K-12 EDUCATION

Research on Effectiveness of Professional Development Is Mixed, but Teachers Find Collaborative Learning Most Useful

Report to the Chair, Committee on Health, Education, Labor and Pensions, U.S. Senate

March 2026
GAO-26-107874
United States Government Accountability Office

Accessible Version

GAO Highlights

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A report to the Chair of the Committee on Health, Education, Labor and Pensions, U.S. Senate

For more information, contact: Jacqueline M. Nowicki at nowickij@gao.gov

What GAO Found

Teacher professional development is generally associated with higher student test scores, according to meta-analyses GAO reviewed. However, research is mixed about which specific elements of teacher professional development contribute to these higher scores. For example, one of the three meta-analyses that reviewed coaching—one specific element of teacher professional development—found a generally positive association between coaching and student test scores, while the other two meta-analyses found no association.

Most teachers (67 percent) said collaborative learning opportunities with other teachers improved their teaching or their students' learning, according to a nationally representative RAND survey of K-12 public school teachers from school year 2022–23. Similarly, teachers who responded to GAO's nongeneralizable questionnaire said collaborative professional development was useful for their classroom teaching. For example, respondents said professional learning communities helped them share resources, exchange ideas, or reflect on teaching practices or issues in the classroom.

Title II, Part A (Title II-A)—a formula grant program in the Elementary and Secondary Education Act of 1965, as amended (ESEA)—provides federal funds to states and school districts for activities such as teacher professional development. State and local officials from the three states and nine school districts GAO spoke with said that Title II-A's flexibility and straightforward requirements helped them meet their communities' educational needs. For example, New Mexico officials described using Title II-A funds to train school district officials on mentoring and recruitment, build a statewide cadre of mentors, and train teachers for leadership and administrative positions. In addition, officials from six of nine school districts reported that requirements applicable to Title II-A—which include that professional development be "data-driven" and "sustained (i.e., not stand-alone, one-day, or short-term workshops)," among others—helped to ensure that professional development is high quality or effective (see figure).

Selected Requirements for Professional Development Under the Elementary and Secondary Education Act of 1965, as Amended

Source: GAO (icons) and the Elementary and Secondary Education Act of 1965, as amended. | GAO-26-107874

Accessible Data for Selected Requirements for Professional Development Under the Elementary and Secondary Education Act of 1965, as Amended

- Sustained
- Intensive
- Collaborative
- Job-embedded
- Data-driven
- Classroom-focused

Source: GAO. | GAO-26-107874/

Why GAO Did This Study

Congress appropriated about $2.2 billion in Title II-A grants each year from fiscal years 2022 through 2024, making it the second largest formula grant program in the ESEA. GAO was asked to review whether Title II-A funds were being used in a manner likely to raise student achievement. This report describes (1) the elements of professional development that research finds to be effective, (2) the elements of professional development that teachers find most useful, and (3) the experiences of selected states and school districts using Title II-A to support effective instruction.

GAO reviewed five meta-analyses that measured the effectiveness of teacher professional development and five U.S. Department of Education studies of randomized controlled trials of teacher professional development programs. In addition, GAO analyzed RAND's nationally representative American Instructional Resources Survey reports from school years 2022–23 and 2023–24 and developed and disseminated a questionnaire to teachers understand the professional development elements they find useful. GAO also interviewed officials from the New Mexico, Pennsylvania, and Tennessee state educational agencies and nine school districts to understand how these states and districts used Title II-A funds to improve instruction. GAO selected these states and school districts based on characteristics such as the level of state Title II-A funds received, geographic distribution, and urbanicity.

Contents

Abbreviations

- ESEA Elementary and Secondary Education Act of 1965, as amended
- OESE Office of Elementary and Secondary Education
- Title II-A Title II, Part A of the Elementary and Secondary Education Act of 1965, as amended

March 27, 2026

The Honorable Bill Cassidy, M.D.
Chair
Committee on Health, Education, Labor and Pensions
United States Senate

Dear Mr. Chair:

Title II, Part A (Title II-A)—the second largest formula grant program in the Elementary and Secondary Education Act of 1965, as amended (ESEA)—provides federal funds to states and school districts for activities such as teacher professional development and efforts to improve teacher recruitment and retention. Congress appropriated about $2.2 billion in Title II-A grants each year from fiscal years 2022 through 2024. Professional development—the most common use of Title II-A funds—is an integral part of school and district strategies for providing educators with the knowledge and skills they need to help students succeed academically. Further, Title II-A specifies that certain professional development activities funded with Title II-A dollars must be evidence-based.[1] Additionally, under the ESEA, professional development must be sustained (i.e., not stand-alone, one-day, or short-term workshops), intensive, collaborative, job-embedded, data-driven, and classroom-focused, among other requirements.[2]

You asked us to review whether Title II-A funds are being used in a manner likely to raise student achievement. We examined (1) the elements of professional development that research finds to be effective, (2) the elements of professional development that teachers find most useful, and (3) the experiences of selected states and school districts using Title II-A to support effective instruction.

To identify the elements of professional development research finds to be effective, we reviewed five meta-analyses that measured the effectiveness of teacher professional development. We selected these meta-analyses based on their recency (published 2015–2025), the outcomes they measured (student test scores), the populations they studied (K-12 teachers), and the quantitative methods of the studies they analyzed (experimental and quasi-experimental studies). In addition, we reviewed five U.S. Department of Education studies of randomized controlled trials of teacher professional development programs. We selected the five studies of randomized controlled trials from Education's Institute of Education Sciences' Resource Library based on relevance to our research objectives, the outcomes they measured (student test scores), the populations they studied (K-12 teachers), and the experimental designs of the studies.[3]

[1]Under the Elementary and Secondary Education Act of 1965, as amended (ESEA), the term "evidence-based" generally means that an activity, strategy, or intervention demonstrates a statistically significant effect on improving student outcomes or other relevant outcomes based on certain evidence, or that it (I) demonstrates a rationale based on high-quality research findings or positive evaluation that such activity, strategy, or intervention is likely to improve student outcomes or other relevant outcomes; and (II) includes ongoing efforts to examine the effects of such activity, strategy, or intervention. 20 U.S.C. § 7801(21).

[2]Professional development under the ESEA is defined at 20 U.S.C. § 7801(42).

[3]We focused our review on how teacher professional development improves student test scores because ESEA focuses on improving student outcomes in its definition of evidence-based, and because all five meta-analyses we reviewed measured student outcomes using test scores.

To identify the elements of professional development that teachers find most useful, we analyzed RAND's nationally representative American Instructional Resources Survey reports from school years 2022–23 and 2023–24, the most recent data available. Not all survey questions were included in both surveys, so we used the most recent available data from the two reports for our analyses. We assessed the reliability of the RAND survey data and determined the data were sufficiently reliable for reporting on the elements of professional development teachers find most useful. We also developed and disseminated a teacher questionnaire to understand the professional development elements that selected teachers find useful. We sent this questionnaire to a nongeneralizable random sample of teachers from grades one through 12.

To understand how selected states and school districts used Title II-A funds to improve instruction, we interviewed officials from state educational agencies in New Mexico, Pennsylvania, and Tennessee and officials from three school districts within each selected state, for a total of nine school districts. We selected states to include those that Education had recently monitored, those that represented a range of state Title II-A funding levels, and those that represented different geographic regions. Within each state, we selected school districts with varying levels of urbanicity (city, suburban, and rural or town). We also reviewed ESEA consolidated state plans from each of the three selected states. In addition, we reviewed Education's consolidated performance review reports of 18 states for the most recent 6 years available (fiscal years 2019 through 2024) to identify common issues that states encountered in administering Title II-A funds to improve instruction. We also reviewed data from an Education report on how states and school districts use Title II-A funds.[4] We assessed the reliability of the data from Education's Office of Elementary and Secondary Education (OESE) and determined the data were sufficiently reliable for reporting on how states and districts used Title II-A funds. Finally, we interviewed Education officials about their roles and activities in administering Title II-A and reviewed relevant federal laws and guidance. See appendix I for more information about our scope and methodology.

We conducted this performance audit from October 2024 through March 2026 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Title II-A Administration

Federal, state, and local government agencies have separate roles in administering Title II-A.[5] Their responsibilities include allocating and using funds, monitoring compliance, and providing guidance. Each year, all states and most school districts receive Title II-A funds, according to an Education report.[6]

[4]U.S. Department of Education, Office of Elementary and Secondary Education, *State and District Use of Title II, Part A Funds in 2023–24* (Jan. 2025).

[5]For the purposes of this report, we refer to state educational agencies as states, and we refer to local educational agencies as school districts.

[6]U.S. Department of Education, *State and District Use of Title II, Part A Funds in 2023–24*. According to Education officials, as of June 2025, the contract for this report series had been canceled.

Federal role. Education awards Title II-A funds to states according to a statutory formula, issues guidance, and periodically monitors states' compliance with Title II-A requirements. The Title II-A funding formula for states generally allots 80 percent of funds based on the number of students from low-income families and 20 percent of funds based on the overall number of students in a state.[7] OESE periodically monitors states' efforts implementing Title II-A for compliance with statutory and regulatory requirements. OESE also has published reports on how states and school districts use Title II-A funds.[8]

State role. States allocate roughly 95 percent of their Title II-A awards to eligible school districts using the same formula of the number of students from low-income families and the overall number of students.[9] States may use up to 5 percent of their total Title II-A allocation for state activities. These activities include things such as fulfilling states' responsibilities concerning proper and efficient administration and monitoring of Title II-A funds, including providing technical assistance to school districts.

Local role. School districts must apply for Title II-A funds and use the subgrants for permitted activities, such as professional development for teachers or hiring additional teachers to reduce class sizes. In developing these applications, school districts are required to meaningfully consult with stakeholders, such as teachers and parents, on how best to improve school district activities to meet the purpose of Title II-A funds.

Use of Title II-A Funds

Under Title II-A, school districts and states may use funds for a broad range of permitted activities related to supporting effective instruction. In school year 2023–24, school districts spent about $1.8 billion, and states spent about $101 million in Title II-A funds, according to a recent Education report.[10] In school year 2023–24, the amount each state spent ranged from about $262,000 (West Virginia) to about $12 million (California). The estimated average Title II-A school district allocation was about $125,000 in school year 2023–24, according to the same report. On average, estimated allocations ranged from about $32,000 for small districts to about $1.3 million for large districts.[11] School districts spent an estimated 57 percent of their Title II-A funds on professional development for teachers, principals, and other school leaders. States spent nearly a third of their Title II-A funds on recruiting, hiring, and retaining effective educators (see fig. 1).

[7]Specifically, after making certain reservations, Education calculates Title II-A allocations to states as follows: 20 percent based on each state's number of children ages 5-17 compared to this population in all States; and 80 percent based on each State's number of individuals ages 5-17 from families with incomes below the poverty line compared to this population in all states.

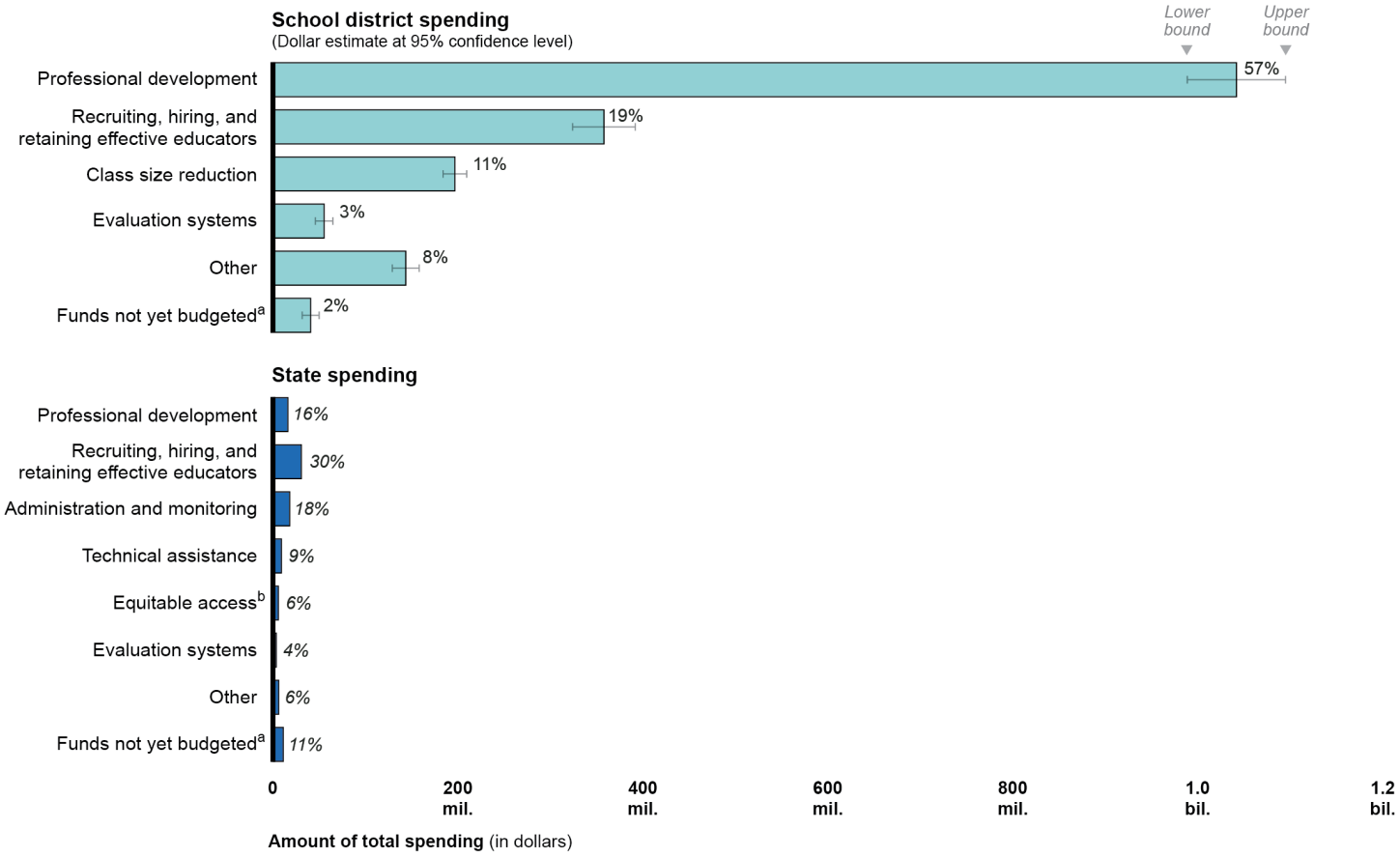
[8]For example, see U.S. Department of Education, *State and District Use of Title II, Part A Funds in 2023–24.*

[9]Of these funds, states may reserve up to an additional 3 percent for a range of state-level activities aimed at improving the effectiveness of principals and other school leaders.

[10]For school year 2023–24, the total amount available for Title II-A state-level activities was about $102.6 million, and for districts the total amount allocated was about $2.1 billion. Some allocated funds may not have been spent within the reporting period asked about in the survey, according to Education officials. States and school districts may have also made adjustments and transfers between programs that are not reflected in the spending subtotals. U.S. Department of Education, *State and District Use of Title II, Part A Funds in 2023–24*.

[11]Large school districts enroll more than 10,000 students, medium districts enroll from 2,500 to 10,000 students, and small districts enroll fewer than 2,500 students. U.S. Department of Education, *State and District Use of Title II, Part A Funds in 2023–24.*

Figure 1: Title II-A State Spending and Estimated School District Spending, School Year 2023–24



Source: GAO analysis of U.S. Department of Education data. | GAO-26-107874

Accessible Data for Figure 1: Title II-A State Spending and Estimated School District Spending, School Year 2023–24

School district spending (Dollar estimate at 95% confidence level)

Amount of total spending (in millions dollars)	Lower bound	Median	Upper bound	Percentage of total
Professional development	988.12	1041.85	1095.58	57%
Recruiting, hiring, and retaining effective educators	323.43	357.96	392.49	19%
Class size reduction	183.35	196.76	210.17	11%
Evaluation systems	45.32	55.4	65.48	3%
Other	128.5	143.65	158.8	8%
Funds not yet budgeted[a]	31.11	40.85	50.59	2%

State spending (Dollar estimate at 95% confidence level)

Amount of total spending (in millions of dollars)	Lower bound	Percentage of total
Professional development	16.14	16%
Recruiting, hiring, and retaining effective educators	30.71	30%
Administration and monitoring	18.2	18%
Technical assistance	9.24	9%
Equitable access[b]	5.91	6%
Evaluation systems	3.56	4%
Other	6.25	6%
Funds not yet budgeted[a]	11.19	11%

Source: GAO analysis of U.S. Department of Education data. | GAO-26-107874

Notes: Title II-A refers to Title II, Part A of the Elementary and Secondary Education Act of 1965, as amended. According to Education, state and district spending data come from two sources: a survey of the state educational agencies in all 50 states, the District of Columbia, and Puerto Rico, as well as a district survey that is representative at the state and national levels. Total state and school district spending for school year 2023–24 does not sum to the total allocation to states of $2.2 billion because some allocated funds may not have been spent within the reporting period asked about in the survey, according to Education officials. States and school districts may also have made adjustments and transfers between programs that are not reflected in the spending subtotals. The standard errors for the spending percent estimates are all less than 1 percent. U.S. Department of Education, Office of Elementary and Secondary Education, *State and District Use of Title II, Part A Funds in 2023–24* (Jan. 2025).

[a]Funds not yet budgeted refers to funds reserved for states or school districts that were not budgeted at the time of data collection.

[b]Equitable access includes activities designed to improve access to effective teachers for low-income and minority students in the state.

Teacher Professional Development Is Associated with Better Student Performance, but Evidence Is Mixed About Which Elements Are Effective

Teacher professional development is generally associated with higher student test scores, according to all five meta-analyses we reviewed.[12] For example, one meta-analysis found teacher professional development was associated with effects on student test scores that were roughly equivalent to one month of additional student

[12]In all five meta-analyses, the average of the estimates for the overall association between teacher professional development and student test scores was positive and significant at the 0.01 significance level. All five meta-analyses we reviewed compared the specific professional development programs in the studies they examined to the professional development teachers would have otherwise received. Two meta-analyses also compared these specific programs to control groups that received alternative professional development programs. Two meta-analyses also compared these specific programs to control groups that received no professional development. Matthew Kraft, David Blazar, and Dylan Hogan, "The Effect of Teacher Coaching on Instruction and Achievement: A Meta-Analysis of the Causal Evidence," *Review of Educational Research*, vol. 88, no. 4 (2018); Kathleen Lynch, Heather C. Hill, Kathryn Gonzalez, and Cynthia Pollard, "Strengthening the Research Base That Informs STEM Instructional Improvement Efforts: A Meta-Analysis," *Educational Evaluation and Policy Analysis*, vol. 41, no. 3 (2019); Marianne Rice, Kacee Lambright, and Kausalai (Kay) Wijekumar, "Professional Development in Reading Comprehension: A Meta-Analysis of the Effects on Teachers and Students," *Reading Research Quarterly*, vol. 59, no. 3 (2024); Sam Sims et al., "What Are the Characteristics of Effective Teacher Professional Development? A Systematic Review and Meta-Analysis," Education Endowment Foundation (2021), ERIC no. ED615914; Adrie J. Visscher, Natasha Dmoshinskaia, Marta Pellegrini, and Anny Rey-Naizaque, "(When) Do Teacher Professional Development Interventions Improve Student Achievement? A Meta-Analysis of 128 High-Quality Studies," *Educational Research Review*, vol. 49 (2025).

progress.[13] Another meta-analysis found that coaching teachers was associated with effects on student test scores that were roughly equivalent to improvements over teachers' first 5 to 10 years of experience.[14]

What Is a Meta-Analysis?

Meta-analysis is a statistical process that combines estimates from multiple studies to estimate average effects and identify overall trends.

Strengths: In general, when compared to individual studies, meta-analysis findings are more broadly applicable because they estimate effects for a wider variety of programs and study a broader variety of populations.

Limitations: The specific meta-analyses we reviewed do not measure causal relationships between individual elements of professional development programs and student test scores (e.g., whether collaboration in professional development is more effective than professional development without collaboration). Instead, these studies measure associations between the individual elements in professional development programs and the estimated effect on student test scores.

Source: GAO analysis of selected meta-analyses. | GAO-26-107874

The five meta-analyses we reviewed arrived at mixed conclusions about which individual elements of teacher professional development were positively associated with effect sizes on student test scores.[15] Below, we present findings on elements that appeared in at least three of the five meta-analyses.[16] See appendix III for additional details and findings from the meta-analyses.

Alignment with curriculum. Three of the four meta-analyses that reviewed alignment with curriculum did not find associations with effect sizes on student test scores.[17] The fourth meta-analysis found mixed results.[18] Specifically, this meta-analysis found a positive association between professional development focused on how to use curriculum materials and effect sizes. The same meta-analysis found no association between professional development in which teachers developed curricula or lesson plans and effect sizes.

Coaching. Two of the three meta-analyses that reviewed coaching did not find associations between coaching and effect sizes on student test scores.[19] The third meta-analysis found that coaching is generally associated with higher student test scores.[20]

[13]Sims et al., "Characteristics of Effective Teacher Professional Development."

[14]Kraft, Blazar, and Hogan, "Effect of Teacher Coaching on Instruction and Achievement."

[15]The effect size is defined as the estimated effect of a teacher professional development program on student test scores, relative to the professional development practices teachers would have otherwise received, alternative professional development programs, or no teacher professional development.

[16]For our analysis, we defined "alignment with curriculum" as support for teachers' implementation and use of instructional materials and coordination of professional development with curriculum content and instructional strategies; "coaching" as opportuniti es teachers have to be observed by experts and provided feedback; "collaboration" as opportunities for teachers to work together in groups or teams; "duration" as the number of hours of professional development provided to teachers; "focus on subject matter" as relevance to academic content and how students learn that content, and "provider type" as the category of facilitator who provided the professional development to teachers (e.g., researchers, district staff, or independent facilitators).

[17]Kraft, Blazar, and Hogan, "Effect of Teacher Coaching on Instruction and Achievement"; Visscher, Dmoshinskaia, Pellegrini, an d Rey-Naizaque, "Teacher Professional Development Interventions"; Rice, Lambright, and Wijekumar, "Professional Development in Read ing Comprehension."

[18]Lynch, Hill, Gonzalez, and Pollard, "STEM Instructional Improvement Efforts."

[19]Lynch, Hill, Gonzalez, and Pollard, "STEM Instructional Improvement Efforts"; Rice, Lambright, and Wijekumar, "Professional Development in Reading Comprehension."

[20]Kraft, Blazar, and Hogan, "Effect of Teacher Coaching on Instruction and Achievement."

Collaboration. Two of the three meta-analyses that reviewed collaboration in teacher professional development found generally positive associations with effect sizes on student test scores.[21] For example, one meta-analysis found a positive association between professional development that included meetings between teacher participants and effect sizes.[22] The third meta-analysis did not find an association between collaboration and effect sizes.[23]

Duration. None of the four meta-analyses that reviewed the duration of professional development found an association between the length of the professional development and effect sizes on student test scores.[24]

Focus on subject matter. Two of the three meta-analyses that reviewed professional development's focus on subject matter did not find associations with effect sizes on student test scores.[25] The third found a positive association between professional development's focus on subject matter and effect sizes.[26] Specifically, this meta-analysis found that focusing on pedagogical content knowledge (e.g., how students learn science) was positively associated with effect sizes.

Provider type. None of the three meta-analyses that reviewed the type of professional development provider found associations between the kind of facilitator (e.g., researchers, district staff, or independent facilitators) and effect sizes on student test scores.[27]

We also reviewed five U.S. Department of Education randomized controlled trials of teacher professional development programs.[28] These programs included almost all selected requirements for professional development under the ESEA and a list of "core features" recommended in seminal 2009 research (see table 1).[29] All five studies compared the specific professional development programs they examined to the professional development practices teachers would have otherwise received. Of the five studies, three found

[21]Kraft, Blazar, and Hogan, "Effect of Teacher Coaching on Instruction and Achievement"; Lynch, Hill, Gonzalez, and Pollard, "STEM Instructional Improvement Efforts."

[22] Lynch, Hill, Gonzalez, and Pollard, "STEM Instructional Improvement Efforts."

[23]Rice, Lambright, and Wijekumar, "Professional Development in Reading Comprehension."

[24]We cannot infer anything about the relationship between duration and effect size for durations shorter than the minimum duration included in each meta-analysis. For example, one meta-analysis did not include studies of professional development programs that lasted less than 12 weeks, and another did not include studies of professional development programs that lasted less than 3 hours. Kraft, Blazar, and Hogan, "Effect of Teacher Coaching on Instruction and Achievement"; Lynch, Hill, Gonzalez, and Pollard, "STEM Instructional Improvement Efforts"; Rice, Lambright, and Wijekumar, "Professional Development in Reading Comprehension"; Visscher, Dmoshinskaia, Pellegrini, and Rey-Naizaque, "Teacher Professional Development Interventions."

[25]Kraft, Blazar, and Hogan, "Effect of Teacher Coaching on Instruction and Achievement"; Visscher, Dmoshinskaia, Pellegrini, and Rey-Naizaque, "Teacher Professional Development Interventions."

[26]Lynch, Hill, Gonzalez, and Pollard, "STEM Instructional Improvement Efforts."

[27]Lynch, Hill, Gonzalez, and Pollard, "STEM Instructional Improvement Efforts"; Rice, Lambright, and Wijekumar, "Professional Development in Reading Comprehension"; Visscher, Dmoshinskaia, Pellegrini, and Rey-Naizaque, "Teacher Professional Development Interventions."

[28]Randomized controlled trials are generally considered the "gold standard" for evaluating the causal effects of interventions such as teacher professional development programs. However, to the extent that schools in the randomized controlled trials have different characteristics than the national average, results from the studies may not generalize to the United States.

[29]In 2009, a study proposed a consensus had emerged around a set of five "core features" (i.e., elements) for effective teacher professional development. The features include sufficient duration, collective participation (i.e., collaboration), content focus (i.e., focus on subject matter), active learning, and coherence. While researchers have proposed other lists of effective elements of professional development, all five meta-analyses we reviewed referred to this framework as influential or as part of a consensus or list of best practices. Laura Desimone, "Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures," *Educational Researcher*, vol. 38, no. 3 (2009).

no effects on student test scores, one found a delayed effect but only for professional development that lasted at least 2 years, and one found positive effects but was less generalizable than the other studies we reviewed.[30] For example, one of the studies that found no effects examined a teacher professional development program with a subject-matter focus on mathematics.[31]

[30]The study with a delayed effect found an effect in the third year in schools that received at least 2 years of a professional development program. The study found no effects in schools receiving 1 year of the program and no effects during the first 2 years in schools receiving 2 years of the program. Steven Glazerman et al., *Impacts of Comprehensive Teacher Induction: Final Results from a Randomized Controlled Study*, National Center for Education Evaluation and Regional Assistance Report No. 2010-4027, Institute of Education Sciences, U.S. Department of Education (2010). The study with positive effects used a convenience sample of schools in Hawai'i, American Samoa, and the Commonwealth of the Northern Mariana Islands. Furthermore, the study found the program increased English reading comprehension scores, and American Samoa and the Commonwealth of the Northern Mariana Islands generally have more English language learners than the U.S. average. Yasuyo Abe, Vanora Thomas, Castle Sinicrope, and Kevin A. Gee, *Effects of the Pacific CHILD Professional Development Program,* National Center for Education Evaluation and Regional Assistance Report No. 2013-4002, Institute of Education Sciences, U.S. Department of Education (2012).

[31]Michael S. Garet et al., *Focusing on Mathematical Knowledge: The Impact of Content-Intensive Teacher Professional Development,* National Center for Education Evaluation and Regional Assistance Report No. 2016-4010, Institute of Education Sciences, U.S. Department of Education (2016).

Table 1: Effects of Teacher Professional Development on Student Test Scores, from Five U.S. Department of Education Randomized Controlled Trial Studies

Citation	Elements included	Effects on student test scores
Michael S. Garet et al., Focusing on Mathematical Knowledge: The Impact of Content-Intensive Teacher Professional Development, National Center for Education Evaluation and Regional Assistance Report No. 2016-4010, Institute of Education Sciences, U.S. Department of Education (2016).	☑ Includes all selected requirements for professional development under the ESEAa ☑ Includes all elements from the "core features" frameworkb	None
Yasuyo Abe, Vanora Thomas, Castle Sinicrope, and Kevin A. Gee, Effects of the Pacific Child Professional Development Program, National Center for Education Evaluation and Regional Assistance Report No. 2013-4002, Institute of Education Sciences, U.S. Department of Education (2012).	☑ Includes all selected requirements for professional development under the ESEAa ☑ Includes all elements from the "core features" frameworkb	Increased student test scores in reading comprehension.**
Michael S. Garet et al., Middle School Mathematics Professional Development Impact Study: Findings After the Second Year of Implementation, National Center for Education Evaluation and Regional Assistance Report No. 2011-4024, Institute of Education Sciences, U.S. Department of Education (2011).	☑ Includes all selected requirements for professional development under the ESEAa ☑ Includes all elements from the "core features" frameworkb	None
Steven Glazerman et al., Impacts of Comprehensive Teacher Induction: Final Results from a Randomized Controlled Study, National Center for Education Evaluation and Regional Assistance Report No. 2010-4027, Institute of Education Sciences, U.S. Department of Education (2010).	☑ Includes all selected requirements for professional development under the ESEAa ☑ Includes all elements from the "core features" frameworkb except for focus on subject matter	None for schools receiving 1 year of comprehensive induction or for schools receiving 2 years of comprehensive induction in the first 2 years of the program. For schools receiving 2 years of comprehensive induction, positive effect on student math*** and reading** test scores in the third year after the program.
Michael S. Garet et al., The Impact of Two Professional Development Interventions on Early Reading Instruction and Achievement, National Center for Education Evaluation and Regional Assistance Report No. 2008-4030, Institute of Education Sciences, U.S. Department of Education (2008).	☑ Includes all selected requirements for professional development under the ESEAa ☑ Includes all elements from the "core features" frameworkb	None

** = statistically significant at the 0.05 significance level *** = statistically significant at the 0.01 significance level

Source: GAO analysis of selected Education studies. I GAO-26-107874

[a]Professional development program(s) includes selected requirements for professional development under the Elementary and Secondary Education Act of 1965, as amended (ESEA). That is, professional development program(s) is sustained (i.e., not stand -alone, one-day, or short-term workshops), intensive, collaborative, job-embedded, data-driven, and classroom-focused. These terms have not been further defined in regulations or guidance, according to Education officials.

[b]Professional development program(s) includes all elements from the "core features" framework. That is, professional development program(s) includes sufficient duration, collective participation (i.e., collaboration), content focus (i.e., focus on subject matter), active le arning, and coherence. Laura M. Desimone, "Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures," *Educational Researcher*, vol. 38, no. 3 (2009).

Nationally, Teachers Identified Collaborative Learning as the Most Useful Element of Professional Development

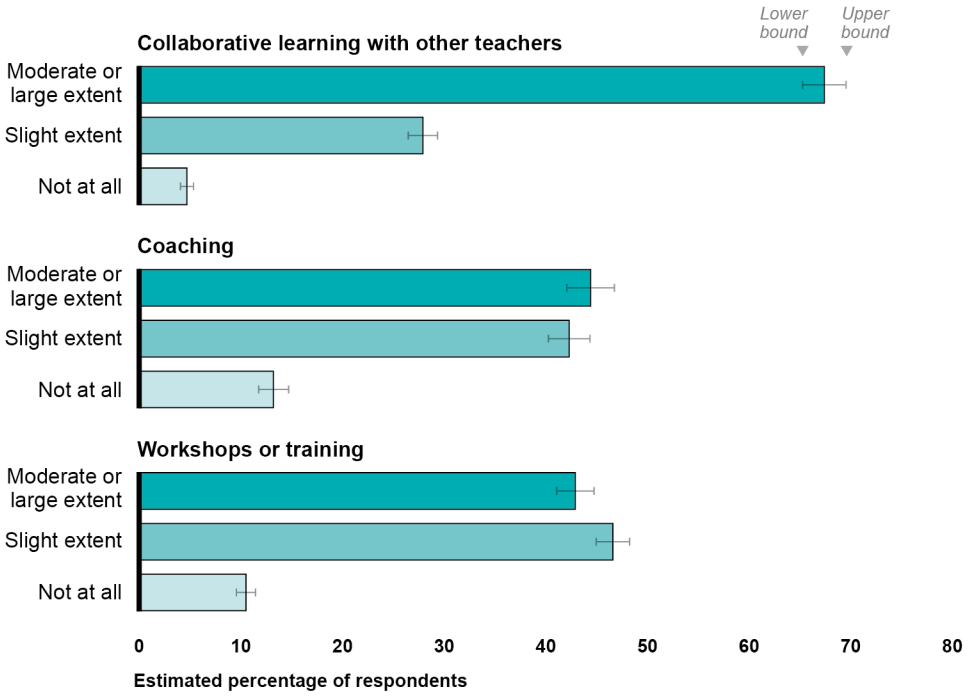
Nationwide, most teachers said collaborative learning opportunities with other teachers improved their teaching or their students' learning, according to a nationally representative RAND survey of K-12 public school teachers for school year 2022–23.[32] RAND estimated about 67 percent of teachers said collaborative learning improved their teaching or student learning to a moderate or large extent, compared to about 43 percent for workshops (i.e., trainings) and about 44 percent for coaching (see fig. 2).[33] Teachers reported mostly spending collaborative learning time on sharing instructional strategies, studying upcoming lessons, adapting materials to meet students' needs, addressing student behavioral issues, reviewing student work, and reviewing student assessment data, according to RAND's updated survey for school year 2023–24.[34]

[32]RAND's American Instructional Resources Survey received over 8,500 responses from teachers in the 2022–23 school year. According to RAND, results are nationally representative of teachers but may not represent new schools, new teachers, or expe rienced teachers new to a school district. RAND updated the survey for school year 2023–24 but did not ask this specific question in the updated survey. Sy Doan, Joshua Eagan, David Grant, and Julia H. Kaufman, *American Instructional Resources Surveys: 2023 Technical Documentation and Survey Results* (Santa Monica, CA: RAND Corporation, 2023).

[33]RAND defines collaborative learning with other teachers as "opportunities, such as instructional planning time or professiona l learning communities, for teachers to work with teams of other teachers grouped by content area or grade level to address shared problems of practice;" coaching as "opportunities teachers have to be observed by experts (for example, master teachers, department leads , school administrators) and provided feedback on the basis of the observed lessons;" and workshops or trainings as "le arning experiences, typically offered by third-party providers outside the classroom, to teach educators about specific resources, materials, or instructional strategies." According to RAND, respondents were not provided with comprehensive definitions for each element of professional development and may not have interpreted the terms the same way.

[34]Sy Doan, Joshua Eagan, David Grant, and Julia H. Kaufman, *American Instructional Resources Surveys: 2024 Technical Documentation and Survey Results* (Santa Monica, CA: RAND Corporation, 2024).

Figure 2: K-12 Teachers' Views on Which Elements of Professional Development Improved Teaching or Student Learning, School Year 2022–23



Source: GAO analysis of RAND data. | GAO-26-107874

Accessible Data for Figure 2: K-12 Teachers' Views on Which Elements of Professional Development Improved Teaching or Student Learning, School Year 2022–23

Category	Subcategory	Lower bound	Median	Upper bound
Collaborative learning with other teachers	Moderate or large extent	65.2	67.4	69.6
Collaborative learning with other teachers	Slight extent	26.4	27.9	29.4
Collaborative learning with other teachers	Not at all	4	4.7	5.4
Coaching	Moderate or large extent	42	44.4	46.8
Coaching	Slight extent	40.2	42.3	44.4
Coaching	Not at all	11.7	13.2	14.7
Workshops or training	Moderate or large extent	41	42.9	44.8
Workshops or training	Slight extent	44.9	46.6	48.3
Workshops or training	Not at all	9.5	10.5	11.5

Source: GAO analysis of RAND data. | GAO-26-107874

Notes: The brackets represent 95 percent confidence intervals; all nonoverlapping intervals are statistically different. According to RAND, results are nationally representative of teachers but may not represent new schools, new teachers, or experienced teachers new to a school district. RAND defines "collaborative learning with other teachers" as opportunities for teachers to work with teams of other teachers grouped by content area or grade level to address shared problems of practice; "coaching" as opportunities teachers have to be observed by experts and provided feedback; and "workshops or trainings" as learning experiences, typically offered by third-party providers outside the classroom, to teach educators about specific resources, materials, or instructional strategies. According to RAND, respondents were not provided with comprehensive definitions for each element of professional development and may have interpreted the terms inconsistently.

Similarly, teachers who responded to our nongeneralizable questionnaire said collaborative professional development was useful for their classroom teaching. For example, respondents said professional learning communities helped them share resources, exchange ideas, or reflect on teaching practices or issues in the classroom.[35] Other useful elements that respondents most commonly identified included teaching and learning strategies, content relevant to the subject or grade level they taught, and management of student behaviors (see text box).

Elements of Professional Development That Selected Teachers Found Useful

"The most useful professional development for me has been collaborative learning with colleagues, job-embedded coaching, and hands-on workshops focused on specific instructional strategies. These formats allowed me to immediately apply what I learned, receive feedback, and adapt practices to fit my students' needs. [Professional development] that is practical, ongoing, and connected to real classroom challenges has had the greatest impact on my teaching. In contrast, one-size-fits-all or theory-heavy sessions without classroom application have been less effective."

"[Professional development] sessions that allowed me to engage in the same activities I would later implement with students were incredibly valuable. For example, a literacy workshop that modeled differentiated reading strategies helped me immediately apply those methods in small reading groups."

"Some professional development has helped me shift how I run my classroom. I think the most beneficial things that I have taken from [professional development] are about routines and procedures, and how to run your classroom better. Having a better understanding and seeing other ways to do this really has helped my class. I can spend less time on the small stuff and focus more on the content."

Source: GAO teacher questionnaire. | GAO-26-107874

As for the elements of professional development teachers did not find useful for classroom teaching, questionnaire respondents most commonly identified professional development that was not relevant to their subject or grade level, or trainings that were only offered one time without follow-up (see text box). For example, one teacher said professional development sessions that did not provide enough time for teachers to practice implementation or interact with other teachers were not helpful. The same teacher said professional development was often advertised as applicable to all teachers, but in fact was only relevant to teachers in certain subject matter areas.

Elements of Professional Development That Selected Teachers Did Not Find Useful

"Workshops and trainings that everyone in a building is required to go to are not useful because they often are best for a particular grade level or subject and not applicable to everyone. Mini sessions that only last 20–30 [minutes in] length are not long enough to learn something new and how to apply it."

"I've attended very little [professional development] at the depth that it needs to be to actually develop teachers to the level we would all like to be. Schools and school districts try to cram things into a 45–50 minute planning time (when we really need to use the bathroom, make sure our materials are prepped for the rest of the day, and breathe) or they try and shove something that should be 3 hours into an hour faculty meeting on Monday afternoon[,] then give us no follow-up time to plan or implement what the [professional development] was about. Therefore, we mostly get surface level items."

Source: GAO teacher questionnaire. | GAO-26-107874

[35]Professional learning communities are a collaborative form of professional development in which small groups of educators with shared interests work together with the goals of expanding their knowledge and improving their craft, according to Education. Typically, a professional learning community consists of a team of teachers that meets regularly to learn new topics, share ideas, and problem solve.

Officials from Selected States and School Districts Generally Said They Valued Title II-A's Flexibility and Straightforward Requirements to Help Meet Local Needs

Officials from all three selected states and all nine school districts we interviewed described using Title II-A flexibility to meet the educational needs of their communities. Title II-A allows states and school districts to use funds on a variety of activities, such as professional development, teacher recruitment and retention, or hiring additional educators to reduce class sizes.[36] District officials said they generally decided how to spend their Title II-A allocations based on factors such as local needs, community input, school- or school district-level data, as well as state or federal guidance.

State perspectives. State officials in New Mexico, Pennsylvania, and Tennessee described using Title II-A's flexibility to advance statewide education goals. For example, New Mexico officials described using Title II-A funds to train school district officials on mentoring and recruitment, build a statewide cadre of mentors, and train teachers for leadership and administrative positions. Tennessee officials described using state-level Title II-A funding for professional development for principals. These efforts align with one of the state's ESEA priorities to support the preparation and development of an exceptional educator workforce, according to our analysis of Tennessee's ESEA consolidated state plan.

Officials from all three states also found aspects of Title II-A's requirements helpful or easy to implement. For example, officials from Pennsylvania and New Mexico found it helpful that Title II-A professional development is required to be sustained (not stand-alone, one-day or short-term workshops). Officials in New Mexico noted that Title II-A requirements helped the state guide school districts to use Title II-A funds on efforts that are more effective at supporting improvements in student outcomes. Regarding issues with administering Title II-A funds, we analyzed Education's fiscal years 2019–2024 consolidated performance review reports of 18 states and found that the most common Title II-A issue was ensuring that school districts only used Title II-A funds for professional development activities that met the statutory definition.[37]

Ensuring Compliance with Title II-A Requirements, According to Selected State Officials

Officials from the three selected states reported taking a variety of approaches to ensuring school districts complied with Title II, Part A (Title II-A) requirements. For example, in Pennsylvania, the state monitored school districts and updated its district application for Title II-A funds by adding legal assurances and narrative explanations. Officials from New Mexico said the state provided liaisons to directly answer questions from a group of school districts. The state also provided trainings to school districts to help them understand allowable uses of Title II-A funds.

Officials from two of the three selected states shared various ways they helped school districts meet the evidence-based professional development requirements for Title II-A funding. For example, officials from these states reported providing resources to help school districts find or use evidence-based professional development. Officials from one state reported ensuring that school districts met Title II-A's evidence-based requirements by integrating them into the districts' application process for Title II-A funds.

Source: GAO interviews with state educational agency officials. | GAO-26-107874

School district perspectives. All nine selected school districts, from urban, suburban, and rural or town locations across our three states, described leveraging the flexibility of Title II-A funds to address needs, such

[36]For the allowable use of funds under Title II-A for states and school districts, see 20 U.S.C. §§ 6311(c) and 6613, respectively.

[37]The definition of professional development changed with the reauthorization of ESEA in 2015. States had through the 2017–18 school year to implement the reauthorization's core components, according to Education.

as teacher retention. For example, officials from one urban school district said the district leveraged its Title II-A funds to support a principal residency program. A suburban school district official said they identified a need for additional professional development funding for specific content areas and used Title II-A funds for stipends that brought content area experts into the classroom. Officials from two school districts described using Title II-A funding flexibility to support class size reductions and noted that Title II-A's requirements for professional development were burdensome. An official from one of these districts said they preferred to use local funds for professional development because there were no requirements tied to those funds.

Rural areas especially face challenges with teacher recruitment and retention.[38] Officials from all three rural or town school districts we met with said they strategically allocated their Title II-A funding to address their unique challenges. For example, an official from one rural school district said that their district already had private funding available for professional development so that enabled them to use Title II-A funds for teacher stipends. By increasing teachers' pay, the school district was able to compete with a neighboring school district that offered higher wages. An official in another rural school district said they felt isolated as a rural community, and that their previous use of Title II-A funds on conferences was not as effective as they had hoped. This official said they switched gears and used their Title II-A funds to partner with an organization that helped them incorporate best practices into their professional development, yielding better results.

Officials from six of the nine selected school districts also said that Title II-A requirements help to ensure that professional development is high quality or effective. For example, one school district official shared that the Title II-A evidence-based requirements help the school district maintain an expectation of high-quality professional development with its schools, which was important given how much districts can spend on professional development.[39] Another school district official noted that Title II-A's stakeholder consultation requirements help the district engage community members, parents, and others about Title II-A's uses and impacts. Officials from all nine school districts said Title II-A requirements were straightforward to implement or easier to implement than other programs.

We also asked school district officials if they faced challenges implementing the requirements of Title II-A funds. In three of the nine school districts, officials identified challenges with restrictions on using Title II-A funds for professional development of district staff who are not school based. For example, one school district official said the district could not pay for district staff's professional development with Title II-A funds even though there were some staff, such as special education leads, who also needed it.

Agency Comments

We provided a draft of this report to Education for review and comment. Education provided a technical comment, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Education, and other interested parties. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

[38]GAO- *K-12 Education: Education Should Assess Its Efforts to Address Teacher Shortages,* GAO-23-105180 (Washington, D.C.: Oct. 27, 2022).

[39]The evidence-based requirements apply to certain professional development activities funded under Title II-A.

If you or your staff have any questions about this report, please contact me at nowickij@gao.gov. Contact points for our Offices of Congressional Relations and Media Relations may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix V.

Sincerely,

//SIGNED//

Jacqueline M. Nowicki, Director
Education, Workforce, and Income Security Issues

Appendix I: Objectives, Scope, and Methodology

We were asked to review whether funds from Title II, Part A (Title II-A) of the Elementary and Secondary Education Act of 1965, as amended (ESEA), are being used in a manner likely to raise student achievement. We examined (1) the elements of professional development that research finds to be effective, (2) the elements of professional development that teachers find most useful, and (3) the experiences of selected states and districts using Title II-A to support effective instruction.

Background

Office of Elementary and Secondary Education Report on State and District Uses of Title II-A Funds

We reviewed a publicly available report from the Office of Elementary and Secondary Education (OESE) on surveys of how states and districts used Title II-A funds in school year 2023–24.[1] We used these data to describe how states and districts used Title II-A funds to support effective instruction.

The U.S. Department of Education's state survey received responses from and therefore generalizes to all states, the District of Columbia, and the Commonwealth of Puerto Rico. The district survey is based on a probability sample that used the Common Core of Data as a sampling frame from which to sample districts. Any newly formed districts between the year of the Common Core of Data sampling frame and the survey year of 2023–24 would not be in the frame or covered by the sample. As a result, estimates based on this survey may not represent newly formed districts. Additionally, there is nonresponse error by state and by district type (traditional or charter, where charters have lower response rates). Nonresponse adjustments were applied in an attempt to remove any bias due to nonresponse error, but adjustments did not include state or district type. As a result, the district survey results might generalize at the national level for existing, traditional districts. However, these district survey results might be biased for charter districts and for newly formed districts.

We assessed the reliability of OESE's survey data by reviewing related documentation and interviewing relevant officials. We found the data to be sufficiently reliable for the purposes of reporting on how states and districts used Title II-A funds to support effective instruction.

Objective 1: Data Sources and Methodology

Literature Review

We conducted a comprehensive literature search for meta-analyses that examined the relationship between elements of teacher professional development and the estimated treatment effect of teacher professional

[1]U.S. Department of Education, Office of Elementary and Secondary Education, *State and District Use of Title II, Part A Funds in 2023–24* (Jan. 2025).

development on student test scores.[2] Five meta-analyses met our methodological standards; focused primarily on K-12 education or teachers in the U.S; reported on student test scores; were published in or after 2015; and included studies that used experimental or quasi-experimental methods. These five meta-analyses estimated the average effect of teacher professional development overall on student test scores, as well as the associations between individual elements of teacher professional development and estimated effects on student test scores. Each individual meta-analysis included between 29 and 128 individual studies.

Search process. In February and March 2025, we conducted a comprehensive search of databases, such as Scopus, EBSCOhost, ProQuest, and Education's Education Resources Information Center, to identify relevant systematic reviews and meta-analyses that were published in peer-reviewed journals in the last 11 years (2015–2025), including both U.S. and international publications.[3] We focused on systematic reviews and meta-analyses because they provide a broad overview of individual studies on the estimated effects of teacher professional development. The search terms we used included variations of "professional development" in combination with variations of "teacher" and variations of "systematic review" and "meta-analysis."

Initial screening and preliminary article selection. Using a standardized process, one analyst reviewed the abstracts of 258 systematic reviews and excluded studies that were not meta-analyses, resulting in 41 meta-analyses. Another analyst reviewed the abstracts to confirm the decision to include meta-analyses and exclude other types of studies. Two analysts then individually reviewed the abstracts of the 41 meta-analyses and reached agreement on which reviews to exclude because they were out of scope. The preliminary article selection resulted in nine meta-analyses.

Full methodological review. Two specialists reviewed the methodological quality of the nine meta-analyses to determine whether they met our methodological standards. We examined the meta-analyses on a variety of characteristics to determine whether they followed best practices for conducting these reviews. Additionally, we assessed whether the meta-analyses were sufficiently reliable for the purposes of our reporting objectives, including whether the findings and conclusions were adequately supported. As a result of this process, we excluded four meta-analyses that did not meet our criteria for methodological quality, leaving five meta-analyses remaining. We excluded one additional study because it duplicated results from another meta-analysis in our selection, resulting in four meta-analyses that met our criteria and methodological standards. One of these studies was not published in a peer-reviewed journal. Although we generally limited our literature search to articles published in peer-reviewed journals, we reviewed the study and determined that it otherwise met our inclusion criteria and standards for methodological quality.[4]

[2]Meta-analysis is a statistical method for combining the results of multiple individual studies. We focused our review on how teacher professional development improves student test scores because ESEA focuses on improving student outcomes in its definition of evidence-based, and because all five meta-analyses we reviewed measured student outcomes using test scores.

[3]A systematic review attempts to answer a specific research question by identifying, appraising, and synthesizing all the empirical evidence—such as published and unpublished studies by other researchers—that meets pre-specified eligibility criteria. Researchers conducting these reviews use explicit, systematic methods that aim to minimize bias and produce more reliable findings than individual studies.

[4]Sam Sims, et al., "What Are the Characteristics of Effective Teacher Professional Development? A Systematic Review and Meta-Analysis," Education Endowment Foundation (2021), ERIC No. ED615914.

After the initial search process, screening, and selection was completed, we added one meta-analysis that was published after we had completed our selection, resulting in five meta-analyses in our final selection.[5] We determined the meta-analysis met our inclusion criteria and standards for methodological quality.

One meta-analysis published combined estimates of both teacher professional development and curriculum programs.[6] We followed up with the authors of this study, and they provided us with estimates that isolated the teacher professional development programs in their meta-analysis.

For the citations of the five selected meta-analyses as well as information on their characteristics and results, see appendixes II and III. Any relationship the meta-analyses measured between elements of teacher professional development and the estimated effect of teacher professional development on student test scores is correlational, rather than causal, because the elements of teacher professional development were not varied randomly in the underlying studies. We did not review the underlying studies included in each meta-analysis.

Studies of Randomized Controlled Trials

We also selected five studies of randomized controlled trials from Education's Institute of Education Science's Resource Library based on their relevance to our research objectives, the outcomes they measured (student test scores), the populations they studied (K-12 teachers), and the experimental designs of the studies. Two specialists independently reviewed the methodological quality of the five studies of randomized controlled trials using a standardized review process to determine whether they met our methodological standards. We examined the studies on a variety of characteristics to determine whether they followed best practices for randomized controlled trials. Additionally, we assessed whether the studies were sufficiently reliable for the purposes of our reporting objectives, including whether the findings and conclusions were adequately supported. As a result of this process, we determined that all five studies were appropriate for inclusion.

[5]Adrie J. Visscher, Natasha Dmoshinskaia, Marta Pellegrini, and Anny Rey-Naizaque, "(When) Do Teacher Professional Development Interventions Improve Student Achievement? A Meta-Analysis of 128 High-Quality Studies," *Educational Research Review*, vol. 49 (2025).

[6]Kathleen Lynch, Heather C. Hill, Kathryn Gonzalez, and Cynthia Pollard, "Strengthening the Research Base That Informs STEM Instructional Improvement Efforts: A Meta-Analysis," *Educational Evaluation and Policy Analysis*, vol. 41, no. 3 (2019).

Objective 2: Data Sources and Methodology

Review of RAND Reports on American Instructional Resources Survey

We obtained publicly available reports on RAND's American Instructional Resources Survey American Teacher Panel, a nationally representative survey of K-12 public school teachers, for school years 2022–23 and 2023–24, the most recent data available at the time of our data collection.[7] Not all survey questions were included in each of the two surveys, so we used the most recent available data from the two reports for our analyses. We used these data to report on the elements of teacher professional development that surveyed teachers found most useful.

Although the overall response rate for the survey is around 15 percent, based on RAND's analysis of weighted teacher demographics and school characteristics, nonresponse-adjusted weighted characteristics do not significantly differ from the population values. Therefore, based on these characteristics, there is no evidence of nonresponse bias. Additionally, according to RAND, results are nationally representative of teachers generally, but may not represent new schools, new teachers, or experienced teachers who are new to a district.

We assessed the reliability of RAND data by reviewing related documentation and interviewing relevant officials. We found the data to be sufficiently reliable for the purposes of reporting on the elements of teacher professional development that teachers found most useful.

Teacher Questionnaire

We developed and disseminated an original teacher questionnaire to understand the professional development elements that teachers find useful. We sent the questionnaire to 5,000 teachers randomly selected from a nongeneralizable national sample of public school teachers from grades one through 12, and 125 teachers responded to at least one question. Two analysts separately reviewed the open-ended questionnaire responses, identified themes, and reconciled discrepancies until a consensus was reached. Where the two analysts did not reach a consensus, a third reviewer decided on the appropriate theme. We report on the themes that were most common across all questions.

Objective 3: Data Sources and Methodology

State Performance Reports from the Office of Elementary and Secondary Education

We reviewed Education's consolidated performance review reports of 18 states from fiscal years 2019–2024 to identify common issues that states encountered in administering Title II-A funds to improve instruction.

[7]Sy Doan, Joshua Eagan, David Grant, and Julia H. Kaufman, *American Instructional Resources Surveys: 2023 Technical Documentation and Survey Results* (Santa Monica, CA: RAND Corporation, 2023); Sy Doan, Joshua Eagan, David Grant, and Julia H. Kaufman, *American Instructional Resources Surveys: 2024 Technical Documentation and Survey Results* (Santa Monica, CA: RAND Corporation, 2024).

Interviews with State and District Officials

To understand how states and districts used Title II-A funds to improve instruction, we interviewed officials from state educational agencies in New Mexico, Pennsylvania, and Tennessee and officials from three school districts within each selected state. We selected states to include those that Education had recently monitored, that represented a range of Title II-A funding levels, and that represented differing geographic Census regions (West, South, Midwest, Northeast). Within each state, we randomly selected three districts with varying levels of urbanicity. We also reviewed ESEA plans from each of the three selected states.

To address all objectives, we interviewed Education officials about their roles and activities in administering Title II-A, and reviewed relevant federal laws and guidance on Title II-A.

We conducted this performance audit from October 2024 through March 2026 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Characteristics of Selected Meta-Analyses

Table 2 includes the characteristics of the studies reviewed by the five meta-analyses we selected.

Table 2: Characteristics of Selected Meta-Analyses

Citation	Number of studies included	Research designs	Subject matter	Locations	Grade levels
Matthew Kraft, David Blazar, and Dylan Hogan, "The Effect of Teacher Coaching on Instruction and Achievement: A Meta-Analysis of the Causal Evidence," Review of Educational Research, vol. 88, no. 4 (2018).	60 studies	56 randomized controlled trials (RCT) 4 quasi-experimental	35 reading 20 general practices 3 science 2 math	55 U.S. 3 Canada 2 Chile	Pre-Kindergarten through high school
Kathleen Lynch, Heather C. Hill, Kathryn Gonzalez, and Cynthia Pollard, "Strengthening the Research Base That Informs STEM Instructional Improvement Efforts: A Meta-Analysis," Educational Evaluation and Policy Analysis, vol. 41, no. 3 (2019).	95 studies	86 RCTs 9 quasi-experimental	Science, technology, engineering, and mathematics (STEM)	89 U.S. 6 other	Pre-Kindergarten through high school
Marianne Rice, Kacee Lambright, and Kausalai (Kay) Wijekumar, "Professional Development in Reading Comprehension: A Meta-Analysis of the Effects on Teachers and Students," Reading Research Quarterly, vol. 59, no. 3 (2024).	29 studies	24 RCTs 5 quasi-experimental	Reading comprehension	25 U.S. 2 Netherlands 1 China 1 Nigeria	Elementary through high school
Sam Sims et al., "What Are the Characteristics of Effective Teacher Professional Development? A Systematic Review and Meta-Analysis," Education Endowment Foundation (2021), ERIC No. ED615914.	104 studies	104 RCTs	52 literacy / first language 30 math 12 science 6 other subjects 17 cross-curricular	73 U.S. 25 United Kingdom 2 Australia 2 Netherlands 1 Canada 1 Italy	Pre-Kindergarten through high school
Adrie J. Visscher, Natasha Dmoshinskaia, Marta Pellegrini, and Anny Rey-Naizaque, "(When) Do Teacher Professional Development Interventions Improve Student Achievement? A Meta-Analysis of 128 High-Quality Studies," Educational Research Review, vol. 49 (2025).	128 studies	138 RCTs 5 quasi-experimental	99 STEM 234 reading 23 other subjects	106 U.S. 30 United Kingdom 7 other	Pre-Kindergarten through high school

Source: GAO analysis of selected meta-analyses. I GAO-26-107874

Note: The number of studies does not always equal the number of research designs, subject matters, or locations because categories of these characteristics were not mutually exclusive or because the characteristics were counted at the level of the intervention rather than the level of the study.

Appendix III: Associations Between Elements of Teacher Professional Development and Effect Sizes on Student Test Scores in Five Meta-Analyses

Table 3: Associations Between Elements of Teacher Professional Development and Effect Sizes on Student Test Scores

Category	Element	Positive association with effect sizes on student test scores	No statistically significant association or negative association with effect sizes on student test scores
Elements studied by 3 or more selected meta-analyses	Alignment with curriculum	Professional development focused on how to use curriculum materials[a]	• Coaching paired with instructional content, such as curriculum materials[b] • Professional development that had teachers develop curriculum materials or lesson plans[a] • Professional development paired with teaching materials, relative to professional development focused on general strategies[c] • Professional development to support the implementation of a curriculum[d]
Elements studied by 3 or more selected meta-analyses	Coaching	Coaching (defined as all in-service professional development programs where coaches or peers observe teachers' instruction and provide feedback to help them improve)[b]	• Expert coaching (defined as coaching or mentoring from experts who observe instruction and provide feedback)[a] • Coaching (defined as a coach teaching a model lesson in a teacher's class or observing a teacher giving a lesson and providing feedback)[c]
Elements studied by 3 or more selected meta-analyses	Collaboration	• Pairing coaching with group training, relative to coaching without group training[b] • Professional development programs that had teachers participate alongside other teachers in their school[a] • Professional development programs with implementation meetings that allow teachers to convene briefly with other activity participants[a]	Teacher professional development that included small-group instruction, relative to professional development that was only provided to the whole group of educators[c]
Elements studied by 3 or more selected meta-analyses	Duration	na	Hours of professional development provided[a,b,c,d]
Elements studied by 3 or more selected meta-analyses	Focus on subject matter	Professional development focused on improving teachers' pedagogical content knowledge[a]	• Coaching focused on content-specific programs, relative to coaching focused on general pedagogical practices[b] • Professional development focused on pedagogical content knowledge[d]

Appendix III: Associations Between Elements of Teacher Professional Development and Effect Sizes on Student Test Scores in Five Meta-Analyses

Category	Element	Positive association with effect sizes on student test scores	No statistically significant association or negative association with effect sizes on student test scores
Elements studied by 3 or more selected meta-analyses	Provider type	na	• Whether professional development was provided by the program's developers and/or the study's authors[a] • Whether professional development was provided by school district staff and/or researchers[c] • Whether professional development was provided by independent facilitators or researchers[d]
Elements studied by 2 or more selected meta-analyses	Number of learning principles	• Professional development that incorporated more learning mechanisms[e] • Professional development that incorporated 3 of 4 learning principles[d]	na
Elements studied by 2 or more selected meta-analyses	Virtual learning	na	• Coaching provided through virtual delivery, relative to in-person delivery[b] • Professional development with any online component[a]

+ positive association
- negative association
o no association

Source: GAO analysis of selected meta-analyses. | GAO-26-107874

Notes: For this analysis, GAO defined "alignment with curriculum" as support for teachers' implementation and use of instructional materials and coordination of professional development with curriculum content and instructional strategies; "coaching" as opportunities teachers have to be observed by experts and provided feedback; "collaboration" as opportunities for teachers to work together in groups or teams; "duration" as the number of hours of professional development provided to teachers; "focus on subject matter" as relevance to academic content and how students learn that content; "number of learning principles" as the number of principles that the professional development program uses to help teachers learn or change their practice; "provider type" as the category of facilitator who provided the professional development to teachers (e.g., researchers, district staff, or independent facilitators); and "virtual learning" as whether professional development was delivered in-person or virtually.

[a]Kathleen Lynch, Heather C. Hill, Kathryn Gonzalez, and Cynthia Pollard, "Strengthening the Research Base That Informs STEM Instructional Improvement Efforts: A Meta-Analysis," Educational Evaluation and Policy Analysis, vol. 41, no. 3 (2019).

[b]Matthew Kraft, David Blazar, and Dylan Hogan, "The Effect of Teacher Coaching on Instruction and Achievement: A Meta-Analysis of the Causal Evidence," Review of Educational Research, vol. 88, no. 4 (2018).

[c]Marianne Rice, Kacee Lambright, and Kausalai (Kay) Wijekumar, "Professional Development in Reading Comprehension: A Meta-Analysis of the Effects on Teachers and Students," Reading Research Quarterly, vol. 59, no. 3 (2024).

[d]This meta-analysis found that the estimated effect size increased as the number of the following learning principles increased: teacher coaching, cooperation, performance standards, and self-regulation. However, only professional development with three learning principles had an effect size that was significantly different than professional development that included no learning principles. Adrie J. Visscher, Natasha Dmoshinskaia, Marta Pellegrini, and Anny Rey-Naizaque, "(When) Do Teacher Professional Development Interventions Improve Student Achievement? A Meta-Analysis of 128 High-Quality Studies," Educational Research Review, vol. 49 (2025).

[e]This meta-analysis found that teacher professional development programs that included more of the following 14 learning mechanisms had higher effect sizes: action planning, context-specific repetition, credible source, feedback, goal setting, instruction, managing cognitive load, modeling, practical social support, praise/reinforce, prompts/clues, rehearsal, revisit prior learning, and self-monitoring. Sam Sims, et al., "What are the Characteristics of Effective Teacher Professional Development? A Systematic Review and Meta-Analysis," Education Endowment Foundation (2021), ERIC No. ED615914.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Jacqueline M. Nowicki, NowickiJ@gao.gov

Staff Acknowledgments

In addition to the contact named above, Scott Spicer (Assistant Director), Maria Gadel (Analyst in Charge), Liz Spurgeon (Analyst in Charge), Walker Adams, and Matthew Naven made key contributions to this report. Also contributing to this report were James Bennett, Elizabeth Calderon, Craig Comen, Kristy Kennedy, Rebecca Sero, Lindsay Shapray, Margaret Sommerfeld, Sonya Vartivarian, and Erin Villareal.

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Website: https://www.gao.gov/about/what-gao-does/fraudnet

Automated answering system: (800) 424-5454

Media Relations

Sarah Kaczmarek, Managing Director, Media@gao.gov

Congressional Relations

David A. Powner, Acting Managing Director, CongRel@gao.gov

General Inquiries

https://www.gao.gov/about/contact-us