research Basis of Coursemojo

Coursemojo's design is grounded in several key areas of educational research and represents a sophisticated approach to AI-powered literacy instruction. The platform integrates four core benefits that address fundamental challenges in middle school literacy education: integrated

design that builds on existing classroom routines, inclusive learning that ensures every student can contribute, smart supports that use AI to provide individualized scaffolding, and stronger outcomes through enhanced student engagement and writing support.

Theoretical Foundations

Bereiter and Bird (1985) demonstrated that successful reading comprehension instruction involves both modeling of strategies and guided practice. Coursemojo's AI-based reading tools blend strategy demonstration with hands-on practice through what the platform calls "smart supports." These supports use graphic organizers to break down complex tasks and provide targeted assistance when students are stuck, including text highlighting capabilities for identifying key passages, embedded dictionary support for improved comprehension, and AI-powered correction of misunderstandings with appropriate scaffolds.

The platform's approach to differentiation and inclusive learning aligns with research showing the importance of ensuring all students can participate meaningfully in classroom discussions. Coursemojo addresses this through features designed to ensure "every student is set up for success," including capabilities that allow all students to contribute regardless of their current literacy level. The platform incorporates speech recognition and read-aloud functionality to give students agency over their learning, while its ability to communicate in over 50 languages supports diverse learners.

AI-Powered Instruction and Feedback

The platform's integrated design philosophy draws from research on effective classroom technology integration. Rather than replacing existing instruction, Coursemojo is designed to fit in with work that is already happening in classrooms. This approach aligns with VanLehn's (2011) meta-analysis showing that intelligent tutoring systems can be nearly as effective as human tutoring (effect sizes of 0.76 vs 0.79) when they provide step-based interaction and complement rather than replace human instruction.

Coursemojo's AI provides individualized feedback and scaffolding that adapts to each student's responses, creating what educators in our study described as a "co-teaching environment." As one instructional coordinator explained, Mojo enables "individualized feedback at scale that teachers cannot provide alone" by extending teacher capacity to work with students who have diverse needs and ability levels.

Writing Instruction and Scaffolding

The platform's approach to writing instruction is informed by research showing that combining explicit strategy instruction with systematic support leads to significant improvements in student

writing. Gillespie and Graham's (2014) meta-analysis of writing interventions found that explicit strategy instruction had the strongest impact (effect size = 1.09), particularly when combined with systematic support and scaffolding. Coursemojo implements this through AI-powered writing support that provides guidance and feedback to support student revisions, breaking down the writing process into manageable components while maintaining high expectations for all students.

Retrieval Practice and Engagement

The platform's integration of retrieval practice throughout its activities is based on research showing consistent benefits of retrieval practice across different content areas and formats (Agarwal et al., 2021). Coursemojo's three-tiered activity structure (Gist → Close Read → Write) emphasizes having students actively recall and apply their understanding rather than simply reviewing information. This approach was validated in our study, where an instructional coach observed that students showed "consistent improvement in response depth throughout the year" as they became accustomed to the platform's expectations for thorough engagement.

Context of This Study

The study took place in a large, diverse school district in Tennessee during the 2024-2025 school year, examining the implementation of Coursemojo's AI-powered teaching platform with sixth-graders across twelve middle schools. For the school year prior to this study (2023-2024), around 45% of students in the participating district met or exceeded the ELA proficiency benchmark for grades 6-8. This is higher than the Tennessee average of roughly 33%, but still indicates that less than half of the students in the participating district were meeting expectations around ELA skills at the start of the study. The current research study was designed to address the compounding challenges facing middle school literacy instruction, including the lingering academic impacts of COVID-19 on elementary learners who are now in middle school, reduced instructional time compared to elementary settings, and teachers' limited preparation in literacy instruction and differentiation strategies.

The study involved 2,203 sixth-grade students across 6 treatment and 6 comparison schools, with 1,017 students using Coursemojo and 1,186 serving as comparison students. LXD Research employed a quasi-experimental design with established baseline equivalence between the treatment and comparison groups on a key pretest outcome measure (e.g., fall Aimsweb scores). The impact was assessed using multiple assessment measures, including Aimsweb reading assessments, TN Ready interim assessments for progress monitoring required by the district, and the state-wide standardized test, TCAP.

To triangulate findings, the research incorporated survey data from both teachers and students, along with interviews with educational leaders to capture stakeholder perspectives on the platform's impact and implementation experience. This comprehensive approach allowed researchers to examine not only academic outcomes but also to unpack the practical realities of integrating AI-powered literacy support into existing middle school English Language Arts instruction.

Research Objectives

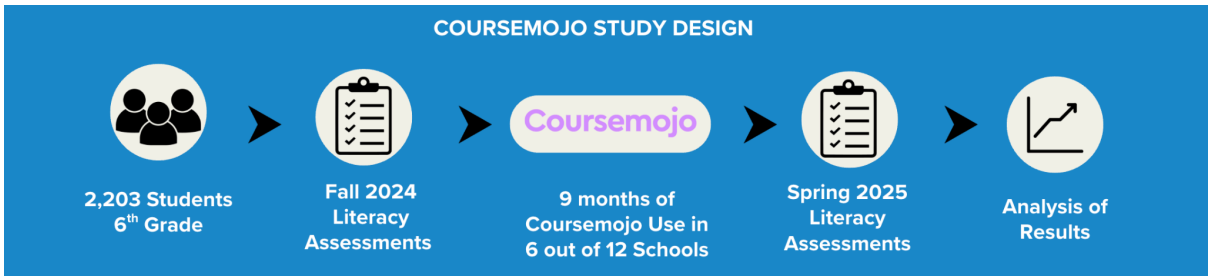
This study addressed two primary research objectives:

- **Goal 1:** Examine the impact of Coursemojo on student ELA achievement after one year of use, comparing users to non-users through an ESSA Level II quasi-experimental study design.
- **Goal 2:** Gather feedback from educators and review usage metrics to understand the nature of the implementation and how teachers use the program in the classroom.

Method

Research Design

This study employed a quasi-experimental design to examine the effectiveness of Coursemojo's AI-powered literacy platform, with six schools implementing Coursemojo and six comparison schools continuing with their existing instructional practices during 2024-25. All schools used the Wit & Wisdom curriculum as their core English Language Arts program, ensuring curricular consistency across treatment and comparison conditions.



Program Description

Coursemojo is an innovative teaching and learning assistant designed to meet the diverse needs of all learners. As a curriculum-aligned tutor for students, Mojo takes the texts and tasks from the curriculum and transforms them into interactive and differentiated experiences for students. Mojo also provides real-time data visibility for teachers into student misconceptions, so teachers can

be more strategic with their conferencing and class discussions. This platform explicitly aligns with top-rated, middle school English Language Arts curricula. Importantly, Coursemojo prioritizes the social experience of learning rather than promoting isolated screen time.

The platform's instructional model follows a three-tiered approach: Gist activities that activate prior knowledge and preview content, Close Read sessions that provide guided practice with reading strategies, and Write components that allow students to synthesize and express their understanding. Throughout these activities, the AI assistant provides individualized feedback, Socratic questioning, and scaffolded support adapted to each student's needs and responses. Importantly, Coursemojo prioritizes maintaining the social experience of learning rather than promoting isolated screen time, enabling teachers to facilitate more effective whole-class discussions with students who are better prepared to participate.

Sample Description

The student sample included 2,203 sixth-grade students across 6 treatment and 6 comparison schools in a large, diverse district in Tennessee. 1,017 students in the treatment schools used Coursemojo and 1,186 served as comparison students (see Appendix for analytic sample flow chart). Student-level demographics for treatment and comparison schools are shown in Table 1.

Table 1. Student Demographic Characteristics Across Treatment and Comparison Schools

Student Characteristic	Comparison	Treatment
Age	11.32	11.27
Female	50.9%	50.3%
American Indian or Alaskan Native	0.7%	1.2%
Asian	4.9%	2.1%
Black or African American	8.6%	19.4%
Native Hawaiian or Other Pacific Islander	0.3%	0.3%
White	85.5%	77.1%
Minority Status	14.5%	22.9%
Hispanic/Latino Ethnicity	8.9%	18.4%
ELL Status	2.1%	5.0%
Special Education Status	19.5%	18.9%
Economically Disadvantaged Status	24.9%	40.3%

Attrition rate between the baseline measure (Fall AimsWeb) and each follow-up outcome measure is low and with acceptable thresholds. Using the administrative roster sample, the overall attrition rate between Fall and Winter AimsWeb was 4.99%, with a differential attrition rate of 1.32%. From Fall to Spring AimsWeb, the overall rate was 6.04% and the differential rate was 2.12%. From Fall AimsWeb to TCAP state test, the overall rate was 7.17% and the differential rate was 0.36% According to WWC attrition standards (WWC, 2022), overall attrition below 20% and differential attrition below 10% are considered acceptable without potential for bias. Therefore, the observed attrition rates in this study do not pose a threat to internal validity.

Baseline Equivalence

Baseline equivalence was established between the treatment and comparison groups on a key pretest outcome measure (e.g., Fall Aimsweb scores). The standardized mean difference (Hedges' *g*) between the treatment and comparison groups was 0.11 standard deviations (Table 2), which fell within the What Works Clearinghouse (WWC) range for equivalence (0.25). Because this difference exceeded 0.05, the pretest score was included as a covariate in the impact estimation models, consistent with the WWC standards for statistical adjustments (What Works Clearinghouse, 2022).

Table 2. Baseline Equivalence on Fall Aimsweb Score

Group	N	Mean	Median	SD	Min	Max	Hedges' *g*	Glass's Δ
Comparison	1186	508.4	510	63.0	302	693	.11	.11
Treatment	1017	501.3	505	66.2	330	671		
Total	2203	505.1	508	64.6	302	693		

Student Assessment Measures

Multiple assessment measures were included to measure evidence of program impact on student academic performance:

Aimsweb Reading Assessments

Aimsweb assessments were administered throughout the year to track reading fluency and comprehension growth. Aimsweb offers nationally-normed, skills-based benchmark assessments and progress monitoring for reading and math domains with additional add-on measures across dyslexia and behavior/social skills. Aimsweb can be used to inform daily instruction and provides growth results to caregivers and district/state audiences in reading and math achievement using curriculum-based assessment and standards-aligned content for students in PreK through Grade 12. Additionally, aimswebPlus links to instructional resources to support growth in reading, writing,

and math skills. The participating district administered Aimsweb in the Fall in mid-August, in the Winter in mid-December, and in the Spring in late April to early May.

Interim TN Ready Progress Monitoring

The TN Ready is a progress monitoring assessment required for all public school students in Tennessee as part of the Tennessee Comprehensive Assessment Program (TCAP). It tracks student progress toward meeting the state's college- and career-ready standards—which focus on critical skills such as writing, analytical thinking, and problem-solving—as well as progress toward Annual Measurable Objectives (AMO). These interim assessments were administered in the participating district in November (prior to Thanksgiving) and March (prior to spring break). These two time points for the TN Ready progress monitoring build up to the Tennessee state test (TCAP), described below.

Tennessee Comprehensive Assessment Program (TCAP) State Test

The Tennessee Comprehensive Assessment Program (TCAP) state-wide assessment is administered at the end of the school year, providing comprehensive measurement of grade-level English Language Arts mastery. The ELA portion of the assessment measures achievement according to the Tennessee Academic Standards through literary and informational texts requiring students to demonstrate the ability to read closely, analyze text, answer text-dependent questions, provide a written response to a prompt, and demonstrate command of the English language. This assessment provides both a scaled score as well as a proficiency classification into one of 4 levels: Below Expectations, Approaching Expectations, Meets Expectations, Exceeds Expectations.

Statistical Analysis Plan

Student academic outcomes were analyzed using hierarchical linear modeling (HLM) to account for the nested structure of students within schools. The statistical model controlled for student demographics, special education status, socioeconomic factors, baseline achievement, and school-level characteristics. Effect sizes were calculated using Hedges' g to provide meaningful interpretation of practical significance. Dosage analysis examined the relationship between frequency of use and academic outcomes within the Coursemojo group. The full estimation model specification and the formula used to calculate the effect sizes are provided in the Appendix.

Stakeholder Voice Collection

- **Student and Teacher Surveys:** Comprehensive feedback instruments administered at beginning of year (BOY) and middle of year (MOY) to 851 students and 22 teachers,

capturing perceptions of learning effectiveness, engagement levels, and overall satisfaction with the platform.

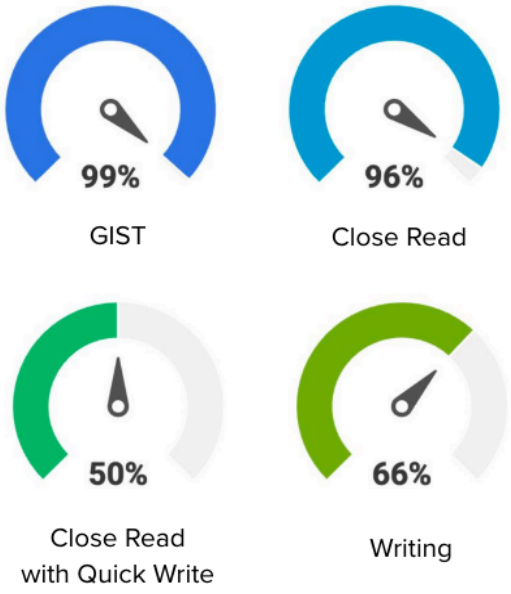
- **Educational Leader Interviews:** In-depth interviews with four educational leaders across the district, including instructional coordinators, coaches, principals, and program directors, conducted between April and May 2025 to understand implementation experiences and observed impacts.

Study Results

Students' Platform Use

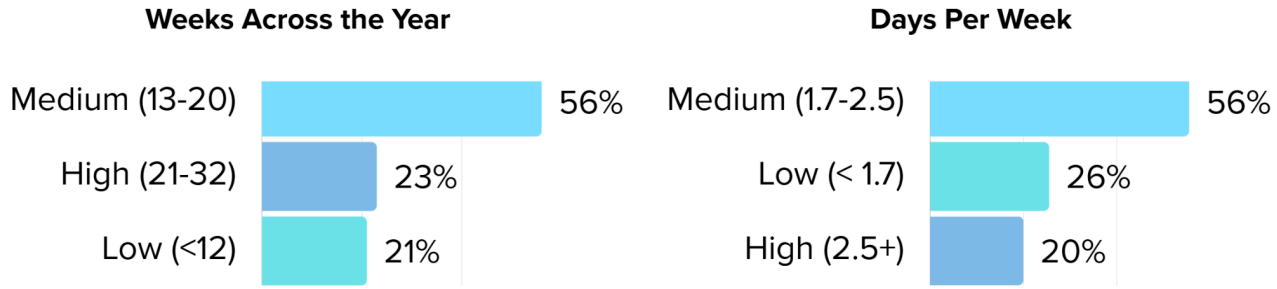
Students used all four of the activity types throughout the year, with nearly all students using the GIST Activities and Close Read activities.

- **GIST Activities** (99% student participation): Focus on reading comprehension, asking students to identify main ideas and key details from texts they read.
- **Close Read Activities** (96% participation): Emphasize vocabulary development and deeper textual analysis, guiding students through strategic reading of complex passages.
- **Writing Activities** (66% participation): Support students through the complete writing process, from planning to revision, with AI-powered scaffolding.
- **Close Read with Quick Write** (50% participation): Combine vocabulary work with brief writing responses, connecting reading and writing skills.



Students engaged in an average of 42 activities during the school year, with a large variation (some students did as little as 4 activities while others did as many as 122 activities). Typically, students did one activity each day they used Coursemojo and some did up to 2. In an average week, students did 2 to 3 activities, with some students doing as many as 7 different Coursemojo activities per week. Most students used the program for about half of the weeks (13-20 weeks) throughout the year and about 1-2 days per week on the weeks they used it (see Figure 1).

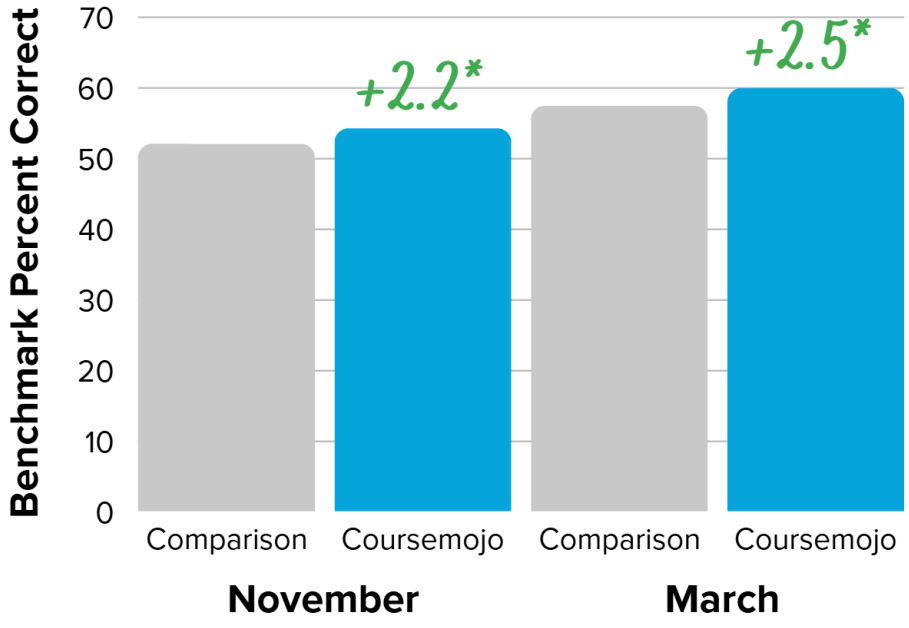
Figure 1. Coursemojo Program Usage Metrics



Overall Academic Impact

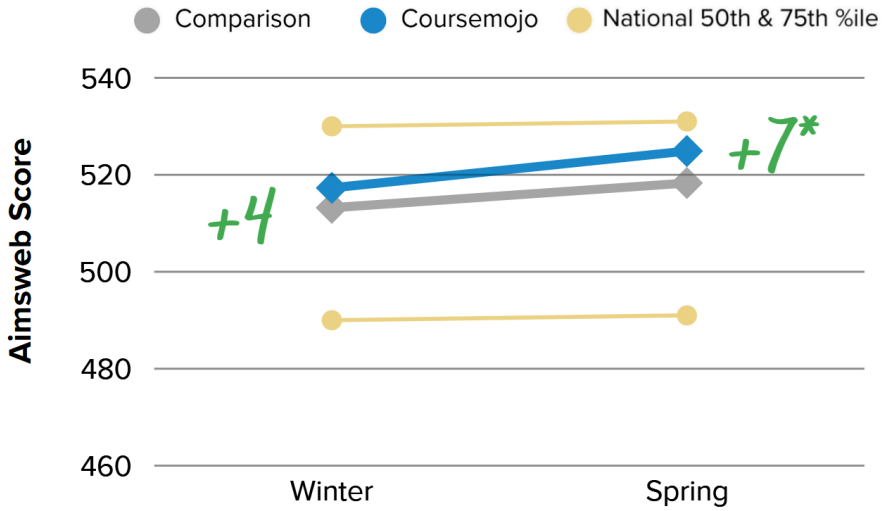
Coursemojo demonstrated consistent positive effects across assessment measures throughout the academic year. See Table 3 for estimated marginal means and model output for each student outcome measure. On the TN Ready interim progress monitoring assessments, Coursemojo students significantly outperformed comparison students by over 2 percentage points for both the November (β = 2.22, p < .05, Hedges' g = 0.03) and March (β = 2.52, p < .01, Hedges' g = 0.04) administrations of the assessment, even after controlling for demographic characteristics and baseline scores (Figure 2).

Figure 2. TN Ready Interim Assessment, Benchmark Percent Correct



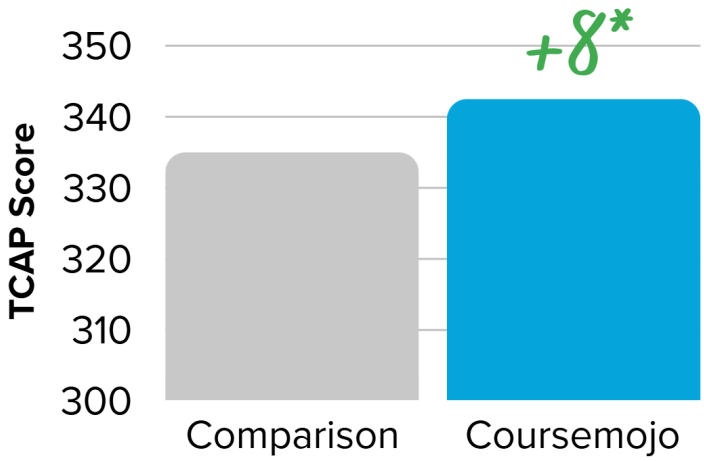
When looking at Aimsweb scores, Coursemojo students performed similarly to comparison students on the Winter Aimsweb assessment (β = 4.15, p = .078, Hedges' g = 0.06), but significantly outperformed comparison students on the Spring Aimsweb assessment (β = 6.60, p < .05, Hedges' g = 0.10; see Figure 3).

Figure 3. Aimsweb Scale Scores for Winter and Spring



This pattern of sustained improvement culminated in significant gains on TCAP, the comprehensive state test, where Coursemojo students scored 8 points higher than their comparison peers (β = 7.46, p < .001, Hedges' g = 0.12; see Figure 4).

Figure 4. Tennessee Comprehensive Assessment Program (TCAP) State Test Performance



The magnitude of this TCAP advantage represents meaningful academic progress that was consistently observed by educators throughout the year. Given that the standard deviation for

scores typically ranges from 60-70 points, the 8-point difference represents approximately 11-13% of a standard deviation, indicating educationally significant improvement. These gains also translate to 49.0% of students who used Coursemojo performing on grade level compared to only 39.5% state wide, as of 2025 (TN.gov). As one principal reflected, *"One thing I will say is, from four years ago we went from being minimally effective on our scores to effective. One thing that we are seeing is growth, which is amazing."*

Table 3. Impact Results for Each Outcome Measure

Outcome Measure	Condition	N	EOY Mean [t]	*β*	*p*-value	Effect Size (Hedges' *g*)
November TN Ready % Correct	**Treatment**	1000	54.3	2.22	0.013*	.03
	Comparison	1172	52.1			
March TN Ready % Correct	**Treatment**	975	60.0	2.52	0.007**	.04
	Comparison	1151	57.5			
Winter Aimsweb Scale Scores	**Treatment**	959	517.3	4.15	0.078	.06
	Comparison	1134	513.2			
Spring Aimsweb Scale Scores	**Treatment**	944	524.9	6.60	0.010**	.10
	Comparison	1126	518.3			
TN State Test (TCAP)	**Treatment**	946	342.5	7.46	0.000**	.12
	Comparison	1099	335.0			

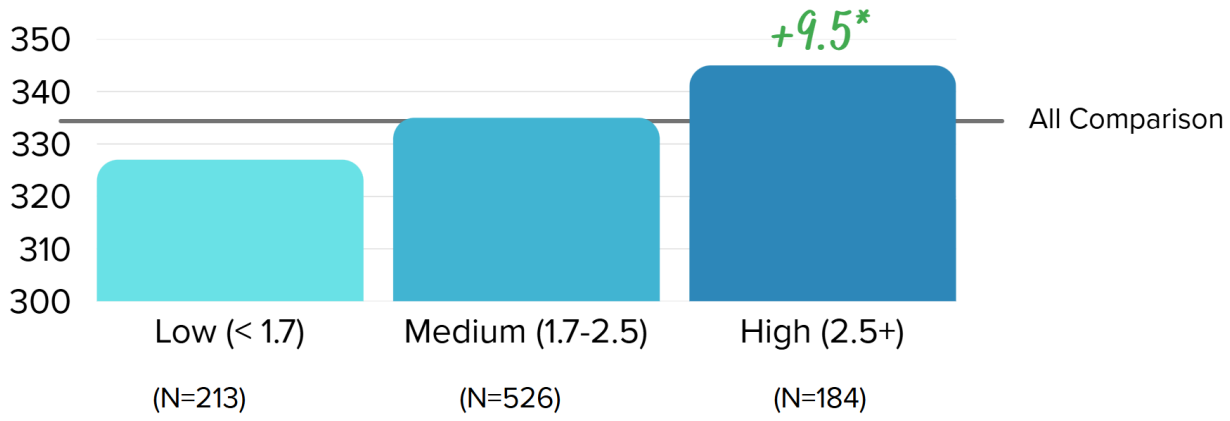
[t] Note: Means are estimated marginal means after conducting a 2-level HLM model controlling for student and school characteristics.

** $p < .01$, *$p < .05$

Dosage Effects and Implementation Quality

Analysis of dosage effects within the Coursemojo student group revealed that implementation frequency was linked to academic outcomes. Students were categorized into three usage groups based on days per week of engagement, on the weeks that Coursemojo was used: low usage (less than 1.7 days), medium usage (1.7-2.5 days), and high usage (2.5+ days). The results showed a dramatic 18-point difference between low and high usage groups on TCAP scores, with high usage students scoring 9.5 points higher than comparison students ($F(2, 920) = 11.45$, $p < .001$; Figure 5).

Figure 5. State Test (TCAP) Performance by Coursemojo Dosage Group

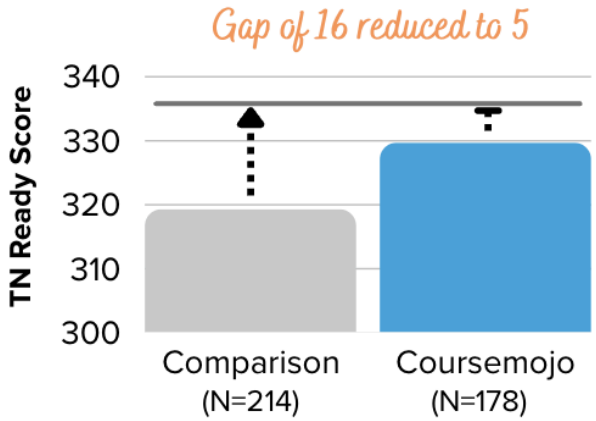


Most significantly, medium usage students performed similarly to non-Coursemojo comparison students, while low usage students actually scored slightly below the comparison group. This pattern indicates that the overall 8-point advantage for all Coursemojo students was driven primarily by those with consistent, frequent engagement. The findings suggest that more sustained, regular usage of 2.5+ days per week, on weeks when the program was used, may support accelerated student achievement. This aligns with educator observations that *"once we realize that this took something off their plate instead of adding to it"* teachers were more likely to implement the platform consistently and see positive results.

Equity Outcomes for Special Populations

Coursemojo demonstrated exceptional effectiveness in advancing outcomes for historically underserved student populations. Students receiving special education services showed significant and meaningful gains, with those using Coursemojo scoring 10.4 points higher than their peers in comparison schools on TCAP (β = 10.346, p < .05, Hedges' g = 0.16). More dramatically, the achievement gap between students with disabilities and their general education peers was substantially reduced through Coursemojo use—from 16 points to only 5 points, effectively cutting the achievement gap by two-thirds (Figure 6).

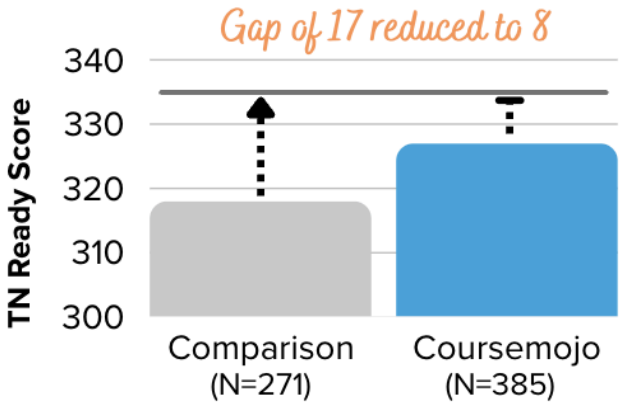
Figure 6. State Test (TCAP) Performance for Special Education Students



These quantitative findings were consistently supported by educator observations about the platform's inclusive design. As one principal noted, *"We have some students, you know, of course, with some inclusion support... while they may only write one word as a response or a part of a sentence, they're still building that confidence and being able to participate just like all the other students. And they're getting feedback."* This observation aligns with Coursemojo's design principle of inclusive learning that ensures every student is set up for success.

Similarly, students from economically disadvantaged backgrounds demonstrated strong and consistent gains throughout the year. By the end of the school year, economically disadvantaged students using Coursemojo achieved an 8.9-point advantage on TCAP compared to their peers in comparison schools (β = 8.917, p < .01, Hedges' g = 0.14). The platform reduced the achievement gap between economically disadvantaged students and their peers from 17 points to only 8 points, representing a reduction of more than half (Figure 7).

Figure 7. State Test (TCAP) Performance for Economically Disadvantaged Students

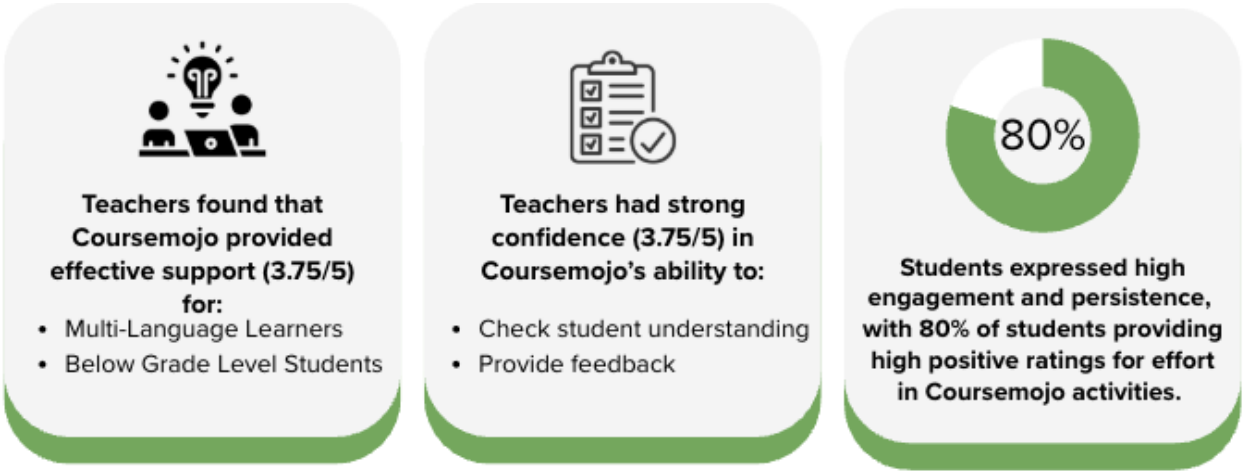


These findings are particularly meaningful given the persistent achievement gaps that typically characterize these student populations. The platform's systematic support and individualized scaffolding appear to have created conditions for substantial growth among students who traditionally face the greatest academic challenges. One instructional coordinator summarized how the platform's design supported outcomes for subgroups of striving students by saying, *"It's accessible to all students, even students who might struggle are still able to participate in the classroom, like the other students are."* The individualized and leveled feedback Coursemojo provides allows struggling students to confidently and independently take more ownership of their learning.

Stakeholder Perspectives and Implementation Experience

Survey data from 851 students in the collaborating school district revealed meaningful engagement and learning impact, with 39.7% of students rating Coursemojo as helping them learn "quite a bit" or "very much." Student effort ratings averaged 4.22 out of 5, with 80.0% of students providing high positive ratings for effort in Coursemojo activities. Student persistence scores averaged 4.03 out of 5, indicating sustained engagement throughout their use of the platform. These engagement metrics suggest that the platform successfully maintained student motivation and investment throughout challenging learning activities, supporting the theoretical foundation that AI-powered support can enhance rather than diminish student engagement.

Teacher feedback from 22 educators confirmed positive implementation experiences across the district's middle schools. The survey data demonstrated that teachers found value in the platform's ability to support diverse learners and provide individualized feedback that would be difficult to achieve through traditional instruction alone.



Educational leader interviews revealed four key themes that characterized successful implementation, providing qualitative validation of the survey findings from the school district's students and teachers:

- **Coursemojo as Teaching Partner:** Leaders described the platform as creating a "co-teaching environment" that extends teacher reach. As one Assistant Principal noted, *"It instantly creates a co-teaching environment where you've got Coursemojo providing feedback to everybody so that they can engage further, whereas the teacher could not do that alone."* This perspective aligns with survey data showing that teachers felt the platform enhanced rather than burdened their instructional capacity.
- **Enhanced Teacher Capacity:** The platform enabled individualized feedback at scale that teachers cannot provide alone. A Language Arts Program Director explained, *"We have, you know, anywhere from 25 to 35 middle schoolers in one classroom. So the opportunity to get that level of feedback consistently is just impossible."* This theme was consistently supported by the survey data from teachers at the school district, who reported that the platform enhanced rather than burdened their instructional capacity, and by the 80.0% of students who provided high effort ratings when working with the AI system.
- **Measurable Learning Improvements:** Multiple schools achieved Annual Measurable Objectives (AMO) months ahead of schedule, providing real-time validation of the academic gains measured in the formal study. An Instructional Coordinator reported, *"After the second benchmark, I believe we had 3 schools that have hit their AMO... and the non-Coursemojo group, none of them had hit their AMO still."* This observation was later confirmed by the formal quantitative analysis showing consistent gains across all assessment measures.
- **Quality Improvement in Student Responses:** Educators observed consistent improvement in student response depth throughout the year, triangulating with the engagement survey findings. An English Department Head noted, *"At the beginning kids were giving very surface level answers... Well, now they know Mojo is going to make me answer this question fully. So their initial answers now are much deeper."* This qualitative observation supports the survey finding that students maintained meaningful engagement throughout the academic year, with an average learning rating of 3.09 out of 5 and high effort ratings of 4.22 out of 5, even as the platform pushed them toward deeper, more thorough responses.

Discussion

This study provides robust evidence that Coursemojo's AI-powered approach enhances student learning and teacher effectiveness while advancing more equitable outcomes for students. Across multiple assessments—from interim benchmarks to progress monitoring towards comprehensive state tests—Coursemojo students consistently outperformed their peers, with gains that grew stronger throughout the academic year. The 8-point advantage on, combined with consistent improvements on interim progress monitoring assessments, demonstrates that the platform's benefits were both immediate and sustained. These quantitative findings were noticed and lauded by interview subjects who are seeing results, with one instructional coach noting that *"We've already seen and talked about some of our data and our AMOs are already tracking for higher."*

The dosage analysis provides crucial insights into optimal implementation practices, supported by educator observations about successful implementation strategies. The findings suggested that more sustained, regular use of 2.5+ days per week on weeks when they used Coursemojo appears to support student achievement more than lower frequency use, underscoring the importance of systematic implementation. As one principal reflected, *"I feel like if we wouldn't have had that partnership and collaboration... I think that would be a challenge of intentionally making sure we're using it with integrity."* This suggests that schools can achieve substantial gains when Coursemojo becomes an integral part of regular ELA instruction rather than an occasional supplement.

Most notably, Coursemojo's exceptional effectiveness in closing achievement gaps for historically underserved populations represents a significant advancement in educational equity. The two-thirds reduction in achievement gaps for students with disabilities and the substantial gains for economically disadvantaged students suggest that AI-powered differentiation can provide the individualized support these populations need to accelerate their academic growth. The current findings align with the platform's design principle of inclusive learning, as one educator observed: *"I love that. It's accessible to all students, even students who might struggle are still able to participate in the classroom."*

Study Limitations

While this study provides compelling evidence for Coursemojo's effectiveness, several limitations should be considered. The quasi-experimental design cannot establish causation with the same certainty as a randomized controlled trial, though the extensive use of covariates, controlling for baseline scores, and using multiple assessment measures strengthen causal inference. The study was also conducted in a single district using the Wit & Wisdom curriculum, which may limit generalizability to schools with different demographics, curricula, or implementation conditions.

Additionally, the one-year timeframe captures immediate academic impacts but does not address longer-term retention of gains. The study focused exclusively on sixth-grade students; therefore, research with other grade levels should be prioritized as the program is extended up or down. The implementation occurred during the 2024-2025 school year, and broader scalability across different contexts could be established with additional studies.

Implications for Practice

The findings suggest several important implications for educational practice, supported by the experiences and observations of educators in this study. First, the critical importance of implementation quality indicates that schools should prioritize systematic, consistent use of AI-powered platforms rather than sporadic integration. The dosage findings suggest potential guidance for Coursemojo usage: on weeks when Coursemojo is used, targeting implementation of about 2.5 or more days per week may help maximize benefits. As one instructional coach emphasized, successful implementation requires *"being intentional with planning and instruction"* and ensuring adequate support structures are in place.

Second, the positive outcomes specifically for striving readers suggest that AI-powered differentiation can be particularly valuable for supporting historically underserved student populations. The platform's ability to provide individualized scaffolding without stigmatizing struggling learners offers a promising approach to addressing persistent achievement gaps. One educator noted how *"students who are academically, you know, really, on that lower end... they're able to jump right in. And none of the other students are realizing that they're not able to participate."*

Third, the positive teacher feedback and implementation experiences indicate that AI can effectively augment rather than replace human instruction. The co-teaching model described by educational leaders suggests a framework for integrating AI support that enhances rather than diminishes the teacher's role.

Conclusion and Next Steps

This study demonstrates that Coursemojo's AI-powered literacy instruction can produce meaningful academic gains while advancing educational equity. The convergent evidence from multiple assessment measures, combined with positive stakeholder feedback, provides a strong foundation for broader implementation and continued research.

To build on these promising findings, future research should examine Coursemojo's effectiveness across multiple grade levels and different ELA curricula to establish broader generalizability. User research and additional co-design focusing on the platform's writing instruction components

could identify areas for improvement, and studies examining optimal implementation practices would help districts maximize the platform's potential for accelerating student achievement.

A multi-site randomized controlled trial would provide more definitive causal evidence, while longitudinal studies would illuminate whether observed gains persist over time. Additionally, research examining the cost-effectiveness of AI-powered literacy support compared to traditional interventions would inform policy and implementation decisions.

The integration of artificial intelligence into literacy instruction represents a significant opportunity to address persistent challenges in middle school education. This study provides evidence that thoughtfully designed AI systems can enhance both learning outcomes and educational equity, suggesting a promising direction for the future of literacy education.

Acknowledgements

The authors of this study would like to express their deepest gratitude to the collaborating school district for partnering with LXD Research to complete this study. The authors also want to express their sincere thanks to the educational leaders, teachers, and students who participated in surveys and interviews for contributing to this work.

References

Agarwal, P. K., Nunes, L. D., & Blunt, J. R. (2021). Retrieval practice consistently benefits student learning: A systematic review of applied research in schools and classrooms. *Educational Psychology Review*, *33*, 1409–1453.

Bereiter, C., & Bird, M. (1985). Use of thinking aloud in identification and teaching of reading comprehension strategies. *Cognition and Instruction*, *2*(2), 131–156.

Gillespie, A., & Graham, S. (2014). A meta-analysis of writing interventions for students with learning disabilities. *Exceptional Children*, 80(4), 454-473.

Kuhfeld, M., Lewis, K., & Peltier, T. (2023). Reading achievement declines during the COVID-19 pandemic: Evidence from 5 million U.S. students in grades 3–8. *Reading and Writing*, *36*(1), 245-261. https://doi.org/10.1007/s11145-022-10345-8

National Center for Education Statistics. (2022). *National Assessment of Educational Progress: 2022 Reading Assessment*. U.S. Department of Education, Institute of Education Sciences.

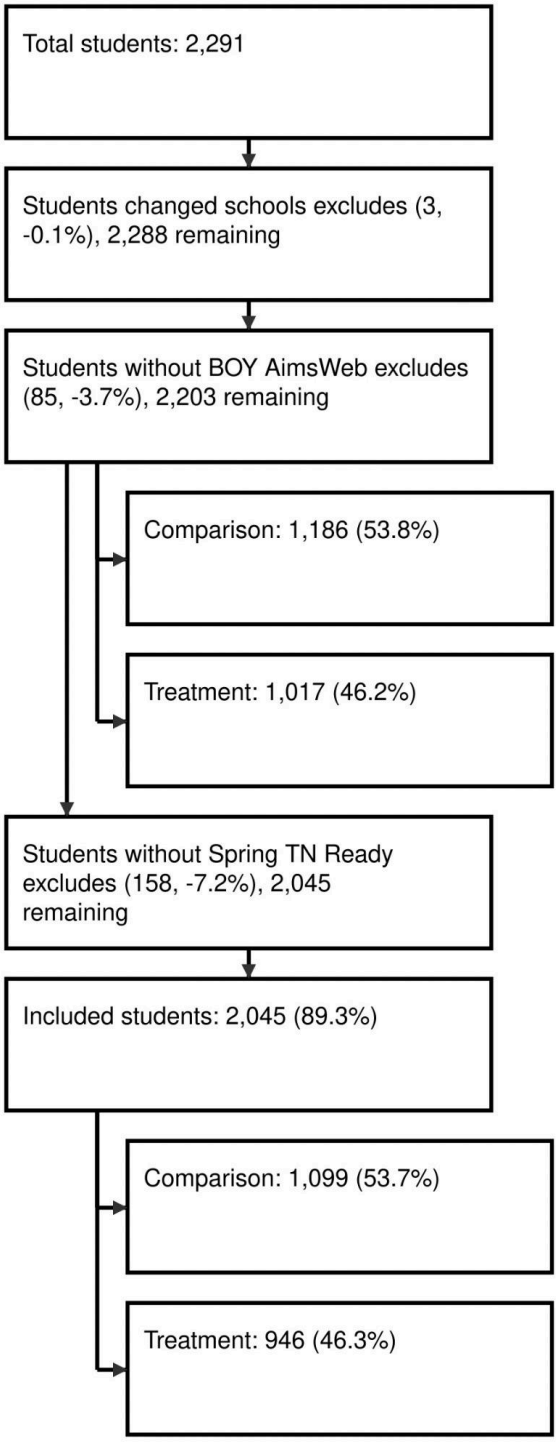
Rouse, A. G., Kiuhara, S. A., & Kara, Y. (2021). Writing-to-learn in elementary classrooms: A national survey of U.S. teachers. *Reading and Writing*, *34*(9), 2381-2415.

VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist*, *46*(4), 197-221.

What Works Clearinghouse. (2022). What Works Clearinghouse procedures and standards handbook (Version 5.0). Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/handbooks

Appendix

Analytic Sample Flow Chart for Tennessee State Test (TCAP)



Statistical Model

$$Y_{ij} = \beta_0 + \beta_1 Treatment_j + \beta_2 BOY_{ij} + \beta_3 X_{ij} + \beta_4 Z_j + u_j + \varepsilon_{ij}$$

Where

- Y_{ij} is the Winter AimsWeb score / Spring AimsWeb score / November TN Ready Benchmark Percent Correct / March TN Ready Benchmark Percent Correct / Final State Test (TCAP) score for student *i* in school *j*;
- $Treatment_j$ is an indicator whether a student received the intervention;
- BOY_{ij} is the Fall AimsWeb score;
- X_{ij} is a vector of student-level covariates (age, gender, race and ethnicity, ELL, SpecEd, and economically disadvantaged status);
- Z_j is a vector of school-level covariates (percentage of students who meet or exceed ELA proficiency, percentage of girls, and percentage of students in different race and ethnicity categories);
- u_j is random intercept for school *j*, $u_j \sim N(0, \sigma_u^2)$
- ε_{ij} is the residual error term, $\varepsilon_{ij} \sim N(0, \sigma^2)$. u_j and ε_{ij} are assumed to be independent

The parameter of interest in the model was β_1, representing the estimated effect of the treatment on the outcome.

Effect size

$$g = \frac{b}{\sqrt{\frac{(n_1-1)SD_1^2+(n_0-1)SD_0^2}{n_1+n_0-2}}}$$

Where

- b is the unadjusted mean difference between the treatment and control groups of a baseline characteristic or the covariate-adjusted mean difference between the treatment and control groups of an outcome measure (regression coefficient);
- n_1 is the sample size of the treatment group;
- n_0 is the sample size of the control group;
- SD_1 is the unadjusted standard deviation for the treatment group;
- SD_0 is the unadjusted standard deviation for the control group.

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