Tutoring

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Introduction

Students arrive in classrooms with vastly different levels of preparation. Within a single classroom, students may differ substantially in their prior knowledge, learning pace, and mastery of the curriculum. Teachers must deliver instruction to the entire class while attempting to address these differences. Tutoring provides one response to this problem in the form of individualized or small-group instruction that supplements classroom learning. Tutors can monitor student understanding closely, provide immediate feedback, and adjust instruction in response to student progress. These features make tutoring particularly well suited to addressing unfinished learning and gaps in foundational skills.

Interest in tutoring has grown substantially in recent years. Policymakers and educators have increasingly viewed tutoring as a promising strategy for addressing persistent achievement gaps and the learning disruptions associated with the COVID-19 pandemic. Federal relief funding enabled many school systems to expand tutoring programs rapidly, and the National Student Support Accelerator (NSSA) helped move high-impact tutoring from a promising intervention to a core strategy for academic recovery and educational equity.

The research base on tutoring has also grown significantly. Over the past two decades, scholars have conducted numerous randomized controlled trials (RCTs) evaluating tutoring interventions across grade levels and subject areas. More recently, the field has turned from asking whether tutoring works to asking how tutoring can work at scale, equitably, cost-effectively, and in real school systems. This shift has brought greater attention to dosage, group size, tutor supply, curricular alignment, scheduling, and the role of technology in supporting implementation.

Researchers have increasingly distinguished between tutoring programs that provide occasional academic assistance and those that deliver intensive, relationship-based instruction. The latter are often described as high-impact tutoring. High-impact tutoring programs typically involve frequent sessions, sustained tutor–student relationships, alignment with classroom instruction, and some system for monitoring student progress and supporting tutors.[1] Programs that incorporate these features consistently produce the largest improvements in student learning.

This chapter reviews the research on tutoring. The chapter first summarizes evidence on the effectiveness of tutoring interventions. It then examines program features associated with successful tutoring initiatives. The following section discusses implementation challenges that arise when tutoring programs are delivered within school systems. A section on costs and cost-effectiveness follows. The chapter concludes with a discussion of emerging technologies and future directions for research and practice.

Key findings

Tutoring has emerged as one of the most promising and rigorously studied strategies for improving student academic outcomes. Research across multiple contexts demonstrates that tutoring interventions can generate large improvements in student learning when implemented with sufficient intensity and instructional quality. Programs that incorporate these features, delivering intensive and relationship-based instruction, are often described as high-impact tutoring. Five key findings emerge from the research literature.

Key finding #1: *Tutoring is one of the most effective education interventions studied.* RCTs consistently show large impacts of tutoring programs on student achievement. Meta-analyses estimate average effects of between 0.29 and 0.37 standard deviations (s.d.) on student achievement, which makes tutoring one of the most effective interventions identified in the education research literature. Newer studies continue to show meaningful effects across in-person and remote contexts, and emerging evidence suggests that tutoring can impact student attendance, academic interests, and longer-term educational and career pathways.

Key finding #2: *Effective tutoring programs share several common features*. Research suggests that the most effective tutoring programs share several characteristics, including frequent sessions, small tutor–student ratios, alignment with classroom instruction, use of formative assessment, and sustained relationships between tutors and students. Newer research has sharpened this conclusion by showing that dosage matters, that one-on-one tutoring often delivers the largest effects while small group tutoring can still be effective, and that curricular alignment appears to strengthen impacts.

Key finding #3: *Tutoring programs lose effectiveness when implementation fidelity declines.*
Evidence from both research studies and real-world implementations shows that tutoring programs are less effective when key design elements are not maintained. Common implementation challenges include scheduling constraints, staffing shortages, weak curricular integration, and difficulties maintaining dosage and tutor consistency. These constraints help explain why scaled programs often produce smaller impacts than those estimated in earlier efficacy studies, even when the underlying intervention remains promising.

Key finding #4*: Tutoring can be cost-effective relative to other educational investments, but cost-effectiveness depends on program design.* The cost of tutoring programs varies widely, depending on tutor type, group size, dosage, and delivery format. Programs using paraprofessionals, university students, or remote delivery can reduce costs while still producing meaningful gains. However, the design changes likeliest to lower costs—such as larger group sizes, reduced dosage, and greater reliance on technology—are also the likeliest to reduce effectiveness. Understanding how costs can be lowered without impact being undermined remains an important and unresolved question for the field.

Key finding #5: *New technologies may help expand access to high-impact tutoring, but they also create risks.* Emerging technologies, including scheduling tools, computer-assisted learning platforms, and artificial intelligence (AI) based tutor support tools, may reduce implementation barriers and improve instructional consistency. At the same time, some caution is warranted. The strongest evidence still points to human-delivered tutoring as the most reliable way to improve student outcomes, and the field continues to face the risk that technology will be used to strip tutoring of the relationships and personalization that drive engagement and learning.

Evidence

Key finding #1: *Tutoring produces large improvements in student learning.* Evidence from both meta-analyses and individual RCTs shows that tutoring programs produce meaningful improvements in student achievement and other desirable outcomes, such as engagement, attendance, and career pathways.

Meta-analyses provide a useful starting point because they synthesize findings across many studies. One such analysis analyzed 96 RCTs of tutoring programs and estimated an average effect size of approximately 0.29 s.d. on student achievement.[2] Similarly, a review of interventions targeting disadvantaged students found that tutoring produces average impacts of approximately 0.36 s.d.[3] Earlier work also finds consistent positive effects across tutoring programs implemented in elementary and secondary schools.[4] Across meta-analyses and randomized evaluations, tutoring consistently produces larger effects than most commonly studied school-based interventions.[5]

Evidence from individual RCTs reinforces these conclusions. One widely cited evaluation examined the Saga Education tutoring model implemented in Chicago Public Schools. In this program, tutors meet daily with small groups of high school students to provide mathematics instruction. Experimental findings from the program show that student participation increased mathematics achievement by between 0.18 and 0.40 s.d. and substantially increased course pass rates.[6] Follow-on work suggests that these effects can be replicated in scaled implementations, though sustaining quality remains challenging.[7]

Additional studies further demonstrate the effectiveness of tutoring programs targeting younger students. An evaluation of the Reading Recovery literacy tutoring program found large improvements in reading outcomes among first-grade students.[8] Randomized evaluations of mathematics tutoring programs such as Number Rockets also find meaningful improvements in elementary students' mathematics achievement.[9] More recent studies show that when implemented with sufficient structure and support, remote tutoring can also improve outcomes for young readers.[10]

Evidence from international contexts supports the same basic conclusion. An evaluation of an online tutoring program in Italy during pandemic-related school closures found improvements in academic performance and student well-being.[11] An online tutoring program serving vulnerable students in Spain also improved math achievement, reinforcing the evidence that well-structured remote tutoring can be effective.[12]

Newer evidence extends the account of tutoring's achievement impacts in two important ways. First, tutoring may produce benefits beyond short-run improvements to test scores. Researchers have found that students were less likely to be absent on days when tutoring was scheduled in a statewide initiative, with larger attendance benefits in programs that more closely resembled high-impact tutoring.[13] In addition, the tutor gender match can affect girls' interest and performance in science, technology, engineering, and math (STEM) courses.[14] Second, tutoring effects may persist longer than earlier work suggested. One study found sustained effects of small-group mathematics instruction extending beyond the period of treatment.[15] Another found that participation in an online tutoring program improved students' academic performance and affected their transition from school to work, pointing to impacts that extend beyond immediate academic outcomes.[16]

Most of the evidence cited in this section comes from RCTs, and the reported effects generally reflect the impact of students' being offered or assigned to tutoring. Meta-analyses synthesize estimates as reported in the original studies and therefore may include a mix of specifications. In practice, however, many of the tutoring programs studied early on were smaller scale and had high rates of participation, so these estimates closely approximate the effects of receiving tutoring (because nearly all the assigned students actually participated). This distinction becomes more important as tutoring models scale and implementation becomes more variable across contexts. In emerging contexts such as AI-based or opt-in tutoring, student take-up is often substantially lower, and the estimated impacts likely depend more on students' level of participation.

The remaining question is which tutoring models produce the largest gains and how those gains can be sustained when programs expand.

Key finding #2: *Effective tutoring programs share common design features.* Although tutoring programs vary widely in their design and implementation, research has identified several features common to the most effective interventions.

One important feature is tutoring dosage. Programs that provide tutoring several times each week generate larger improvements in student learning. High-dosage tutoring programs typically involve at least three sessions per week and often provide daily tutoring during the school day.[17] Several studies link additional tutoring exposure to stronger academic outcomes.[18] At the same time, newer studies suggest that dosage need not always take the same form. One study showed that young students can make gains through frequent, short tutoring sessions paired with linked independent practice, suggesting that what counts as effective dosage may vary by age, subject, and instructional context.[19]

Tutor–student ratios also influence program effectiveness. Many successful tutoring programs use one tutor for one or two students. Small instructional groups allow tutors to monitor student understanding closely and provide immediate feedback. Newer studies provide more direct evidence on this question. One study found that one-on-one tutoring often produces the largest effects although small-group tutoring can still generate meaningful gains.[20] Another added an important mechanism by showing that students working one-on-one with a tutor receive more than twice as much individualized instructional attention and relationship building as students working in pairs.[21] When tutors work with multiple students, they often distribute attention unevenly across students.[22] A shift from one-on-one to small-group tutoring changes both instructional attention and opportunities for relationship building. These findings suggest that differences in tutoring effects across program models are partly driven by how instructional attention is distributed across students.

Tutor consistency also appears to be important. Programs in which students work with the same tutor over an extended period allow tutors to build relationships with students and develop a deeper understanding of their learning needs. Research on tutoring emphasizes that sustained tutor–student relationships contribute to student engagement and motivation.[23] Newer evidence reinforces the importance of those relationships by linking tutoring to attendance, STEM identity, and broader engagement with school.[24]

Alignment with classroom instruction is another key feature. Tutoring programs that coordinate instruction with the school curriculum help reinforce classroom learning and ensure that tutoring sessions focus on relevant content. For many years, this proposition was widely believed but only weakly tested. Recent work offers stronger evidence that curricular alignment matters. One study found that tutoring is more effective when the tutoring curriculum is aligned with classroom instruction or instructional standards.[25] Another similarly showed that null effects can emerge when interventions fail to fit the broader instructional context.[26]

Finally, effective tutoring programs often incorporate data to guide instruction. Tutors may use formative assessments to monitor student progress and adjust instruction accordingly. These assessments allow tutors to identify areas where students need additional support and tailor instruction to individual learning needs.[27] The NSSA framework places formative assessment, student progress monitoring, and tutor support at the center of effective tutoring design because they help programs personalize instruction while maintaining coherence across tutors and sites.

Together, these features help explain why some tutoring programs generate large improvements in student learning while others produce smaller effects. The most effective tutoring programs combine intensity, personalization, instructional coherence, and human connection.

Key finding #3: *Tutoring programs lose effectiveness when implementation is weak.* Although tutoring programs can generate substantial improvements in student learning, implementing them within school systems presents several challenges.

One challenge involves scheduling tutoring sessions. High-impact tutoring programs typically involve frequent sessions that occur during the school day. Integrating these sessions into existing school schedules can be difficult, particularly in secondary schools, where students have complex course schedules. Recent implementation studies consistently identify time in the schedule and physical space for tutoring as the two most significant barriers schools face.[28] These constraints affect whether students receive the dosage and consistency required for impact, and when they result in irregular or missed sessions, they directly drive the participation gaps that ultimately erode program effectiveness.

Staffing is another challenge. Schools must recruit, train, and supervise tutors, though many systems also address this challenge by contracting with external tutoring providers. Many tutoring programs rely on paraprofessionals, AmeriCorps fellows, or university students as tutors.[29] Recruitment of sufficient numbers of tutors can be difficult, particularly in areas with limited labor supply. At the same time, the evidence suggests that tutoring does not require a single type of educator. Teachers, paraprofessionals, college students, and paid volunteers can all be effective tutors, though unpaid volunteers tend to produce weaker results, and novice tutors generally require more support.[30] New research suggests that recruitment strategy matters, as well. One study found that emphasizing the financial benefits of being a tutor in outreach materials nearly tripled applications among college students.[31]

Coordination with classroom instruction also presents challenges. Tutoring programs are most effective when tutoring sessions reinforce classroom learning. Achieving this alignment requires communication between tutors and classroom teachers. It also requires schools to treat tutoring as a core instructional support instead of an add-on. Two studies showed that principal buy-in, site-level coordination, and clear instructional integration are central to implementation quality.[32]

Programs that provide tutoring less frequently than planned often generate smaller learning gains. Programs in which students work with different tutors each session may struggle to build the relationships that support student engagement. Programs that move from one-on-one to larger groups for cost reasons may alter the instructional experience in ways that reduce personalization. Research on scaled tutoring underscores this point. One study showed that scaled programs often produce smaller effects than those found in earlier studies in part because cost and capacity constraints lead programs to reduce dosage and increase group size.[33]

Recent work also highlights the importance of family engagement and take-up. After the pandemic, many districts launched on-demand tutoring systems that students could access when needed. These models generally relied on opt-in participation and reached relatively few students, with particularly low participation among the students who stood to benefit most.[34] Tutoring outside school hours faces similar challenges. Even when programs are available, take-up depends on transportation, family schedules, communication, and the fit between program content and student needs.[35]

Across these dimensions, implementation challenges often translate into changes in the core features of tutoring programs. Research on tutoring implementation therefore emphasizes the importance of maintaining program fidelity. When tutoring programs provide high dosage, small group sizes, strong alignment with classroom instruction, and clear organizational support, they are likelier to generate substantial improvements in student learning. Scaling tutoring is not only about expanding access but also about preserving the conditions that make tutoring effective. Evidence from large-scale implementations suggests that reductions in dosage and increases in tutor–student ratios account for a substantial share of the decline in impacts observed when tutoring programs expand.[36]

Key finding #4: *Tutoring programs can be cost-effective, but cost-effectiveness depends on design choices that also shape impact.* The cost of tutoring programs varies widely, depending on program design, tutor type, and instructional format. Programs that employ certified teachers as tutors often have higher costs because teachers typically receive higher wages. Programs that rely on paraprofessionals, service fellows, or university students can operate at lower cost while still producing meaningful improvements in student learning.[37] Recent evidence suggests that well-designed programs using embedded paraprofessionals or novice tutors supported by strong materials and support can generate real gains, which expands the menu of feasible staffing models.[38]

Research suggests that tutoring programs can be cost-effective relative to other educational interventions.[39] The substantial learning gains associated with tutoring programs mean that the cost per unit of learning improvement can compare favorably with that of other education policies. Nevertheless, cost-effectiveness depends heavily on design. Smaller tutor–student ratios increase program costs because each tutor serves fewer students. Increasing the number of students per tutor can reduce costs but may also reduce program effectiveness. The same is true of dosage. More sessions increase costs, yet lower-dosage programs may fail to generate sufficiently strong gains to justify their expense.

The delivery format of tutoring programs also influences costs. In-person tutoring requires tutors to be physically present in schools, which can limit the pool of potential tutors and raise coordination costs. Remote tutoring expands the potential tutor workforce and may reduce costs associated with travel and scheduling. Research since the pandemic suggests that remote tutoring (i.e., human tutoring on a virtual platform) can produce academic gains comparable to those of in-person tutoring in some settings, though in-person tutoring may have advantages for attendance and relationship building.[40] These tradeoffs matter for cost-effectiveness because the lowest-cost model is not necessarily the most efficient if it reduces engagement or learning.

Recent research increasingly examines how design choices influence cost-effectiveness. The relevant policy question is how to lower costs while preserving the elements that generate learning. That is why current research increasingly focuses on marginal changes in dosage, tutor–student ratio, delivery format, and the use of technology as a support rather than a substitute for tutors.[41]

Understanding the cost-effectiveness of different tutoring models remains an important area for future research. The strongest programs are unlikely to be the cheapest possible models, yet they may still prove highly cost-effective when compared with other investments aimed at improving student outcomes.

Key finding #5: *New technologies may help address implementation barriers, but they do not replace human connection.* As tutoring programs have expanded, attention has turned to whether technology can help schools deliver high-quality instruction at greater scale. The evidence so far justifies cautious optimism, but it consistently points to one conclusion: Technology works best when it supports rather than replaces human connection.

Emerging technologies may help schools address some of the logistical challenges associated with implementing tutoring programs. Scheduling platforms can help schools coordinate tutoring sessions within the school day. Digital tools can support tutor training, instructional planning, and progress monitoring. Computer-assisted learning platforms can also complement tutoring by giving students opportunities for practice linked to tutoring sessions.[42]

Artificial intelligence tools may also play a role in supporting tutoring programs. These tools can assist tutors by generating instructional prompts, suggesting practice problems, and providing feedback on student responses. One study showed that Tutor CoPilot, an embedded AI support tool, can improve student learning, particularly for novice tutors.[43] Early evidence from hybrid human–AI models suggests that students use AI tutors more effectively when a human is alongside to provide emotional and pedagogical support as needed.[44] Consistent with this, an exploratory randomized trial of an AI tutoring tool deployed in UK classrooms found that the intervention was safe and produced positive effects on student learning, though the authors note that effect sizes were modest and that student engagement with the platform remained a limiting factor.[45]

At the same time, these developments raise important questions about how tutoring programs should balance technology with human interaction. The strongest evidence still points to human-delivered tutoring as the most reliable path to student gains.[46] Remote tutoring can work. AI-supported tutoring can work. Computer-assisted platforms can help. Yet the literature continues to show that relationships between tutors and students play an important role in student engagement, attendance, identity development, and learning. Human support appears to increase students' engagement with technological tools and improve the quality of their learning experience.

Areas for future research

Future research should focus on three questions. First, how can tutoring models maintain effectiveness when implemented across large and diverse school systems? Second, how do program design choices such as dosage, tutor–student ratios, and delivery format influence both effectiveness and cost-effectiveness? Third, how can emerging technologies support tutors while preserving the human relationships that appear central to tutoring's impact?

The field therefore faces a tension. Technology may make tutoring easier to deliver and scale. It may improve scheduling, expand tutor supply, strengthen tutor practice, and lower some costs. Yet those benefits come with a risk. Implementations driven primarily by cost reduction may eliminate the features that the evidence most consistently links to student learning. These models may weaken the instructional personalization and relationships that contribute to tutoring effectiveness.

The path forward requires moving from isolated pilots to integrated systems. Districts that treat tutoring as core instruction instead of an add-on, that invest in leadership and implementation infrastructure, and that keep sessions frequent, groups small, relationships strong, and tutoring content aligned with curricula will be best positioned to sustain effective programs. Future work should identify models that maintain the features associated with strong tutoring impacts while operating within the constraints of real school systems.

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