

# Evaluation of Departmentalized Instruction in Elementary Schools: Exploring Implementation Experiences

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## Appendix

**July 2024**

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## INTRODUCTION

This appendix is a companion to the report *Evaluation of Departmentalized Instruction in Elementary Schools: Exploring Implementation Experiences*. The appendix provides additional information about the study, which sought to explore schools' implementation of departmentalized instruction, teachers' experiences with the strategy, and how the strategy was related to key outcomes. This additional information includes details on departmentalized instruction (Section A), study design and execution (Section B), key findings presented in the report (Section C), and additional findings that are not included in the report but provide important context (Section D).

## SECTION A. ADDITIONAL DETAILS ON DEPARTMENTALIZED INSTRUCTION

Departmentalized instruction is a potential strategy for improving student achievement and teacher retention in upper elementary grades by assigning teachers to teach specific subjects to multiple classes of students, instead of teaching all subjects to a single class. This section describes prior research on departmentalized instruction, the study's approach to departmentalized instruction, and the support the study provided to schools that chose to departmentalize. This information can provide important context for the study's findings on schools' and teachers' experiences implementing departmentalized instruction.

### A.1 Prior research

Despite the growing prevalence of departmentalized instruction in elementary schools, at the time this study began, evidence on its implementation and outcomes was limited. Three studies had shown that many teachers are, to some degree, more effective at teaching particular subjects, suggesting that assigning teachers to teach those subjects could raise student achievement.<sup>1</sup> Six other studies that directly examined the relationship between departmentalized instruction and student achievement found either no relationship or a negative relationship.<sup>2</sup> Only one study examined the relationship between departmentalized instruction and teacher retention; that study found a positive relationship.<sup>3</sup> However, each of these studies had shortcomings that prevented definitive judgments about departmentalized instruction as a promising approach. Among the concerns was a lack of clarity about whether participating schools had the information they needed to carry out departmentalized instruction well (or had actually carried it out well).

This study aimed to expand the research by providing light-touch support to help schools implement departmentalized instruction well, describing their implementation experiences, and measuring the relationship between departmentalized instruction and both student achievement and teacher retention.

### A.2 The study's approach to departmentalized instruction, including support for implementation

How schools departmentalize instruction can influence the success of the approach. Therefore, the study set some parameters for schools that might want to participate in the research:

- ***Choosing whether to departmentalize.*** The study focused on schools that had not already been using departmentalized instruction and asked them to choose whether to switch to departmentalized instruction in 4th and 5th grades in the 2019-2020 and 2020-2021 school years or maintain self-contained instruction for those two years. This allowed the study to learn about schools' experiences switching to departmentalized instruction and to compare these experiences to those of a set of schools in the same districts that chose to maintain self-contained instruction.
- ***Deciding how to assign teachers to subjects.*** Generally, when schools departmentalize, they can assign teachers to teach any combination of up to three of four core subjects: math, English language arts, social studies, or science. The study gave schools flexibility to departmentalize in the way that best met their needs. However, the study required that schools assign different teachers to teach math and English language arts so that it could examine the relationship between departmentalized instruction and student achievement in these subjects.

- **Implementing departmentalized instruction with light-touch support.** The study provided light-touch implementation support to schools that chose to departmentalize to help them do so successfully and navigate any challenges that arose. The support included three key activities: a design meeting to help the schools make key decisions on their approach to departmentalizing instruction, a webinar on effective use of collaborative planning time, and supplemental coaching calls (Exhibit A.1).

### Exhibit A.1. Implementation Support Activities

Type of support	Format	Timing	Length	Topics discussed
Design meeting	In person	Spring 2019	Three to four hours	Choosing a staffing model, developing a schoolwide schedule, and strategically assigning teachers to subjects
Collaborative planning time webinar	Webinar	Summer 2019	One hour	Strategies to help teachers use their collaborative planning time effectively
Supplemental coaching calls	Phone	By request Summer 2019- Spring 2021	Varied	Approaches to address specific challenges the school encountered

Source: Implementation support materials.

#### A.2.1 Design meetings

The design meetings, held in person in each study district in spring 2019, focused on helping school leaders work through three key steps needed to departmentalize instruction:

- **Step 1: Select a staffing model that determines how many subjects each teacher will teach and how many teachers each student will have.**
- **Step 2: Develop a schoolwide schedule, which shows the schedule for all classes and teachers, that addresses district and school requirements and eases students’ transitions between teachers.**
- **Step 3: Assign teachers to subjects that reflect their relative strengths and preferences.**

The study worked with Public Impact, an education consulting firm, to plan and carry out the implementation support. Public Impact recommended departmentalizing schools focus on these three steps based on their experience working with other schools transitioning to departmentalized instruction. The meetings lasted three to four hours, and all meetings covered the planned content.

The design meetings included principals and other school staff whom the principals chose to involve in planning the switch to departmentalized instruction. Almost all principals who chose to departmentalize instruction attended the design meeting in their district (95 percent). About half of the principals (47 percent) brought staff such as teachers, instructional specialists, instructional coaches, or assistant principals with them. At least one district staff person attended each meeting. District staff who attended included assistant superintendents, directors of elementary education, directors of curriculum and assessment, directors of effectiveness, and data analysts. The high attendance rates suggest that most schools received the intended support to help them departmentalize instruction well.

As part of the design meetings, the implementation support team gave attendees a packet of resources that covered the three key steps described above and helped them use the resources to design their approach to

departmentalize. The packet included worksheets to help school leaders select a staffing model. The packet also included scheduling examples for grades with even and odd numbers of teachers and other special situations. Finally, it included instructions and worksheets for the schools to use when strategically assigning teachers to subjects.

### Select a staffing model

At the design meeting, principals first considered what departmentalized staffing model they would use. The implementation support team presented several possible staffing models (Exhibit A.2). The team also guided schools in considering key factors when selecting a model, including the number of teachers departmentalizing (Exhibit A.3). After principals determined which staffing models could work for their situation, they had to consider whether they wanted to implement a model with more or less specialization. In models with more specialization, teachers teach fewer subjects and students have more teachers. In models with less specialization, teachers teach more subjects and students have fewer teachers. The implementation support team led a discussion of the potential trade-offs between models, based on Public Impact’s experiences collaborating with other schools that had implemented departmentalized instruction (Exhibit A.4).

### Exhibit A.2. Staffing Models

Name of staffing model (ordered from lowest to highest level of specialization <sup>a</sup> )	Description	Example
Homeroom	<ul style="list-style-type: none"> <li>Each teacher teaches three of the four core subjects</li> <li>Each student has two core subject teachers</li> </ul>	<p><b>Grade with two classes</b></p> <ul style="list-style-type: none"> <li>Teacher 1: teaches English language arts, science, and social studies to homeroom students; teaches English language arts to the other class of students</li> <li>Teacher 2: teaches math, science, and social studies to homeroom students; teaches math to the other class of students</li> </ul>
Paired Subjects	<ul style="list-style-type: none"> <li>Each teacher teaches two of the four core subjects</li> <li>Each student has two core subject teachers</li> </ul>	<p><b>Grade with two classes</b></p> <ul style="list-style-type: none"> <li>Teacher 1: teaches English language arts and social studies to two classes of students</li> <li>Teacher 2: teaches math and science to two classes of students</li> </ul>
Math or English Language Arts Focus	<ul style="list-style-type: none"> <li>Each teacher teaches one or two of the four core subjects, with specific teachers teaching math or English language arts (but not both); other teachers teach both science and social studies</li> <li>Each student has three core subject teachers</li> </ul>	<p><b>Grade with four classes</b></p> <ul style="list-style-type: none"> <li>Teacher 1: teaches English language arts to four classes of students</li> <li>Teacher 2: teaches math to four classes of students</li> <li>Teacher 3: teaches science and social studies to two classes of students</li> <li>Teacher 4: teaches science and social studies to two classes of students</li> </ul>

Name of staffing model (ordered from lowest to highest level of specialization <sup>a</sup> )	Description	Example
Full Specialization	<ul style="list-style-type: none"> <li>Each teacher teaches one of the four core subjects</li> <li>Each student has four core subject teachers</li> </ul>	<b>Grade with four classes</b> <ul style="list-style-type: none"> <li>Teacher 1: teaches English language arts to four classes of students</li> <li>Teacher 2: teaches math to four classes of students</li> <li>Teacher 3: teaches science to four classes of students</li> <li>Teacher 4: teaches social studies to four classes of students</li> </ul>

Source: Implementation support materials from the spring 2019 design meetings.

<sup>a</sup> In staffing models with a higher level of specialization, each student has more teachers and each teacher teaches fewer subjects.

### Exhibit A.3. Staffing Models, by Number of Teachers Departmentalizing

Description of staffing model	Departmentalized staffing model (from left to right, ordered from lowest to highest levels of specialization <sup>a</sup> )			
	<u>Homeroom</u>	<u>Paired Subjects</u>	<u>Math or English Language Arts Focus</u>	<u>Full Specialization</u>
	Each teacher teaches three of the four core subjects	Each teacher teaches two of the four core subjects	Specific teachers teach math or English language arts (but not both); other teachers teach both science and social studies	Each teacher specializes in one core subject
<b>Even numbers of teachers in a grade</b>				
Two teachers	X	X		
Four teachers	X	X	X	X
<b>Odd numbers of teachers in a grade</b>				
Three teachers	X		X	
Five teachers	X	X <sup>b</sup>	X	
<b>Departmentalizing across grades</b>				
Six teachers, departmentalizing across two grades (three student sections per grade)	X	X	X	
<b>Other scenarios</b>				
Four teachers in a grade, with a double block of English language arts			X	

Source: Implementation support materials from the spring 2019 design meetings.

<sup>a</sup> In staffing models with a higher level of specialization, each student has more teachers and each teacher teaches fewer subjects.

<sup>b</sup> Schools must combine this model with the Homeroom model or the Math or ELA Focus model if five teachers are departmentalizing.

**Exhibit A.4. Potential Benefits and Challenges of Greater Specialization**

Feature associated with greater specialization	Potential benefits of greater specialization	Potential challenges of greater specialization
More teachers per student	<ul style="list-style-type: none"> <li>• Students can build strong relationships with more core subject teachers.</li> <li>• Students might learn organizational skills and how to adapt to different expectations and teaching styles.</li> <li>• Students might be better prepared for departmentalized classes in middle school.</li> <li>• Students might be more productive due to changing environments throughout the day.</li> </ul>	<ul style="list-style-type: none"> <li>• Students might have difficulty building strong relationships with their core subject teachers if they split their time across a larger number of teachers.</li> <li>• Students might have difficulty organizing their materials and adapting to the expectations and teaching styles of more teachers.</li> <li>• Students might not have the maturity and developmental skills needed to transition across more teachers.</li> <li>• Students might lose instructional time when they transition between teachers.</li> </ul>
Fewer subjects per teacher	<ul style="list-style-type: none"> <li>• More students can receive instruction from the most effective teachers in each subject. This has the potential to increase students’ achievement and equitable access to effective teaching.</li> <li>• Teachers can be assigned to teach the subjects they prefer, feel most confident in, or have the most experience teaching.</li> <li>• Teachers can focus their teaching, planning time, and professional development activities on fewer subjects, improving their content knowledge and instruction in those subjects.</li> <li>• Teachers can prepare for fewer subjects, potentially reducing their workload.</li> </ul>	<ul style="list-style-type: none"> <li>• Teachers might have less scheduling flexibility. This could make it more difficult to schedule special education or English learner services or subjects with different instructional time requirements.</li> <li>• Teachers might have less flexibility to shift time across subjects.</li> <li>• Differences in workloads or stakes and incentives for each subject may lead to inequities across teachers.<sup>a</sup></li> <li>• Teachers will have to coordinate with more teachers to integrate curricula across subjects.</li> <li>• Because teachers teach more students, it may be harder for them to build strong relationships with individual students or their parents. This could result in these teachers meeting less outside of class with students and parents, adversely affecting the amount of extra help they provide students, their understanding of students’ needs, and their ability to adapt instruction to those needs.</li> </ul>

Source: Implementation support materials from the spring 2019 design meetings.

<sup>a</sup> For example, English language arts teachers might spend more time grading homework than other teachers, and teachers of tested subjects might face greater accountability and be eligible for greater financial incentives than teachers of untested subjects.

## Develop a schoolwide schedule

Next, principals focused on designing their schoolwide schedule—the schedule for all classes and teachers. During the design meeting, principals:

- Reviewed example schedules for different staffing models and considered which might be appropriate or adapted to meet their needs (see Exhibit A.5 for an example schedule for a Math or English Language Arts Focus staffing model).
- Identified requirements and priorities that the schedule should address, such as minimum instructional time required in specific subjects or a focus on improving math instruction.
- Used those requirements and priorities to determine instructional time in each subject.
- Used strategies to maximize instructional time during the day and minimize time spent in transitions, such as assigning teachers with common students to classrooms near each other.

### Exhibit A.5. Example Schedule Based on the Math or English Language Arts Focus Model with Three Teachers

Teacher (4th grade)	Homeroom 9:00–9:15	Block 1 9:15–10:50	Block 2 10:50–11:50 lunch and recess	Block 3 11:50–12:35 specials	Block 4 12:35–2:10	Block 5 2:20–3:55
Teacher 1	Section A Homeroom	Section A English language arts	Teacher planning		Section B English language arts	Section C English language arts
Teacher 2	Section B Homeroom	Section B Math	Teacher planning		Section C Math	Section A Math
Teacher 3	Section C Homeroom	Section C Science and social studies	Teacher planning		Section A Science and social studies	Section B Science and social studies

Source: Implementation support materials from the spring 2019 design meetings.

Notes: This example assumes that (1) the school day starts at 9 a.m. and ends at 3:55 p.m.; (2) all core subject teachers teach the same amount of time each day; (3) lunch, recess, and specials instruction (such as music and art) are in consecutive blocks to minimize transitions during core subject instruction; (4) students have the same schedule each day; and (5) the number of student sections is the same as the number of core subject teachers.

Sections A, B, and C are student sections that stay together throughout the course of the day.

## Strategically assign teachers to subjects

In the design meetings, principals also learned how to use teacher performance data to assign teachers to subjects in a way that might be most beneficial for student achievement. The packet of resources illustrated a step-by-step process for using teacher performance data to assign teachers to subjects. The implementation support team asked principals to bring measures of teachers’ performance to the design meetings. These performance measures could be based on student achievement growth, observations, or other factors. The team then showed principals how they could apply the process to the specific performance data they brought to the meeting.

The implementation support team suggested that principals complete the following steps:



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**Step 1: Determine how many teachers to assign to each combination of subjects.** The number of positions for each combination of subjects depended on the staffing model selected and the number of teachers in the grade. For example, the four-teacher Paired Subjects model might have two teachers for English language arts and social studies and two teachers for math and science.

**Step 2: Summarize data on each teacher’s strengths and preferences in math and English language arts.** Doing so would make it easier to compare each teacher’s performance in and preferences for teaching math and English language arts.

**Step 3: Rank teachers according to their strengths, separately in math and English language arts.** When assessing teachers’ strengths, the implementation support team encouraged principals to place more weight on measures that were objectively defined and comparable across teachers, such as measures of student achievement growth. However, principals could consider other data if they captured important information about teachers’ strengths or if measures of student achievement growth were not available. If principals did not have access to objective measures of student achievement or growth, principals ranked teachers as best they could with the available information.

**Step 4: Compare each teacher’s ranking in math and English language arts to determine which teachers have a relative strength in each subject.** For example, a principal would identify a teacher as having a relative strength in English language arts if they had a higher ranking in English language arts than math, and vice versa.

**Step 5: Assign teachers to subjects based on their relative strengths while accounting for other factors.** These factors included the number of teachers needed in each subject, teachers’ preferences, their school’s need for improvement in math or English language arts, or teachers’ strengths and weaknesses in other subjects (such as science and social studies) that were not the focus of the study. These other factors could help principals finalize their decisions in cases where teachers had the same or very similar relative strengths based on measures of student achievement growth in math and English language arts.

**Step 6: Determine which teachers of different subjects would share students.** For staffing models in which multiple groups of teachers share students, the principal needed to determine which teachers would work together to teach each group of students. For example, the four-teacher Paired Subjects model creates two pairs of teachers. One teacher in each pair might teach math and science and the other might teach English language arts and social studies to the same students. For these types of staffing models, principals considered how to pair teachers. For example, they could pair those with a track record of working well together or who balanced each other in terms of other relevant experience and skills, such as communicating with families.

**Step 7: If assigning teachers to subjects in a grade with teacher vacancies, choose which teaching positions to fill first and which to assign to future new hires.** For example, if a principal had retained or hired only two of the four teachers needed for the coming school year, the principal decided which two teaching positions to fill first. The principal then used the process described above to assign the two available teachers to those two positions. With each additional hire, the principal would then use their best judgment to decide which of the remaining positions the new hire would fill.

## **A.2.2 Collaborative planning time webinars**

The implementation support team conducted a one-hour webinar in each district before the start of the 2019-2020 school year. These webinars aimed to help school leaders discuss how to effectively use group planning

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time to support coordination among teachers who teach the same students. Like the design meetings, the webinars included principals and other key staff from study schools switching to departmentalized instruction.

The webinars explored four topics on how to effectively use collaborative planning time for departmentalized teams:

1. Establish common expectations and procedures
2. Share data to provide better student support
3. Integrate curricula across subjects
4. Coordinate parent communication, homework, and test schedules

The implementation support team also shared three resources to guide schools in designing collaborative planning time and support departmentalized teachers in working as a team:

1. A planning worksheet in which principals could consider and document decisions and practices at their school related to each of the four topics from the webinar
2. An example of and template for a collaborative team meeting agenda
3. A planning tool for teachers to plan common classroom rules and procedures

Almost all principals (more than 93 percent) attended the webinars or watched a recording if they missed it. About half of the principals (47 percent) brought staff such as teachers, instructional specialists, or assistant principals with them. At least one district staff person attended in more than 75 percent of the districts. District staff who attended included assistant superintendents, directors of elementary education, directors of curriculum and assessment, directors of effectiveness, and data analysts. All webinars covered the planned content.

### **A.2.3 Supplemental coaching calls**

During principal interviews conducted once each semester (see next section), interviewers asked principals of departmentalized schools whether they could use additional support to address challenges the school was experiencing related to departmentalized instruction. If the principal said yes, the implementation support team scheduled a one-on-one coaching call with the principal.

Of the 43 study schools that departmentalized instruction, 12 schools in eight districts requested one-on-one coaching calls between summer 2019 and spring 2020 (Year 1), and five schools in three districts requested calls between summer 2020 and spring 2021 (Year 2). Of the 17 schools that indicated they would like additional support, the implementation support team conducted one-on-one coaching calls with 11 of them (seven in Year 1 and four in Year 2). The most common reasons principals did not participate in the calls were that (1) they felt they were able to address concerns internally and no longer needed additional support, or (2) they did not respond to requests to schedule the calls.

The coaching calls in Year 1 focused on planning for and managing departmentalized instruction. Principals and teachers sought advice on one or more of the following topics:

- Adjusting student schedules
- Building the schoolwide schedule to maximize instructional time

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- Adjusting teacher staffing to allow for departmentalization
  - Deciding which teachers should teach each subject
  - Aligning teacher schedules to allow for teacher collaboration
  - Continuing departmentalization during principal turnover

The coaching calls in Year 2 focused on maintaining departmentalized instruction during the COVID-19 pandemic. Principals and teachers sought advice on one or more of the following topics:

- How to departmentalize students effectively during distance instruction
- How to effectively departmentalize during hybrid instruction, when some students were attending school in person and others were attending from a distance
- Addressing teacher concerns about having contact with large numbers of students during in-person instruction

## SECTION B. STUDY DESIGN, ANALYSIS SAMPLES, DATA COLLECTION, MEASURES, AND ANALYTIC METHODS

This section provides more details on the study’s design, including the research questions, selection and recruitment of districts and schools, the characteristics of the study schools, and changes in the sample of districts and schools over the course of the study. It also provides information on the analysis samples, data sources, measures, and analytic methods the study used to address each research question. This information can help other researchers build on or replicate the study in other settings.

### B.1 Study design and research questions

The study design aimed to answer the following research questions:

- 1. How did schools implement the three key steps of departmentalized instruction, including selecting a staffing model, developing a schoolwide schedule, and assigning teachers to subjects?** Addressing this question can shed light on potential challenges schools might encounter when implementing departmentalized instruction that could limit its effectiveness.
- 2. Were teachers’ experiences implementing departmentalized instruction consistent with the potential benefits and challenges?** Addressing this question can shed light on potential benefits and challenges for teachers implementing departmentalized instruction that could influence the strategy’s effect on student achievement and teacher retention.
- 3. What is the relationship between schools’ implementation of departmentalized instruction and key outcomes, including student achievement and teacher retention?** Addressing this question can provide evidence on whether departmentalized instruction is a promising strategy for schools seeking to improve these outcomes.

To answer these questions, the study recruited elementary schools that were not already using departmentalized instruction in the 2018-2019 school year and asked them to choose whether to implement departmentalized instruction for the 2019-2020 and 2020-2021 school years or continue to use the traditional self-contained instruction for those two years. It planned to compare the two sets of schools to learn about the relationship between departmentalized instruction and key outcomes across two years.

Over the course of the study, the study design changed due to challenges recruiting districts to participate. The study had originally planned to use an experimental design, in which schools would be randomly assigned—as if by lottery—to departmentalize instruction or maintain self-contained instruction. However, after one year of recruiting under this plan, too few schools were willing to participate in the random assignment study to allow the study to reliably examine the effects of departmentalized instruction. This led the study to shift to a quasi-experimental design that compared schools that chose to departmentalize to those that chose to maintain self-contained instruction for the 2019-2020 and 2020-2021 school years. Using this design, the study examined the relationship between departmentalized instruction and key outcomes—including 5th-grade math and English language arts achievement and teacher retention—at the end of the two-year period.

### B.2 Sample selection and recruitment

The study sought to include 100 elementary schools from about 12 districts. To be eligible, schools could not already be departmentalized in 4th or 5th grades during the 2018-2019 school year.<sup>4</sup> Schools that agreed to

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participate either chose to departmentalize instruction in the 2019–2020 and 2020–2021 school years or to maintain self-contained instruction for those two years. Ideally, schools that chose to departmentalize would do so in both 4th and 5th grades; however, schools could choose to departmentalize only one grade.

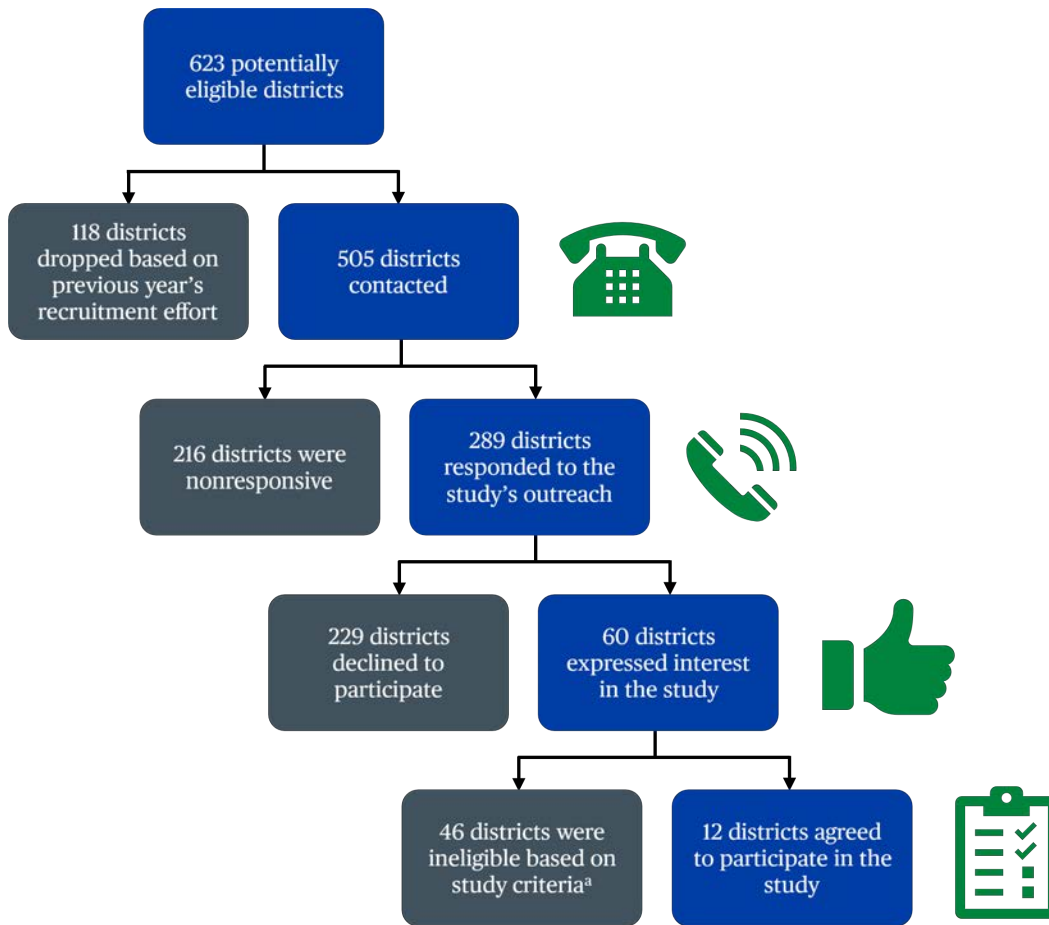
Recruitment efforts focused on districts with relatively large numbers of elementary schools because this was more cost-effective than contacting more districts with fewer elementary schools. The study used the U.S. Department of Education’s Common Core of Data to identify 623 districts that had at least 13 elementary schools.

Before beginning outreach, the study eliminated 118 of the 623 districts that seemed like unlikely candidates for the study based on information collected from recruiting for the random assignment study in the previous year. The study eliminated these 118 districts for three main reasons (1) the district had already departmentalized in 4th and 5th grades in most or all of its schools, (2) it firmly opposed departmentalized instruction, or (3) it did not wish to participate in any studies.

The study reached out to the remaining 505 districts to assess their interest in and suitability for the study (Exhibit B.1). For the 289 districts that responded to the study’s outreach, recruiters spoke with district and school leaders about the study’s purpose and activities. When districts expressed interest and willingness to participate, recruiters determined whether the district had at least four elementary schools willing to participate in the study that were not already departmentalized.

Ultimately, 12 districts agreed to participate in the study. Of the 12 districts, 11 initially agreed to participate for two years, and one agreed to participate only in the first year. However, due to the pandemic, one of the 11 districts dropped out of the second year of the study as well.

## Exhibit B.1. Results from District Recruitment Effort for the Quasi-Experimental Study



<sup>a</sup> To be eligible, districts needed to have at least four schools that were not already departmentalized in 4th and 5th grades (as of the 2018-2019 school year) and that were willing to participate in the study.

### B.3 Characteristics of the study sample

Because the districts and schools that participated in the study were not randomly selected but instead voluntarily chose to both participate and to departmentalize, the findings do not represent the experiences of all schools nationally or in other educational settings. Information about the characteristics of the study sample could be useful to those who wish to understand how similar the study sample is to other schools or samples used in other studies.

#### B.3.1 Comparison of study districts and schools to districts and schools nationally

Given the study's focus on recruiting districts with at least 13 schools serving 4th and 5th grades, study districts differed from typical districts nationwide (Exhibit B.2). For example, study districts on average had a higher percentage of Black students, were larger, and were more likely to be in urban areas and the South than public school districts nationally.

**Exhibit B.2. Pre-Study Characteristics of Study Districts and Public School Districts Nationally**

Characteristic (percentages unless otherwise noted)	Means		Difference		
	Study districts	All public school districts	Difference <sup>a</sup>	Standard error	<i>p</i> -value
<b>Student racial and ethnic distribution<sup>b</sup></b>					
Black, non-Hispanic	19	8	10*	5	0.03
Hispanic	28	16	12	6	0.06
White, non-Hispanic	44	69	-25*	8	<0.01
Other, non-Hispanic	9	9	1	4	0.82
<b>Other student characteristics</b>					
Students eligible for free or reduced- price lunch	63	48	14	7	0.06
English language learners	10	7	3	3	0.26
Students with Individualized Education Program	16	16	-1	3	0.85
<b>District size</b>					
Number of schools (average)	42	7	36*	6	<0.01
Number of students (average)	25,126	3,486	21,640*	4,077	<0.01
<b>District location</b>					
Urban	58	6	52*	7	<0.01
Suburban	33	23	10	12	0.42
Town	0	18	-18	11	0.10
Rural	8	52	-44*	14	<0.01
<b>Geographic region</b>					
Northeast	8	21	-13	12	0.28
Midwest	17	36	-20	14	0.16
South	50	23	27*	12	0.03
West	25	20	5	11	0.64
<b>Number of districts<sup>c</sup></b>	<b>11-12</b>	<b>10,376-13,664</b>			

Source: Common Core of Data from the 2018-2019 school year.

Notes: Exhibit excludes districts that contain only charter schools.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>c</sup> Number of districts is reported as a range because the number of districts with available data differed across the characteristics reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.



Across the 12 participating districts, the study included all 90 eligible schools that were willing to participate. Study schools had both similarities to and differences from all public elementary schools nationwide (Exhibit B.3). They were similar in student racial composition and school size. However, study schools had larger percentages of students eligible for free or reduced-price lunch. Study schools were also more likely to serve grades K-5 and less likely to have other grade-level configurations, such as K-6.

**Exhibit B.3. Pre-Study Characteristics of Study Schools and Public Elementary Schools Nationally**

Characteristic (percentages unless otherwise noted)	Means		Difference		
	Study schools	All public elementary schools	Difference <sup>a</sup>	Standard error	<i>p</i> -value
<b>Student racial and ethnic distribution<sup>b</sup></b>					
Black, non-Hispanic	19	15	4	2	0.06
Hispanic	23	26	-3	3	0.30
White, non-Hispanic	47	50	-3	3	0.42
Other, non-Hispanic	11	11	0	1	0.74
Students eligible for free or reduced- price lunch	62	56	6*	3	0.05
<b>Grade levels served<sup>c</sup></b>					
K-5	90	55	35*	5	<0.01
K-6	0	19	-19*	4	<0.01
K-8	10	11	-1	3	0.70
Other	0	14	-14*	4	<0.01
Number of students (average)	479	467	12	24	0.61
Student-teacher ratio (average)	15	16	-1	1	0.50
Schoolwide Title I status <sup>d</sup>	89	84	5	4	0.26
<b>Number of schools<sup>e</sup></b>	<b>66-90</b>	<b>35,853-44,892</b>			

Source: Common Core of Data from the 2018-2019 school year.

Notes: All student characteristics are based on percentages or counts at the school level.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>c</sup> Schools categorized as K-5, K-6, and K-8 may also include pre-K.

<sup>d</sup> Schoolwide Title I status refers to schools with student populations that are at least 40 percent low income and eligible for Title I funds. This means the schools are classified by state and federal regulations as high poverty and eligible for additional financial assistance.

<sup>e</sup> Number of schools is reported as a range because the number of schools with available data differs across the characteristics reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

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### **B.3.2 Comparison of schools that departmentalized to those that maintained self-contained instruction**

In addition to examining how study districts and schools compared to districts and schools nationally, the study conducted several comparisons of the two groups of study schools—those that departmentalized and those that maintained self-contained instruction. In particular, the study examined the factors schools considered when deciding whether to departmentalize; principals' beliefs about departmentalized instruction; and the characteristics of study schools, teachers, and students. This information is useful to readers interested in understanding the similarities and differences between the two study groups.

Schools that chose to departmentalize reported considering different factors when deciding whether to departmentalize than schools that chose to maintain self-contained instruction (Exhibit B.4). Principals who chose departmentalized instruction reported that the following factors influenced their decision more often than principals who chose to maintain self-contained instruction: (1) teachers' strengths in teaching math and English language arts, (2) teachers' preferences to teach more or fewer subjects, (3) teachers' workload, (4) teachers' preferences to develop teaching skills and content knowledge in more or fewer subjects, and (5) students' academic performance.

At the time schools decided whether to departmentalize instruction, principals who chose to departmentalize were also more likely to believe their schools fit the circumstances that would justify departmentalizing (Exhibit B.5). For example, compared to principals who maintained self-contained instruction, those who chose to departmentalize were more likely to report that their students would benefit from departmentalized instruction. They were also more likely to report that their teachers were better at teaching some subjects than others, that their teachers preferred teaching fewer subjects, and that they believed their school needed to make major changes to achieve their student achievement goals.

**Exhibit B.4. Factors Contributing to Schools’ Decisions to Departmentalize Instruction or Maintain Self-Contained Instruction**

Factor	Percentage of principals who reported factor contributed to their decision to a moderate or large extent		Difference		
	Principals of departmentalized schools in Year 1	Principals of self-contained schools in Year 1	Difference <sup>a</sup>	Standard error	p-value
Teachers’ strengths at teaching math and English language arts	94	40	54*	8	<0.01
Teachers’ preferences to teach more or fewer subjects	73	34	38*	10	<0.01
Teacher workload	65	34	30*	11	0.01
Teachers’ preferences to develop teaching skills and content knowledge in more or fewer subjects	76	50	26*	10	0.01
Students’ academic performance	87	69	19*	9	0.05
Teachers’ preferences to collaborate with each other or to work independently	73	61	12	10	0.25
District’s decision or preference	20	13	7	8	0.37
Past experiences with departmentalized instruction in 4th and 5th grades	61	56	5	11	0.65
Quality of student-teacher relationships	69	71	-2	10	0.88
Complexities of the schoolwide schedule	22	26	-4	10	0.68
<b>Number of principals<sup>b</sup></b>	<b>41-43</b>	<b>44-47</b>			

Source: Principal survey from spring 2019.

Notes: The question asked principals to what extent each factor contributed to their school’s decision to departmentalize or maintain a self-contained structure for the 4th or 5th grades for the 2019-2020 school year. Principals could select from the following: not a factor, to a small extent, to a moderate extent, or to a large extent. The results are from a regression model that controls for district fixed effects. The district fixed effects allow principals who chose to maintain self-instruction to serve as a comparison for principals in the same district who chose to departmentalize.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Number of principals is reported as a range because the number of principals who responded differed across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

**Exhibit B.5. Principals’ Beliefs About Departmentalized Instruction at the Start of the Study**

Statement that supports switching to departmentalized instruction	Percentage of principals who reported statement reflected their beliefs <sup>a</sup>			Difference	
	Principals of departmentalized schools in Year 1	Principals of self-contained schools in Year 1	Difference <sup>a</sup>	Standard error	<i>p</i> -value
“From my experience or those of my colleagues, 4th- and 5th-grade students benefit overall from departmentalized instruction”	74	31	43*	10	<0.01
“Some of my teachers are better at teaching math than English language arts, whereas others are better at teaching English language arts than math”	93	55	38*	9	<0.01
“My teachers prefer teaching just a few subjects”	65	28	36*	10	<0.01
“To meet our student achievement goals, my school needs to make major changes at the school or grade level”	53	24	30*	10	<0.01
“My teachers prefer developing their teaching skills and content knowledge in just a few subjects”	46	18	28*	10	0.01
“Departmentalized instruction would strengthen student-teacher relationships”	42	16	26*	10	0.01
“Our school would be likely to adopt a promising new initiative even if it required major changes to the schoolwide schedule”	65	47	19	11	0.10
“Departmentalized instruction would reduce teachers’ workload”	80	64	16	10	0.12
“My teachers prefer to work closely with each other”	87	79	8	9	0.36
<b>Number of principals<sup>b</sup></b>	<b>42-43</b>	<b>46-47</b>			

Source: Principal survey from spring 2019.

Notes: Principals read two statements that represented opposite beliefs and appeared on opposite ends of a scale. The survey asked principals to select a number from 1 to 5 depending on which statement best reflected their beliefs. For example, one statement on the left side of the scale (at 1) was “From my experiences or those of my colleagues, 4th- and 5th-grade students benefit overall from departmentalization.” The opposite statement on the right side of the scale (at 5) was “From my experiences or those of my colleagues, 4th- and 5th-grade students do not benefit overall from departmentalization.” Rows include principals that selected a 1 or 2 (one of the two closest numbers to the statements in the exhibit). The results are from a regression model that controls for district fixed effects. The district fixed effects allow principals who chose to maintain self-instruction to serve as a comparison for principals in the same district who chose to departmentalize.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Number of principals is reported as a range because the number of principals who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

Before the study began, schools that chose to departmentalize were similar to schools that remained self-contained in terms of school and student characteristics (Exhibit B.6) and teacher characteristics (Exhibit B.7).

### Exhibit B.6. Pre-Study Characteristics of Departmentalized and Self-Contained Schools and Their Students, Among All Schools Initially Participating in the Study

Characteristic (percentages unless otherwise noted)	Means		Difference		
	Departmentalized schools	Self-contained schools	Difference <sup>a</sup>	Standard error	p-value
<b>Student achievement (average 3rd-grade z-scores)</b>					
Math	-0.01	-0.08	0.07	0.12	0.54
English language arts	-0.01	-0.09	0.08	0.10	0.47
<b>Student characteristics</b>					
Female	49	48	1	1	0.11
<b>Race and ethnicity<sup>b</sup></b>					
Black	22	17	4	5	0.39
Hispanic	20	24	-4	5	0.46
White	48	47	0	6	0.94
Other	11	12	-1	2	0.49
Eligible for free or reduced-price lunch	60	64	-4	6	0.52
<b>School characteristics</b>					
<b>Grade levels served<sup>c</sup></b>					
K-5	84	>94 <sup>d</sup>	-10 to -16 <sup>d</sup>	6	0.06
K-8	16	<6 <sup>d</sup>	10 to 16 <sup>d</sup>	6	0.06
Number of students (average)	504	456	49	35	0.17
Student-teacher ratio (average)	16	15	0	0	0.56
Schoolwide Title I status <sup>e</sup>	90	9	82	8	0.82
<b>Number of schools<sup>f</sup></b>	<b>31-43</b>	<b>35-47</b>			

Source: Student administrative records from the 2018-2019 school year (student achievement); Common Core of Data from the 2018-2019 school year (student and school characteristics).

Notes: The study converted test scores to z-scores by subtracting the mean and dividing by the standard deviation of scores for all students in that state and grade. Student achievement means in the year before the study are based on all students in 3rd grade with available data. The study averaged data to the school level, and the reported means are averages across schools. The study reported student characteristics at the school level for students in all grade levels in the school, and the reported means are averages across schools.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>c</sup> Schools categorized as K-5 and K-8 may also include pre-K.

<sup>d</sup> Exact percentage has been withheld to protect respondent confidentiality in accordance with National Center for Education Statistics statistical standards.

<sup>e</sup> Schoolwide Title I status refers to schools with student populations that are at least 40 percent low income and eligible for Title I funds. This means that the schools are classified by state and federal regulations as high poverty and eligible for additional financial assistance.

<sup>f</sup> Number of schools is reported as a range because the number of schools with available data differs across the characteristics reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

### Exhibit B.7. Pre-Study Characteristics of Teachers in Departmentalized and Self-Contained Schools, Among All Schools Initially Participating in the Study

Teacher characteristic (percentages unless otherwise noted)	Means		Difference		
	Departmentalized schools	Self-contained schools	Difference <sup>a</sup>	Standard error	<i>p</i> -value
Female	87	88	-1	4	0.75
Years of teaching experience <sup>b</sup> (average)	11.4	10.5	0.9	0.9	0.36
<b>Value-added scores<sup>c</sup> (average)</b>					
Math	-0.09	0.13	-0.21	0.11	0.06
English language arts	0.00	0.16	-0.16	0.11	0.15
Difference between math and English language arts (absolute value)	0.69	0.63	0.06	0.06	0.34
<b>Race and ethnicity<sup>d</sup></b>					
Black	3	6	-3	4	0.43
Hispanic	11	5	7	5	0.21
White	82	86	-5	6	0.44
Other	4	3	1	3	0.58
<b>Highest degree</b>					
Bachelor's	55	49	6	9	0.47
Master's or higher	45	51	-6	9	0.49
<b>Grades taught</b>					
4	63	58	5	5	0.26
5	57	51	7	5	0.19
<b>Content areas taught</b>					
Math	93	99	-6*	3	0.04
English language arts	99	100	-0	1	0.44
Science	84	93	-8	7	0.27
Social studies	98	94	4	6	0.52
<b>Number of teachers<sup>e</sup></b>	<b>97-273</b>	<b>154-298</b>			
<b>Number of schools</b>	<b>17-52</b>	<b>23-49</b>			

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Source: Teacher administrative records from the 2018-2019 school year.

Notes: The sample includes 4th- or 5th-grade teachers identified as core subject teachers with available data. The study identified core subject teachers as teachers assigned to teach math or English language arts and either had a value-added score (in districts that provided value-added scores) or at least 10 students assigned to them (in districts for which the study directly estimated value-added scores based on student achievement data). The study averaged data to the school level, and the reported means are averages across schools.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Years of experience include all years of teaching before and including the 2018-2019 school year.

<sup>c</sup> Value-added scores are a measure of teachers' estimated contributions to growth in student achievement. Districts often use them as a measure of teacher effectiveness.

<sup>d</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>e</sup> Number of teachers and schools is reported as a range because the number of teachers and schools with available data differs across the characteristics reported in the exhibit.

## **B.4 Changes in the school sample during the study**

After the study began, the sample of schools in the study evolved. In particular, many schools dropped out of the study or changed their decisions about using departmentalized and self-contained instruction in the second year of implementation, after the COVID-19 pandemic began (Exhibit B.8). Of the 43 schools that chose to departmentalize at the start of the study, only 22 (51 percent) maintained their departmentalized status and remained in the study through Year 2. Of the 47 schools that chose to maintain self-contained instruction at the start of the study, only 35 (74 percent) maintained their self-contained status and remained in the study through Year 2. The analytic sample sizes used to address specific research questions also varied based on the availability of the required data for each analysis. For example, teacher retention data were available from 21 departmentalized and 28 self-contained schools in nine districts. Similarly, 5th-grade math achievement data were available from just 12 departmentalized and 19 self-contained schools in six districts.

### **Exhibit B.8. Number of Departmentalized and Self-Contained Schools Participating in the Study, by Year**

Source: Principal interviews conducted in fall 2019, spring 2020, fall 2020, and spring 2021.

Notes: At the beginning of Year 1, 90 schools participated in the study. Of the 90 schools, 43 originally chose to departmentalize in Year 1 in at least one of the study grades, and 47 chose to maintain self-contained instruction. Most of the 90 schools (78) participated in both 4th and 5th grades, but nine schools participated only in 4th grade and three schools participated only in 5th grade. Most of the schools that did not maintain their initial departmentalized or self-contained status switched statuses between Year 1 and Year 2. More than 94 percent of the schools that departmentalized used departmentalized instruction during Year 1 until schools closed in March 2020 due to the COVID-19 pandemic. By the end of Year 1, one school in 4th grade and two schools in 5th grade had switched from departmentalized to self-contained instruction, and one school in 4th grade switched from self-contained to departmentalized instruction. Between Year 1 and Year 2, nine schools in 4th grade and seven schools in 5th grade switched from departmentalized to self-contained instruction, and two schools in 4th grade switched from self-contained to departmentalized instruction. During Year 2, two schools in 4th grade and one school in 5th grade switched from departmentalized to self-contained instruction. The study did not include all schools with retention, English language arts, or math data



in the analysis of those outcomes because the study excluded any school districts without at least one school using departmentalized instruction in the relevant grade levels. The calculation of response rates excludes schools from these districts (Exhibit B.14).

ELA = English language arts.

Most schools that changed their instructional structure (departmentalized or self-contained) did so because of the pandemic (Exhibit B.9). Overwhelmingly, the schools that changed status were using departmentalized instruction in Year 1 and switched back to self-contained instruction in Year 2.

### Exhibit B.9. Reasons Schools Changed Status or Dropped Out of the Study

	Number of departmentalized schools	Number of self-contained schools
<b>Reason for changing status</b>		
COVID-19 pandemic	9	<3 <sup>a</sup>
School preference	0	<3 <sup>a</sup>
<b>Reason for dropping out of the study</b>		
COVID-19 pandemic	8	7
The district or school planned to participate only for Year 1	4	3
<b>Number of schools at the start of the study</b>	<b>43</b>	<b>47</b>

Source: Principal interviews conducted in fall 2019, spring 2020, fall 2020, and spring 2021.

<sup>a</sup> Exact number has been withheld to protect respondent confidentiality in accordance with National Center for Education Statistics statistical standards.

To examine how two years of departmentalized instruction related to student achievement and teacher retention, those analyses focus on schools that maintained departmentalized or self-contained instruction over the full two years of the study. The departmentalized and self-contained schools that remained in the study for two years had similar student and school characteristics (Exhibit B.10) and teacher characteristics (Exhibit B.11) in the year before the study began.

**Exhibit B.10. Pre-Study Characteristics of Study Schools and Their Students, Among Schools that Maintained Departmentalized or Self-Contained Instruction for Two Years**

Characteristic (percentages unless otherwise noted)	Means		Difference		
	Departmentalized schools	Self-contained schools	Difference <sup>a</sup>	Standard error	p-value
<b>Student achievement (average 3rd-grade z-scores)</b>					
Math	0.09	-0.04	0.13	0.14	0.36
English language arts	0.03	-0.05	0.08	0.13	0.54
<b>Student characteristics</b>					
Female	49	48	1	1	0.24
<b>Race and ethnicity<sup>b</sup></b>					
Black	18	14	3	5	0.50
Hispanic	27	28	-1	7	0.91
White	44	44	-0	7	0.98
Other	11	13	-3	2	0.24
Eligible for free or reduced-price lunch	53	62	-9	8	0.30
<b>School characteristics</b>					
<b>Grade levels served<sup>c</sup></b>					
K-5	86	>91 <sup>d</sup>	-6 to -14 <sup>d</sup>	8	0.28
K-8	14	<9 <sup>d</sup>	6 to 14 <sup>d</sup>	8	0.28
Number of students (average)	565	495	70	40	0.08
Student-teacher ratio (average)	16	15	1	1	0.25
Schoolwide Title I status <sup>e</sup>	93	11	82	11	0.51
<b>Number of schools<sup>f</sup></b>	<b>14-21</b>	<b>28-35</b>			

Source: Student administrative records from the 2018-2019 school year (student achievement); Common Core of Data from the 2018-2019 school year (student and school characteristics).

Notes: The study converted test scores to z-scores by subtracting the mean and dividing by the standard deviation of scores for all students in that state and grade. Student achievement means from the year before the study are based on all students in 3rd grade with available data. The study averaged data to the school level, and the reported means are averages across schools. The study reported student characteristics at the school level for students in all grade levels in the school, and the reported means are averages across schools.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>c</sup> Schools categorized as K-5 and K-8 may also include pre-K.

<sup>d</sup> Exact percentage has been withheld to protect respondent confidentiality in accordance with National Center for Education Statistics statistical standards.

<sup>e</sup> Schoolwide Title I status refers to schools with student populations that are at least 40 percent low income and eligible for Title I funds. This means state and federal regulations classify the schools as high poverty and eligible for additional financial assistance.

<sup>f</sup> Number of schools is reported as a range because the number of schools with available data differs across the characteristics reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

**Exhibit B.11. Pre-Study Characteristics of Teachers, Among Study Schools that Maintained Departmentalized or Self-Contained Instruction for Two Years**

Teacher characteristic (percentages unless otherwise noted)	Means		Difference		
	Departmentalized schools	Self-contained schools	Difference <sup>a</sup>	Standard error	p-value
Female	83	89	-7	4	0.15
Years of teaching experience <sup>b</sup> (average)	11.4	11.5	-0.1	1.2	0.93
<b>Value-added scores<sup>c</sup> (average)</b>					
Math	-0.02	0.06	-0.08	0.15	0.60
English language arts	0.15	0.18	-0.04	0.15	0.81
Difference between math and English language arts (absolute value)	0.69	0.67	0.03	0.08	0.75
<b>Race and ethnicity<sup>d</sup></b>					
Black	2	7	-5	5	0.31
Hispanic	10	7	2	7	0.74
White	81	83	-2	8	0.76
Other	8	3	5	3	0.12
<b>Highest degree</b>					
Bachelor's	65	47	18	12	0.14
Master's or higher	34	52	-18	12	0.14
<b>Grades taught</b>					
4	58	65	-7	6	0.28
5	54	62	-8	6	0.24
<b>Content areas taught</b>					
Math	93	94	-1	5	0.83
English language arts	98	100	-1	1	0.08
Science	89	87	2	10	0.85
Social studies	95	95	1	8	0.95
<b>Number of teachers<sup>e</sup></b>	<b>64-146</b>	<b>151-253</b>			
<b>Number of schools</b>	<b>8-21</b>	<b>25-45</b>			

Source: Teacher administrative records from the 2018-2019 school year.

Notes: The sample includes teachers identified as core subject teachers in grades 4 and 5 with available data. The study identified core teachers as teachers assigned to teach math or English language arts and either had a value-added score (in districts that provided value-added scores) or at least 10 students assigned to them (in districts for which the study directly estimated value-added scores based on student achievement data). The study averaged data to the school level, and the reported means are averages across schools.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Years of experience include all years of teaching before and including the 2018-2019 school year.

<sup>c</sup> Value-added scores are a measure of teachers' estimated contributions to growth in student achievement. Districts often use them as a measure of teacher effectiveness.

<sup>d</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>e</sup> Number of teachers and schools is reported as a range because the number of teachers and schools with available data differs across the characteristics reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

Due to the reductions in the number of participating schools, the study could not precisely estimate relationships between departmentalized instruction and key outcomes (Exhibit B.12). Therefore, the report does not highlight those analyses and only includes them in the appendix. For instance, when looking at student achievement in math, the study only had a large enough sample to detect differences between schools that departmentalized and those that maintained self-contained instruction greater than approximately 0.19 standard deviations, or about four months of student learning.<sup>5</sup> Based on prior research, a difference this large would not be plausibly expected solely from reassigning teachers to subjects. For example, prior studies have estimated that reassigning teachers to subjects would result in changes in student achievement ranging from 0.05 to 0.10 standard deviations for math and from -0.04 to 0.03 standard deviations for English language arts.<sup>6</sup> These estimates reflect only the potential changes from assigning teachers to the subjects aligned with their relative strengths. The estimates do not reflect any potential improvements in student achievement that could result from other aspects of departmentalized instruction, such as increased professional development and planning time for teachers' specific subjects. However, expected improvements to student achievement due to changes in professional development or planning time may be small because the study did not provide substantive support in those areas. Due to the small sample sizes, this study presents the findings on the relationship between departmentalized instruction and key outcomes in Section C of this appendix but not in the main body of the report.

**Exhibit B.12. Minimum Detectable Effect Sizes**

Outcome	Minimum detectable effect size <sup>a</sup>	Number of departmentalized schools	Number of self-contained schools	Number of individuals (students or teachers)
Student achievement in math	0.19	12	19	966
Student achievement in English language arts	0.15	35	21	1046
Teacher retention	13	49	28	171

Source: Student and teacher administrative records from the 2020-2021 school year.

Notes: The study calculated minimum detectable effects by multiplying the standard errors by 2.8.

**B.5 Data collection, measures, and analytic methods**

The study collected data from a variety of sources to examine the implementation of departmentalized instruction, the experiences of departmentalized and self-contained teachers, and the relationships between departmentalized instruction and key outcomes (Exhibit B.13).

**Exhibit B.13. Data Collection**

Data source	Data obtained	Timing of data collected	Respondent
<b>Study-collected data</b>			
Principal survey	Factors that principals considered when deciding whether to departmentalize (or not) and their beliefs about departmentalized instruction	Spring 2019	Principals (all study schools)
Design meeting attendance and observations forms	Staff attendance and content covered	Spring 2019	Not applicable (study team completed forms; departmentalized schools only)
Collaborative planning time webinar attendance and observations forms	Staff attendance and content covered	Summer 2019	Not applicable (study team completed forms; departmentalized schools only)
Reports from supplemental coaching calls	Additional help requested and assistance provided	Summer 2019-spring 2021	Not applicable (study team completed reports)
Principal interviews	Teacher grade and subject assignments (all interview rounds); challenges of departmentalized instruction (all interview rounds); benefits of departmentalized instruction (spring 2020, fall 2020, spring 2021); factors considered for teacher assignments (spring 2020); communication and discipline strategies (spring 2020); amount of instruction provided from a distance <sup>a</sup> (spring 2021); whether school maintained instructional structure (departmentalized or self-contained) selected at the beginning of the study and reason for any changes (all interview rounds)	Fall 2019, spring 2020, fall 2020, and spring 2021	Principals (all study schools)
Teacher survey	Teaching experience, professional development, instruction and planning time, teacher collaboration, student and parent interactions, job satisfaction	Spring 2021	Teachers (all study schools)
Student administrative records	Student achievement and background characteristics from the year before the study (2018-2019) and study school years (2019-2020 and 2020-2021), if available <sup>b</sup>	Fall 2021	Districts provided data on individual students (all study schools)

Data source	Data obtained	Timing of data collected	Respondent
Teacher administrative records	School, grade, and subject assignment data; background characteristics; and performance data from the year before the study	Fall 2019 (performance data only) and fall 2021	Districts provided data on individual teachers (all study schools)
<b>Existing national data sets</b>			
Title I/II principal survey	Teacher grade and subject assignments; factors considered for teacher assignments	Spring 2022	Principals in a nationally representative sample of all U.S. schools, limited to schools that include 4th or 5th grade
National Teacher and Principal Survey	Teacher grade and subject assignments	2017–2018, 2020–2021	Teachers in a nationally representative sample of all U.S. teachers, limited to elementary teachers
Schools and Staffing Survey	Teacher grade and subject assignments	1999–2000, 2011–2012	Teachers in a nationally representative sample of all U.S. teachers, limited to elementary teachers
Common Core of Data	Characteristics of study districts and schools	2018–2019	Districts and schools in the United States

<sup>a</sup> The study team completed spring 2020 interviews before schools closed in March 2020 due to the COVID-19 pandemic. Schools provided instruction in a variety of ways (distance, in person, and a combination) during the 2020–2021 school year.

<sup>b</sup> No districts administered assessments in spring 2020 due to the COVID-19 pandemic.

Response rates across the study data sources ranged from 70 to 100 percent (Exhibit B.14). Response rates were generally similar between departmentalized and self-contained schools. However, fewer students had achievement scores in self-contained schools than departmentalized schools.

**Exhibit B.14. Response Rates**

Data collected	Response rates			Difference	
	Overall	Departmentalized schools	Self-contained schools	Difference <sup>a</sup>	<i>p</i> -value
Student achievement records (5th-grade students in spring 2021)					
<b>Percentage of students with data<sup>b</sup></b>					
Math scores	83	85	81	4	<0.01*
English language arts scores	80	81	78	4	<0.01*
<b>Percentage of schools with data for at least one student</b>					
Math scores	78	71	83	-12	0.38
English language arts scores	88	82	91	-9	0.41
<b>Teacher data</b>					
<b>Percentage of teachers with data</b>					
Teacher survey	83	84	83	0	0.98
Math value-added	70	70	n.a.	n.a.	n.a.
English language arts value-added	70	70	n.a.	n.a.	n.a.
Teacher retention	100	100	100	0	.
<b>Percentage of schools with data for at least one teacher</b>					
Teacher survey	99	100	97	3	0.36
Math value-added	93	93	n.a.	n.a.	n.a.
English language arts value-added	95	95	n.a.	n.a.	n.a.
Teacher retention	100	100	100	0	1.00
<b>Principal data</b>					
Principal survey	100	100	100	0	1.00
Principal interviews	100	100	100	0	1.00
<b>Number of students</b>	<b>2,740-2,429</b>	<b>1,136-1,282</b>	<b>2,698</b>		
<b>Number of teachers</b>	<b>405</b>	<b>188</b>	<b>217</b>		
<b>Number of principals</b>	<b>68-90</b>	<b>24-43</b>	<b>42-47</b>		

Source: Student and teacher administrative records from the 2018-2019 (teacher value-added) and 2020-2021 school years (student achievement and teacher retention); teacher survey from spring 2021; principal survey from spring 2019; principal interviews conducted in fall 2019, spring 2020, fall 2020, and spring 2021.

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Notes: The study calculated student achievement response rates at the student level for the schools included in the analyses of the relationship between departmentalized instruction and outcomes. The study calculated the response rates at the school level from all districts still participating in the study after two years that had at least one school implementing departmentalized instruction. This included eight districts for the 5th-grade student achievement analysis and nine districts for the analysis of teacher retention. All districts administered math and English language arts assessments in spring 2021; however, some districts received waivers not to administer assessments in particular grades or subjects that year. For this reason, the school-level response rates are below 100 percent. For example, in a school where only the 5th grade was participating in the study, if the district had a waiver exempting 5th grade from testing, that school would not have test score data. The study used value-added scores in the analysis of principals' assignments of teachers to subjects. The study conducted this analysis at the teacher team level (each set of teachers teaching different subjects to the same group of students was considered a team). For this analysis, 59 percent of teams had value-added scores in math and English language arts for all teachers.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Response rates for student achievement data exclude students and schools from districts that did not provide any student-level data.

\* Statistically significant at the .05 level, two-tailed test.

n.a. = not applicable. The study did not collect these data in self-contained schools.

### **B.5.1 Approach to examining how schools implemented the three key steps of departmentalized instruction**

To learn about schools' experiences implementing departmentalized instruction, the study examined how departmentalized schools implemented the three key steps: selecting a staffing model, developing a schoolwide schedule, and strategically assigning teachers to subjects. Each analysis relied on different samples, data sources, measures, and analytic methods.

#### **Samples, data sources, measures, and analytic methods used to describe staffing models chosen (step 1)**

To examine the percentage of teacher teams that used each of the four staffing models (Exhibit A.3), the study used data from the fall 2019 principal interview (Exhibit B.15). Specifically, the study used interview responses about which grade and subject(s) each teacher was teaching. The study used these responses to (1) identify departmentalized teacher teams—sets of core subject teachers who teach the same group of students and (2) determine which staffing models each teacher team used. The study classified teacher teams into the four models as follows:

- 1. Homeroom model:** Each teacher taught three core subjects
- 2. Paired Subjects model:** Each teacher taught two core subjects
- 3. Math or English Language Arts Focus model:** Each teacher taught math or English language arts or science and social studies
- 4. Full Specialization model:** Each teacher taught one core subject

The study classified these models as having a low, medium, or high level of specialization based on the average number of subjects each teacher taught. The study classified the Homeroom model, in which each teacher taught three core subjects, as low specialization. The study classified the Paired Subjects model, in which each teacher taught two core subjects, as moderate specialization, along with the slightly more specialized Math or English Language Arts Focus models, in which each teacher taught one or two core subjects. The study classified the Full Specialization model, in which each teacher taught one core subject, as high specialization.

To compare the study schools to elementary schools nationally, the study used the spring 2022 Title I/II principal survey. The comparison to the national sample is useful for understanding the extent to which the staffing models the study schools selected are used in other contexts, including without the external support the study provided. The Title I/II principal survey included questions about whether the school used departmentalized



instruction in 4th or 5th grade; the number of teachers each student typically had for math, English language arts, science, and social studies; the number of subjects each math teacher typically taught; and the number of subjects each English language arts teacher typically taught. The study mapped the patterns of responses to these questions to the staffing models identified in the study. For example, if the principal reported that each student in a grade had four teachers and both the math and English language arts teacher taught only one subject each, then the study would categorize the school as using the Full Specialization model in that grade. The study then calculated the percentage of teams using each staffing model for 4th and 5th grade among the schools using departmentalized instruction in that grade. Because it did not have additional details on teachers' teams, the study assumed each grade had one staffing model. The study was not able to determine if some schools were using multiple staffing models or cross-grade level teams. For this reason, the study categorized teams that did not meet the criteria for Full Specialization, Math or English Language Arts Focus, Paired Subjects, or Homeroom models as "other models."

**Exhibit B.15. Analysis, Sample, Data, and Measures for Describing Staffing Models**

Information	Description
Analysis	Calculated percentage of teacher teams that used each of four staffing models, overall and by number of teachers departmentalizing
Sample	97 teacher teams in 43 departmentalized schools at start of Year 1
Data	Principal interview, fall 2019; Title I/II principal survey, spring 2022
Measures	Responses to questions about teacher grade and subject assignments

**Samples, data sources, measures, and analytic methods used to describe schools' experiences developing a schoolwide schedule (step 2)**

To examine the percentages of principals who reported that scheduling was a challenge of switching to departmentalized instruction, the study used the fall 2019 and spring 2020 principal interviews (Exhibit B.16). This analysis focused on responses to open-ended questions about the benefits and challenges experienced due to the switch to departmentalized instruction. The study categorized the responses into specific scheduling challenges based on key words included in the responses. It then calculated the percentage of principals who reported specific challenges (such as developing a schoolwide schedule or scheduling support services) and who reported any scheduling challenges in either round of the interview. No principals reported that departmentalized instruction made scheduling easier and was therefore a benefit of departmentalized instruction.

**Exhibit B.16. Analysis, Sample, Data, and Measures for Describing Schools' Experiences Developing a Schoolwide Schedule**

Information	Description
Analysis	Calculated percentage of principals who reported that scheduling was a challenge of switching to departmentalized instruction in Year 1
Sample	43 principals of departmentalized schools at start of Year 1
Data	Principal interview, fall 2019 and spring 2020
Measures	Responses to questions about benefits and challenges faced over the past year because the school departmentalized

### Samples, data sources, measures, and analytic methods used to assess principals' assignments of teachers to subjects (step 3)

To examine whether principals assigned teachers in departmentalized schools to teach English language arts and math in accordance with their strengths in each subject, the study conducted two analyses (Exhibit B.17). The first analysis examined the percentage of principals who reported considering various factors when assigning teachers to subjects. The second analysis examined the consistency between actual teaching assignments and teachers' measured effectiveness.

**Exhibit B.17. Analysis, Samples, Data, and Measures for Assessing Principals' Assignments of Teachers to Subjects**

Information	Factors considered when assigning teachers to subjects	Consistency between actual teaching assignments and teachers' measured effectiveness
Analysis	Calculated percentage of principals who reported they considered various factors when making teacher assignments by subject or grade	Analyzed whether any reassignments in math or English language arts would result in higher value-added scores in at least one subject without lowering value-added scores in the other subject
Sample	43 principals of departmentalized schools in 12 districts	119 teachers in 42 departmentalized grades in 11 districts
Data	Principal interview, spring 2020; Title I/II principal survey, spring 2022	Principal interview, fall 2019; teacher and student administrative data, spring 2019
Measures	Responses to questions about most important factors when assigning teachers to subjects	<ul style="list-style-type: none"> <li>Teacher value-added scores in math and English language arts in year before study</li> <li>Subject assignment for each teacher in departmentalized grades</li> </ul>

#### *Factors considered when assigning teachers to subjects*

During the spring 2020 interview, the study asked principals of departmentalized schools which of the following five factors they considered when making teachers' subject assignments: (1) the grade taught in the prior year, (2) teachers' preferences for certain grades or subjects, (3) principals' perceptions of teachers' knowledge of subjects, (4) teachers' evaluation measures based on student achievement, and (5) observations of teachers' classroom practices. The study also asked principals if there were other factors they considered that were not on this list—the study systematically coded these responses into other categories. If principals mentioned considering more than one factor, they then indicated which factor they would rank as the most important. The study calculated the percentage of principals who reported each factor and the percentage reporting it was the most important factor.

For comparison to departmentalized elementary schools nationally, the study used data from the spring 2022 Title I/II principal survey. This comparison is useful for providing context on whether the factors that principals in this study considered when assigning teachers were unique to this study or are common factors that principals nationwide consider when making teaching assignments. For example, principals in the study schools may be more likely to use teachers' evaluation measures based on student achievement because the study team emphasized that during the design meetings. This survey asked principals who indicated that their school was departmentalized for 4th or 5th grade to select the top three factors they considered when assigning teachers to

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subjects from a list of possible factors. The list of factors largely overlapped with factors in the list from the study interviews with principals in departmentalized schools. The study included any additional factors listed in the Title I/II survey that were not in the list from interviews with principals in the “other factors” category. For each factor, the study calculated the percentage of principals reporting that factor as one of the top three factors they considered. To get results that were representative of departmentalized elementary schools nationally, the study used school-level weights provided with the data.

*Consistency between actual teaching assignments and teachers’ measured effectiveness*

The study analyzed whether, within each departmentalized grade in a school (4th, 5th, or both), principals assigned teachers to subjects in a manner that aligned with teachers’ strengths. This is important to examine because it is a key way that departmentalized instruction could improve the quality of instruction. The study examined assignments within departmentalized grades because typically principals would assign 4th-grade teachers to subjects separately from 5th-grade teachers, rather than shift teachers between grades.<sup>7</sup> The study measured teachers’ relative strengths using value-added scores in math or English language arts from the year before the study. For each departmentalized grade, the study defined assignments as aligning with teachers’ strengths if no reassignments of math and English language arts teachers were possible that could increase average value-added scores in one of these subjects without lowering it in the other. The analysis only considered reassigning English language arts teachers to math and reassigning math teachers to English language arts. It did not consider reassigning science or social studies teachers to math or English language arts. This was because the study did not have teacher value-added scores for science and social studies.

Specifically, this analysis involved the following steps:

**Step 1: Exclude departmentalized grades for which any teachers assigned to teach math or English language arts were missing teacher value-added scores (31 of 73 departmentalized grades).**<sup>8</sup> For those grades, the study could not determine whether reassigning teachers to subjects would have led to improvements in average math and English language arts value-added scores.

**Step 2: Determine the number of teachers who taught math and English language arts in each departmentalized grade.**

**Step 3: Determine all possible ways of assigning math and English language arts teachers within a departmentalized grade to math and English language arts. For each possible assignment, calculate average value-added scores in math and English language arts for the teachers assigned to those subjects.** As discussed earlier, these hypothetical reassignments involved only the teachers who principals actually assigned to math or English language arts.

**Step 4: Identify the departmentalized grades in which any teacher reassignments between math and English language arts would have resulted in higher average teacher value-added scores in one subject without lowering them in the other.** For those grades, the study classified the original subject assignments as not aligning with teachers’ strengths. The study used this approach to assess teacher assignments, rather than determining the assignment that would have maximized the sum of teachers’ value-added scores across math and English language arts. The study opted for this approach because schools might not have prioritized these subjects equally. For example, a school that prioritized improvements in English language arts achievement might have assigned the teacher with the highest English language arts value-added score to teach English

language arts, even if the school could have increased total value-added scores across math and English language arts by assigning the teacher to teach math.

Because this analysis relies on teachers' value-added scores from the year before the study, it examines only whether subject assignments aligned with teachers' *prior* strengths. It does not reflect potential changes in teachers' effectiveness after departmentalized instruction began, such as improved effectiveness through specialization.

### *Constructing teacher value-added scores*

To examine the alignment between teachers' subject assignments and their value-added scores, the study used teachers' scores from the year before the study (the 2018-2019 school year). For districts without existing value-added scores, the study directly estimated teachers' value-added scores in math and English language arts using an established approach.<sup>9</sup> Districts with existing value-added scores reported the scores on different scales depending on the assessment each district used. To put these scores on the same scale as the value-added scores the study calculated, the study rescaled the scores so that each district's value-added scores had a mean score of 0 and a standard deviation of 1. In this way, the study could analyze value-added scores of teachers across districts.

### *Estimating teacher value-added scores in districts without existing scores*

To estimate value-added scores in districts without existing scores, the study estimated what is known as a value-added model. A value-added model is a widely used approach that aims to determine how much value a teacher adds to student learning compared with the average teacher in the district. The approach also adjusts for factors such as previous achievement and background characteristics of the teacher's students. The study accomplished this by using the following five steps:

**Step 1: Estimating a basic value-added model.** The basic value-added model used a regression model to estimate the relationship between students' math or English language arts test scores and their prior-year scores in both subjects, key background characteristics, and indicators for each teacher who taught the student during the current school year. The coefficient on each teacher indicator provided that teacher's initial value-added score—an estimate of that teacher's contribution to their students' achievement over and beyond what would be expected based on the students' prior achievement and background characteristics. These initial value-added scores reflect that a given student would have somewhat higher or lower test scores in a subject, depending on which teacher they had. Specifically, the study estimated the following regression model, separately for each district and subject:

$$(1) \quad y_{itgs} = M_i \gamma_M + R_i \gamma_R + X_i \beta + \sum_{t,g} \delta_{tg} T_{itgs} + \varepsilon_{itgs},$$

where  $y_{itgs}$  is the score on the 2018-2019 test in subject  $s$  for student  $i$  taught by teacher  $t$  in grade  $g$ . The vectors  $M_i$  and  $R_i$  contain the student's scores on the math and English language arts tests from the previous year, with each vector including separate variables for scores in each of grades 3 through 7;  $X_i$  is a set of other student background characteristics (including indicators for grade, free or reduced-price lunch eligibility, racial and ethnic group, special education status, and English learner status);  $T_{itgs}$  is a binary variable indicating whether student  $i$  was taught by teacher  $t$  in grade  $g$  (a teacher who taught multiple grades will have variables in the

regression model for each grade) and subject  $s$ ;  $\varepsilon_{iigs}$  is a random error term; and  $\gamma_M$ ,  $\gamma_R$ ,  $\beta$ , and  $\delta_{ig}$  are parameters to be estimated.

Estimates of the parameters  $\delta_{ig}$ , the coefficients on the teacher indicators, give the initial, unstandardized value-added scores for each teacher in each grade. The study included teachers in the regression model only if they had at least five students in a grade and subject combination, as value-added scores are highly uncertain when based on fewer students. When estimating Equation (1), the study explicitly accounted for students taught by multiple teachers in the same subject using an approach known as the Full Roster Method.<sup>10</sup> The study also corrected for measurement error in students' prior test scores using what is known as an errors-in-variables correction.<sup>11</sup>

**Step 2: Measuring the degree of imprecision in the value-added scores.** All estimates from value-added models have some amount of uncertainty, or imprecision. This is due to measurement error associated with standardized tests, measurement error in other variables in the model, small numbers of students in the analysis for some teachers, and other factors. The study measured the degree of imprecision in estimated value-added scores to account for it in the analysis using an adjustment that minimizes the amount of uncertainty in the final estimates. To carry out this adjustment, the study accounted for two challenges to properly estimating the imprecision of each teacher's value-added estimate.

First, because some individual students took multiple tests over the years covered by the data, the model's resulting standard errors—a standard measure of imprecision—may be biased due to correlations between observations of the same student. To address this issue, the study estimated cluster-robust standard errors that account for these relationships between observations of the same students.<sup>12</sup>

Second, methods that account for measurement error in the estimation of Equation (1) cannot produce cluster-robust standard errors due to computational limitations. In other words, there is no practical way to address both of these complications of Equation (1) at the same time. To address this challenge, the study estimated Equation (1) in two steps. In the first step, the study used the errors-in-variables approach described earlier to estimate the coefficients in Equation (1). The study used the coefficient estimates  $\gamma_M$  and  $\gamma_R$  to calculate an adjusted English language arts or math score that nets out the contribution of the prior scores. The study calculated the adjusted test score as:

$$(2) \quad A_{iigs} = y_{iigs} - M_i \hat{\gamma}_M - R_i \hat{\gamma}_R$$

The study then used these adjusted test scores as the dependent variable in a second regression estimated using cluster-robust standard errors:

$$(3) \quad A_{iigs} = X_i \beta + \delta_{ig} T_{iigs} + \varepsilon_{iigs}$$

Equation (3) produces coefficient estimates identical to those of Equation (1) but has the added advantage of producing more accurate estimates of the amount of uncertainty in the estimated value-added scores.

**Step 3: Standardizing the value-added scores to allow comparisons across grades.** Within a subject and district, the study needed to place value-added scores from different grades on the same scale. This was so the study could compare scores across grades and combine value-added scores from different grades taught by the same teacher. To do so, the study standardized value-added scores to have the same mean and standard deviation in every grade, subject, and district. This standardization relied on the assumption that the average

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teacher in each district, grade, and subject were all equally effective, and that differences in effectiveness between teachers were of equal magnitude in each district, grade, and subject.

In each subject and district, the standardized value-added estimate of teacher  $t$  in grade  $g$ ,  $\hat{\eta}_{tg}$  is as follows:

$$(4) \quad \hat{\eta}_{tg} = \frac{(\hat{\delta}_{tg} - \overline{\hat{\delta}_g})}{\hat{\sigma}_g},$$

where  $\hat{\delta}_{tg}$  is the teacher's original value-added estimate from Equation (3),  $\overline{\hat{\delta}_g}$  is the weighted average of the value-added scores for all teachers in grade  $g$  (with weights based on the number of students taught by a teacher in that grade), and  $\hat{\sigma}_g$  is an estimate of the standard deviation of true teacher value-added in grade  $g$ .<sup>13</sup>

To obtain a single value-added score,  $\hat{\eta}_t$ , for each teacher within a given subject, the study computed a weighted average of the teacher's standardized value-added scores from the grades they taught ( $\hat{\eta}_{tg}$ ). The weight on each grade was the fraction of the teacher's students from that grade. This approach ensured that each student contributed equally to a teacher's value-added score, regardless of the number of grades taught or the number of students in each grade. Likewise, the sampling variance of each teacher's combined estimate was a weighted sum of the sampling variances of the teacher's grade-specific estimates, with weights equal to the squared fraction of the teacher's students from that grade.

**Step 4: Adjusting value-added scores for imprecision.** To minimize the average error in the final value-added scores, the study used a method known as empirical Bayes shrinkage to adjust the scores. This method addresses the concern that teachers who taught few students may have very high or very low value-added scores simply by chance if their students happen to be especially high or low performing.<sup>14</sup>

**Step 5: Standardizing all value-added scores to be on the same scale.** The study conducted one final standardization of the value-added scores so that differences in the characteristics of student assessments across districts, subjects, or years would not influence the distribution of the scores.<sup>15</sup> The study pooled together all final value-added scores and standardized them to have mean of 0 and standard deviation of 1 within each district, subject, and implementation year.

#### *Adjusting teacher value-added scores in districts with existing value-added scores*

In districts with existing value-added scores, the study adjusted them to place them on the same scale as the scores from the districts in which the study estimated the scores. Specifically, the study applied Step 5 (standardizing all value-added scores) to the existing value-added scores from districts.

### **B.5.2 Approach to examining how teachers in departmentalized and self-contained classrooms described their experiences**

To learn about teachers' experiences implementing departmentalized instruction, the study used the spring 2021 teacher survey to examine teachers' reported experiences in various aspects of their jobs (Exhibit B.18). The study team developed the teacher survey using items from the 2020-2021 National Teacher and Principal Survey (NTPS 2021) as well as new items designed for the study. Guided by the study's logic model, the survey measured

time spent on planning, professional development, course instruction, transitions between classes, and meetings with parents and students, as well as job satisfaction.<sup>16</sup>

The study compared the experiences of departmentalized and self-contained teachers from study schools in the same districts. To do so, the study estimated a regression model that regressed each experience measure on an indicator for whether the teacher was departmentalized and an indicator for the teacher’s district. The regression coefficient on the departmentalized indicator reflects the average difference in experiences between departmentalized and self-contained teachers within each district. The study calculated the adjusted average experience for departmentalized teachers as the average for self-contained teachers plus the regression coefficient on the departmentalized indicator. The adjusted average reflects the average experiences of departmentalized teachers who taught in the same school districts as the self-contained teachers. The regressions gave all schools equal weight so that schools with more teachers would not overly influence the results. The study adjusted standard errors to account for the clustering of teachers’ responses within the same district.

To understand how the experiences of departmentalized teachers in the study compared to those of self-contained teachers nationwide, the study also analyzed responses of a nationally representative sample of self-contained teachers using the 2020-2021 NTPS. This sample provides a useful point of comparison because it more closely represents the average experiences of 4th- and 5th-grade self-contained teachers nationwide than the study schools. To conduct these comparisons, the study calculated averages and standard deviations on select survey measures for respondents from the 2020-2021 NTPS who (1) were full-time 4th- and 5th-grade teachers and (2) taught self-contained classes, excluding teachers providing pull-out services, such as special education services provided outside of the classroom. To get results that were representative of elementary teachers nationally, the study used teacher-level weights provided with the NTPS data when calculating the means and standard deviations. The study separately calculated the averages and standard deviations on the same measures for the departmentalized teachers in study schools. Using the means, standard deviations, and sample sizes from each dataset, the study conducted statistical tests to compare the averages of the two groups of teachers. The study limited these comparisons to the specific measures of teachers’ experiences that were in both the study’s spring 2021 teacher survey and the 2020-2021 NTPS. This included measures of instructional time and job satisfaction.

**Exhibit B.18. Analysis, Sample, Data, and Measures for Describing Teachers’ Experiences Implementing Departmentalized Instruction**

Information	Description
Analysis	Calculated averages for each measure for departmentalized and self-contained teachers, adjusted based on a regression model that allowed self-contained teachers to serve as a comparison for departmentalized teachers in the same district. Separately calculated differences in average measures for departmentalized teachers in study schools and self-contained teachers nationwide.
Sample	101 departmentalized and 235 self-contained teachers in study schools; 2,860 self-contained teachers nationwide. <sup>a</sup>
Data	Teacher survey, spring 2021; National Teacher and Principal Survey, 2020-2021

Information	Description
Measures	<ul style="list-style-type: none"> <li>• Amount of time spent planning overall and for specific subjects</li> <li>• Amount of instructional time for specific subjects</li> <li>• Amount of time spent transitioning between classes</li> <li>• Amount of professional development overall and for specific subjects</li> <li>• Amount of time spent meeting with parents and students</li> <li>• Job satisfaction</li> </ul>

<sup>a</sup> Number of self-contained teachers has been rounded to the nearest 10 in accordance with Institute of Education Sciences guidelines for the National Teacher and Principal Survey restricted-use data.

For these analyses, the study classified teachers as departmentalized or self-contained based on the subjects they taught in Year 2.<sup>17</sup> Specifically, it classified teachers who taught both math and English language arts as self-contained and classified teachers who taught just one of those two subjects as departmentalized. Many self-contained teachers in Year 2 were departmentalized in the prior school year, because many schools shifted from departmentalized to self-contained instruction between Years 1 and 2. Departmentalized and self-contained teachers in Year 2 generally had similar background characteristics (Exhibit B.19).

#### Exhibit B.19. Characteristics of Departmentalized and Self-Contained Teachers in Year 2

Teacher characteristic (percentages unless otherwise noted)	Means		Difference		
	Departmentalized teachers	Self-contained teachers	Difference <sup>a</sup>	Standard error	<i>p</i> -value
Female	83	88	-5	4	0.26
Years of teaching experience (average) <sup>b</sup>	12.9	14.1	-1.2	1.1	0.26
<b>Race and ethnicity<sup>c</sup></b>					
Black	10	9	1	4	0.70
Hispanic	4	8	-4	3	0.18
White	89	88	1	4	0.79
Other	4	4	-0	2	0.90
<b>Highest degree</b>					
Bachelor's	48	46	2	6	0.68
Master's or higher	52	54	-2	6	0.68
<b>Grades taught</b>					
4	47	59	-12	6	0.07
5	62	56	6	6	0.33
<b>Content areas taught</b>					
Math	40	100	-60*	4	<0.01
English language arts	50	100	-50*	4	<0.01
Science	55	96	-41*	4	<0.01
Social studies	43	96	-53*	4	<0.01



Teacher characteristic (percentages unless otherwise noted)	Means		Difference		
	Departmentalized teachers	Self-contained teachers	Difference <sup>a</sup>	Standard error	<i>p</i> -value
<b>Experience in the prior school year</b>					
Taught in a departmentalized grade	72	25	48*	5	<0.01
Taught in a self-contained grade	6	56	-50*	5	<0.01
Taught in a different school or did not teach	22	19	3	5	0.58
<b>Number of teachers<sup>d</sup></b>	<b>99-101</b>	<b>224-235</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Data are weighted equally at the school level.

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> Years of experience include all years of teaching before and including the 2020-2021 school year.

<sup>c</sup> Race and ethnicity categories are not mutually exclusive.

<sup>d</sup> Number of teachers is based on unweighted data and appears as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

### B.5.3 Approach to examining the relationship between departmentalized instruction and key outcomes, including student achievement and teacher retention

Examining the relationship between departmentalized instruction and key outcomes required several different samples, data sources, measures, and analytic methods. Exhibit B.20 provides more details.

#### Exhibit B.20. Analysis, Samples, Data, and Measures for Examining the Relationship Between Departmentalized Instruction and Key Outcomes

Information	Student achievement analysis	Teacher retention analysis
Analysis	<ul style="list-style-type: none"> <li>Compared outcomes for schools that used departmentalized instruction for two years to schools that maintained self-contained instruction for two years</li> <li>Adjusted for preexisting differences between the two sets of schools through propensity score weighting and regression adjustment</li> </ul>	Same approach as student achievement analysis

Information	Student achievement analysis	Teacher retention analysis
Sample	<ul style="list-style-type: none"> <li>Math: 12 departmentalized and 19 self-contained schools (78 percent of the 40 schools remaining in the study from districts that had at least one school that departmentalized in 5th grade)</li> <li>English language arts: 14 departmentalized and 21 self-contained schools (88 percent of the 40 schools remaining in the study from districts that had at least one school that departmentalized in 5th grade)</li> </ul>	18 departmentalized and 26 self-contained schools (100 percent of the schools remaining in the study from districts that had at least one school that departmentalized in 4th or 5th grade)
Outcome data	State or district assessment scores from spring 2021 (Year 2)	<ul style="list-style-type: none"> <li>District records on teacher assignments from spring 2019, fall 2020, and spring 2021</li> <li>Principal interview data on teacher assignments from spring 2019, fall 2020, and spring 2021</li> </ul>
Measures	Student achievement in grade 5 math and English language arts	Percentage of 4th- and 5th-grade teachers in study schools in spring 2019 who were retained in that school until the 2020-2021 school year

### Student achievement and teacher retention measures

To measure student achievement, the study used students’ test scores on state and district assessments in math and English language arts.<sup>18</sup> To standardize the scores across the different state and district assessments, the study converted these scores to a standard unit known as a z-score, which describes each student’s score relative to the average score in their grade in their state or district. If a student has a positive z-score, this implies the student performed better on the assessment than the average student in their state or district; a negative score indicates the student performed below average.

The study converted the test scores from the state assessments to z-scores by subtracting the statewide average score and dividing by the statewide standard deviation for that year, grade, and subject. Similarly, the study converted test scores from district assessments to z-scores by subtracting the districtwide average score and dividing by the districtwide standard deviation for that year, grade, and subject. The study then calculated the average math and English language arts z-scores for each school. Some schools in the study did not administer math or English language arts standardized assessments in spring 2021 due to the COVID-19 pandemic. This resulted in 78 percent of schools having valid math scores and 88 percent having valid English language arts scores.

To measure teacher retention, the study first identified teachers who were in study schools and teaching a core subject (math, English language arts, social studies, or science) in 4th or 5th grade in spring 2019 based on district administrative records. In cases where district administrative records were incomplete, the study instead relied on principal interview data on teachers’ assignments. The study then used those same data sources to determine whether each of those teachers were still teaching in the same school in the 2020-2021 school year. The study used that information to calculate the percentage of 4th- and 5th-grade teachers retained at each school.

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## Estimating the relationship between departmentalized instruction and outcomes

To estimate the relationship between departmentalized instruction and key outcomes, the study compared outcomes of schools that maintained departmentalized instruction for two years and those that maintained self-contained instruction for two years. To adjust for preexisting differences between the two sets of schools, the study first reweighted the self-contained schools so that as a group, their characteristics would resemble those of the departmentalized schools in the analysis. The study then adjusted for any remaining preexisting differences between the two sets of schools using regression models. Studies comparing experimental and quasi-experimental designs have shown this approach can reduce much of the bias from quasi-experimental designs, particularly when highly predictive covariates such as pre-implementation measures of the outcome (students' achievement) are available.<sup>19</sup> However, the findings in this study may not be completely free from bias due to unobserved differences between the schools that departmentalized and those that maintained self-contained instruction. For this reason, the study refers to these findings as estimates of the relationship between departmentalized instruction and outcomes rather than estimates of the effects of departmentalized instruction.

These analysis methods estimate the average relationship between departmentalized instruction and key outcomes among the study schools that chose to departmentalize and the self-contained schools that resembled them at the start of the study. The study focused on comparisons between these types of schools because it anticipated that schools outside of this study that pursue departmentalized instruction would be more like the study schools that decided to departmentalize than those that continued using self-contained instruction. In addition, the study focused on estimating relationships for the average *school* that resembled the departmentalized schools in the study—rather than for the average teacher or student in those schools. This is because schools choose to departmentalize for an entire school or grade within a school, rather than for individual teachers or students.

The specific analytic approach involved two steps: (1) reweighting self-contained schools to resemble departmentalized schools and (2) estimating the relationship between departmentalized instruction and key outcomes using regression models.

### *Reweighting self-contained schools to resemble departmentalized schools*

The study calculated a weight for each self-contained school so that the weighted sample of those schools would, on average, resemble the unweighted sample of departmentalized schools on pre-study characteristics. The study calculated the weights using a model for the propensity score, or the estimated probability of each school deciding to departmentalize. The study estimated the propensity score with a logit regression as follows:

$$(5) \quad p_{sd} = \Pr(DI_{sd} = 1 | X_{sd}, Z_d) = \Lambda(\alpha + \beta X_{sd} + \gamma Z_d),$$

where  $s$  refers to schools, and  $d$  refers to districts;  $DI_{sd}$  is an indicator equal to 1 if the school switched to departmentalization;  $X_{sd}$  is a vector of pre-implementation covariates;  $Z_d$  is a set of indicators for school districts; and  $\Lambda(x) = \frac{e^x}{1 + e^x}$  (the logistic function). The study used this model to calculate the propensity score

$\hat{p}_{sd}$  for each school.

The study sought to minimize underlying differences between the schools that chose to departmentalize and those that chose to maintain self-contained instruction. As such, each model included a set of covariates

capturing pre-study school characteristics most likely to be related to the decision to departmentalize and the outcome of interest. The models varied slightly depending on the outcome of interest. However, each included student achievement and demographics averaged to the school level; principal responses to the survey on their views of departmentalized instruction at the start of the study; teacher characteristics; and district indicators (Exhibit B.21). The pre-study value-added scores were unavailable from all schools in one district. To account for this, the study also included an indicator for whether the average value-added score was missing. In creating the school-level averages, the study took the average across all students or teachers with available data, excluding any students or teachers with missing data. All variables in the model were from the 2018-2019 school year—the year before schools began implementing departmentalized instruction.

**Exhibit B.21. Pre-Study Characteristics Included in the Propensity Score Models for Each Outcome**

	Outcome analysis		
	Math achievement	English language arts achievement	Teacher retention
<b>School-level characteristics</b>			
<b>Student achievement (average 3rd-grade z-scores)</b>			
Math	X		X
English language arts		X	X
<b>Student characteristics (percentage of students from the whole school)</b>			
Black	X	X	X
Hispanic	X	X	X
Eligible for free or reduced-price lunch	X	X	X
<b>Principals' beliefs<sup>a</sup> (indicator of agreement with the statement)</b>			
“To meet our student achievement goals, my school needs to make major changes at the school or grade.”	X	X	X
“Some of my teachers are better at teaching math than English language arts, whereas others are better at teaching English language arts than math.”	X	X	X
<b>Teacher characteristics</b>			
Math value-added score (average among 5th-grade teachers)	X		
English language arts value-added score (average among 5th-grade teachers)		X	
Average value-added score across math and English language arts (average among 4th- and 5th-grade teachers)			X
Indicator for missing school-level average value-added score	X	X	X
Years of teaching experience (average among 4th- and 5th-grade teachers)			X
<b>District fixed effects (indicator of district membership)</b>			
Separate indicators for each district	X	X	X

Source: Student administrative records from the 2018-2019 school year (student achievement); Common Core of Data from the 2018-2019 school year (student and school characteristics); principal survey from spring 2019 (principal beliefs); teacher administrative records from the 2018-2019 school year (value-added scores and years of teaching experience).

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<sup>a</sup> Principals read two statements that represented opposite beliefs and appeared on opposite ends of a scale. The survey asked principals to select a number from 1 to 5, depending on which statement best reflected their beliefs. For example, one statement on the left side of the scale (at 1) was “From my experiences or those of my colleagues, 4th- and 5th-grade students benefit overall from departmentalization.” The opposite statement on the right side of the scale (at 5) was “From my experiences or those of my colleagues, 4th- and 5th-grade students do not benefit overall from departmentalization.” Principals received a 1 for the indicator if they selected 1 or 2 for the statement in the exhibit, indicating they agreed with the statement.

The study used the propensity scores to calculate weights for self-contained schools so they would resemble departmentalized schools. Self-contained schools received a weight,  $\hat{p}_{sd} / (1 - \hat{p}_{sd})$ . Therefore, self-contained schools with larger propensity scores—those most similar to the departmentalized schools in their observed characteristics—received larger weights. This made the weighted sample of self-contained schools more similar to the sample of departmentalized schools. The study reduced any weights that were above the 99th percentile of the distribution of weights down to the weight at the 99th percentile to ensure these large weights did not disproportionately influence the results.<sup>20</sup> All departmentalized schools had an equal weight of 1.

The study assessed the quality of the propensity score model by examining whether the departmentalized schools and weighted self-contained schools were well balanced on all covariates used in the propensity score model. For each covariate included in the propensity score model, the study examined the standardized difference in mean values, or effect size, between the departmentalized and weighted self-contained schools. The study calculated these effect sizes in the same way that the U.S. Department of Education’s What Works Clearinghouse would calculate them to determine whether the study would meet standards with reservations.<sup>21</sup> Specifically, for the continuous variables (student achievement, teacher experience, and teacher value-added), the study calculated the effect sizes using a measure known as Hedges’ *g*, with standard deviations at the school level. The study then converted those effect sizes into student-level effect sizes using formulas in the What Works Clearinghouse handbook.

For student characteristics, the study calculated the effect sizes using the Cox Index formula in the What Works Clearinghouse handbook. To do so, the study first converted the percentages across schools into probabilities by dividing by 100. The study weighted the probabilities at the school level, consistent with the school-level analysis. The study also used the Cox Index to calculate the effect sizes for the variables on principals’ views on departmentalized instruction. The study considered the departmentalized and self-contained schools to be well balanced on a given covariate if the absolute value of the standardized effect size was less than 0.25 (that is, the means differed by less than a quarter of a standard deviation). This is consistent with the standard the What Works Clearinghouse uses for assessing whether covariates are balanced.

In addition, for each covariate, the study examined the ratio of the variance of the departmentalized schools to the variance of the self-contained schools using propensity score weights. The literature recommends variance ratios as another measure of covariate balance in addition to effect sizes.<sup>22</sup> Following recommendations from the literature, the study considered the departmentalized and self-contained schools to be well balanced on a given covariate if the variance ratio was 0.5 to 2.0 (the larger value of the variance was no more than twice the smaller value).

Based on these criteria, departmentalized and self-contained schools were well balanced on most covariates in the analysis samples for 5th-grade math achievement (Exhibit B.22), 5th-grade English language arts achievement (Exhibit B.23), and teacher retention (Exhibit B.24). Most standardized differences were less than 0.25 standard deviations, and most variance ratios were in the recommended range of 0.5 to 2.0. As described later, the regression model used for the analysis adjusted for the remaining differences in covariates.

The sample of schools included in these analyses—those that maintained their original instructional approach (departmentalized or self-contained) for both study school years and had the necessary outcome data—had higher average student achievement than the sample of schools originally participating in the study (Exhibit B.5). For example, in the analysis sample for 5th-grade math outcomes, average math achievement in departmentalized schools in the year before the study began was a quarter of a standard deviation higher than the average in their state or district (Exhibit B.22). By contrast, average math achievement in the year before the study began among the original sample of departmentalized schools was approximately the same as the state or district average.

**Exhibit B.22. Pre-Study Characteristics for the Analysis Sample Used to Estimate the Relationship Between Departmentalized Instruction and 5th-Grade Math Achievement**

School-level characteristic	Means		Difference		
	Departmentalized schools	Self-contained schools	Difference in means <sup>a</sup>	Effect size <sup>b</sup>	Ratio of variances <sup>c</sup>
<b>Student achievement (average 3rd-grade z-scores)</b>					
Math	0.25	0.23	0.03	0.03	0.47 <sup>^</sup>
English language arts	0.18	0.04	0.14	0.15	0.73
<b>Student characteristics (percentage of students in the school)</b>					
<b>Race and ethnicity<sup>d</sup></b>					
Black	6	6	0	0.01	0.95
Hispanic	36	39	-3	-0.08	0.83
White	47	43	4	0.10	1.12
Other	11	13	-1	-0.08	1.14
Eligible for free or reduced-price lunch	53	61	-8	-0.20	1.14
<b>Principals' beliefs<sup>e</sup> (percentage in agreement)</b>					
“To meet our student achievement goals, my school needs to make major changes at the school or grade”	50	35	15	0.37 <sup>^</sup>	1.14
“Some of my teachers are better at teaching math than English language arts, whereas others are better at teaching English language arts than math”	92	88	4	0.25	0.74
<b>Value-added scores (average among 5th-grade teachers)<sup>f</sup></b>					
Math	-0.05	-0.21	0.15	0.17	0.50
English language arts	0.01	-0.22	0.21	0.20	0.32 <sup>^</sup>
<b>Number of schools</b>	<b>12</b>	<b>19</b>			

Source: Student administrative records from the 2018-2019 school year (student achievement); Common Core of Data from the 2018-2019 school year (student and school characteristics); principal survey from spring 2019 (principal beliefs); teacher administrative records from the 2018-2019 school year (value-added scores).

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Notes: This exhibit weights the means for self-contained schools using inverse propensity scores, consistent with the weights used in the outcome analysis. The study calculated the difference in means, effect sizes, and ratios of variances with the weights for the self-contained schools.

The study averaged all student and teacher characteristics to the school level, consistent with the outcome analysis. Test scores are reported for 3rd-grade students because students in the outcome sample were in 3rd grade during the year before the study began. The sample for teacher characteristics includes all 5th-grade teachers identified as core subject teachers with available data in the year before the study. The study identified core subject teachers as teachers assigned to teach math or English language arts and either had a value-added score (for schools in districts that provided value-added scores) or at least 10 students assigned to them (for schools in districts that did not provide value-added scores). The study reported student characteristics (race, ethnicity, and free or reduced-price lunch status) at the school level for all students in the school.

The study does not report  $p$ -values and statistical significance because hypothesis testing is not recommended for assessing covariate balance (Imai et al. 2008).

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> The study calculated the effect size for math and English language arts achievement, math and English language arts value-added scores, and teaching experience using Hedges'  $g$  with standard deviations at the student level. The study calculated effect sizes for all other covariates using the Cox Index.

<sup>c</sup> The ratio of variances represents the variance of the covariate in the departmentalized schools divided by the variance of the covariate in self-contained schools.

<sup>d</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>e</sup> Principals read two statements that represented opposite beliefs and appeared on opposite ends of a scale. The survey asked principals to select a number from 1 to 5, depending on which statement best reflected their beliefs. For example, one statement on the left side of the scale (at 1) was "From my experiences or those of my colleagues, 4th- and 5th-grade students benefit overall from departmentalization." The opposite statement on the right side of the scale (at 5) was "From my experiences or those of my colleagues, 4th- and 5th-grade students do not benefit overall from departmentalization." Principals received a 1 for the indicator if they selected 1 or 2 to the statement in the exhibit, indicating that they agreed with the statement.

<sup>f</sup> Value-added scores are in student standard deviation units.

<sup>^</sup> Falls outside of the recommended range for covariate balance.

**Exhibit B.23. Pre-Study Characteristics for the Analysis Sample Used to Estimate the Relationship Between Departmentalized Instruction and 5th-Grade English Language Arts Achievement**

School-level characteristic (percentages unless otherwise noted)	Means		Difference		Ratio of variances <sup>c</sup>
	Departmentalized schools	Self-contained schools	Difference in means <sup>a</sup>	Effect size <sup>b</sup>	
<b>Student achievement (average 3rd-grade z-scores)</b>					
Math	0.27	0.25	0.02	0.02	0.43 <sup>^</sup>
English language arts	0.19	0.09	0.10	0.11	0.68
<b>Student characteristics (percentage of students in the school)</b>					
<b>Race and ethnicity<sup>d</sup></b>					
Black	6	6	0	0.05	0.84
Hispanic	34	34	0	0.01	0.79
White	48	48	1	0.01	0.97
Other	12	13	-1	-0.07	1.08
Eligible for free or reduced-price lunch	50	54	-4	-0.09	1.01
<b>Principals' beliefs<sup>e</sup> (percentage in agreement)</b>					
“To meet our student achievement goals, my school needs to make major changes at the school or grade”	50	28	22	0.57 <sup>^</sup>	1.27
“Some of my teachers are better at teaching math than English language arts, whereas others are better at teaching English language arts than math”	86	82	4	0.16	0.85
<b>Value-added scores (average among 5th-grade teachers)<sup>f</sup></b>					
Math	-0.05	-0.11	0.07	0.08	0.52
English language arts	-0.01	-0.08	6.830.07	0.07	0.28 <sup>^</sup>
<b>Number of schools</b>	<b>14</b>	<b>21</b>			

Source: Student administrative records from the 2018-2019 school year (student achievement); Common Core of Data from the 2018-2019 school year (student and school characteristics); principal survey from spring 2019 (principal beliefs); teacher administrative records from the 2018-2019 school year (value-added scores).

Notes: This exhibit weights the means for self-contained schools using inverse propensity scores, consistent with the weights used in the outcome analysis. The study calculated the difference in means, effect sizes, and ratios of variances with the weights for the self-contained schools.

The study averaged all student and teacher characteristics to the school level, consistent with the outcome analysis. Test scores are reported for 3rd-grade students because students in the outcome sample were in 3rd grade during the year before the study. The sample for teacher characteristics includes all 5th-grade teachers identified as core subject teachers with available data in the year before the study. The study identified core subject teachers as teachers assigned to teach math or English language arts and either a value-added score (for schools in districts that provided value-added scores) or at least 10 students assigned to them (for schools in districts that did not provide value-added scores). The study reported student characteristics (race, ethnicity, and free or reduced-price lunch status) at the school level for all students in the school.



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The study does not report *p*-values and statistical significance because hypothesis testing is not recommended for assessing covariate balance (Imai et al. 2008).

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> The study calculated the effect size for math and English language arts achievement, math and English language arts value-added scores, and teaching experience using Hedges' *g* with standard deviations at the student level. The study calculated effect sizes for all other covariates using the Cox Index.

<sup>c</sup> The ratio of variances represents the variance of the covariate in the departmentalized schools divided by the variance of the covariate in self-contained schools.

<sup>d</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>e</sup> Principals read two statements that represented opposite beliefs and appeared on opposite ends of a scale. The survey asked principals to select a number from 1 to 5 depending on which statement best reflected their beliefs. For example, one statement on the left side of the scale (at 1) was "From my experiences or those of my colleagues, 4th- and 5th-grade students benefit overall from departmentalization." The opposite statement on the right side of the scale (at 5) was "From my experiences or those of my colleagues, 4th- and 5th-grade students do not benefit overall from departmentalization." Principals received a 1 for the indicator if they selected 1 or 2 to the statement in the exhibit, indicating that they agreed with the statement.

<sup>f</sup> Value-added scores are in student standard deviation units.

<sup>^</sup> Falls outside of the recommended range for covariate balance.

**Exhibit B.24. Pre-Study Characteristics for the Analysis Sample Used to Estimate the Relationship Between Departmentalized Instruction and Teacher Retention**

School-level characteristic	Means		Difference		Ratio of variances <sup>c</sup>
	Departmentalized schools	Self-contained schools	Difference in means <sup>a</sup>	Effect size <sup>b</sup>	
<b>Student achievement (average 3rd-grade z-scores)</b>					
Math	0.13	0.09	0.04	0.03	1.19
English language arts	0.06	0.02	0.04	0.04	1.27
<b>Student characteristics (percentage of students in the school)</b>					
<b>Race and ethnicity<sup>d</sup></b>					
Black	18	14	4	0.17	2.46 <sup>^</sup>
Hispanic	27	30	-3	-0.09	0.75
White	44	43	2	0.04	1.34
Other	11	13	-2	-0.14	1.14
Eligible for free or reduced-price lunch	53	57	-3	-0.08	1.14
<b>Principals' beliefs<sup>e</sup> (percentage in agreement)</b>					
"To meet our student achievement goals, my school needs to make major changes at the school or grade"	57	46	12	0.28 <sup>^</sup>	1.00
"Some of my teachers are better at teaching math than English language arts, whereas others are better at teaching English language arts than math"	90	88	2	0.15	0.83
<b>Teacher characteristics (average among 4th- and 5th-grade teachers)</b>					
Math and English language arts value-added (average across subjects)	0.08	0.01	0.06	0.08	0.57
Years of teaching experience <sup>f</sup>	11.8	11.9	-0.2	-0.03	0.46 <sup>^</sup>
<b>Number of schools</b>	<b>21</b>	<b>28</b>			

Source: Student administrative records from the 2018-2019 school year (student achievement); Common Core of Data from the 2018-2019 school year (student and school characteristics); principal survey from spring 2019 (principal beliefs); teacher administrative records from the 2018-2019 school year (value-added scores).

Notes: This exhibit weights the means for self-contained schools using inverse propensity scores, consistent with the weights used in the outcome analysis. The study calculated the difference in means, effect sizes, and ratios of variances with the weights for the self-contained schools.

The study averaged all student and teacher characteristics to the school level, consistent with the outcome analysis. Test scores are reported for 3rd-grade students because students in the outcome sample for the retention analysis were in 2nd and 3rd grade during the year before the study. However, 2nd-grade students were not tested in the year before the study and could not be included. The sample for teacher characteristics includes all 4th- and 5th-grade teachers identified as core subject teachers with available data in the year before the study. The study identified core subject teachers as teachers assigned to teach math or English language arts and either had a value-added score (for schools in districts that provided value-added scores) or at least 10 students assigned to them (for schools in districts that did not provide value-added scores). The study reported student characteristics (race, ethnicity, and free- or reduced-price lunch status) at the school level for all students in the school.

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The study does not report  $p$ -values and statistical significance because hypothesis testing is not recommended for assessing covariate balance (Imai et al. 2008).

<sup>a</sup> Values in this column may differ from differences in the reported means from prior columns due to rounding.

<sup>b</sup> The study calculated the effect size for math and English language arts achievement, math and English language arts value-added scores, and teaching experience using Hedges'  $g$  with standard deviations at the student level. The study calculated effect sizes for all other covariates using the Cox Index.

<sup>c</sup> The ratio of variances represents the variance of the covariate in the departmentalized schools divided by the variance of the covariate in self-contained schools.

<sup>d</sup> Race and ethnicity categories are mutually exclusive but may not sum to 100 due to rounding.

<sup>e</sup> Principals read two statements that represented opposite beliefs and appeared on opposite ends of a scale. The survey asked principals to select a number from 1 to 5 depending on which statement best reflected their beliefs. For example, one statement on the left side of the scale (at 1) was "From my experiences or those of my colleagues, 4th- and 5th-grade students benefit overall from departmentalization." The opposite statement on the right side of the scale (at 5) was "From my experiences or those of my colleagues, 4th- and 5th-grade students do not benefit overall from departmentalization." Principals received a 1 for the indicator if they selected 1 or 2 to on the scale, indicating that they agreed with the statement.

<sup>f</sup> Years of experience include all years of teaching before and including the 2018-2019 school year.

<sup>^</sup> Falls outside of the recommended range for covariate balance.

### *Estimating the relationship between departmentalized instruction and key outcomes using regression models*

To estimate the relationship between departmentalized instruction and outcomes (student achievement or teacher retention), the study estimated the following school-level regression model:

$$(6) \quad y_{sd} = \phi_1 + X_{sd}\theta_1 + DI_{sd}\theta_2 + \gamma Z_d + \varepsilon_{sd},$$

where  $y_{sd}$  is the outcome,  $x_{sd}$  is a vector of covariates (including all of the school-level covariates in the propensity score model),  $DI_{sd}$  is an indicator for whether schools chose to implement departmentalized instruction (equal to 1 for schools that chose to departmentalize and 0 for schools that maintained self-contained instruction),  $Z_d$  is a set of indicators for school districts,  $\varepsilon_{sd}$  is the error term, and  $\phi_1$ ,  $\theta_1$ ,  $\theta_2$ , and  $\gamma$  are parameters to be estimated, with  $\theta_2$  representing the difference in outcomes between departmentalized and self-contained schools. The regression model used the weights described previously. The model used weights and covariate adjustment to more accurately estimate the relationship between departmentalized instruction and outcomes by controlling for factors that might influence both the decision to departmentalize and the outcomes. The model also accounted for the clustering of schools within the same district.

## SECTION C. SUPPLEMENTAL FINDINGS AND EXHIBITS

This section supplements the exhibits and results cited in the text of the report and provides statistical information for readers interested in the technical details of the study's findings. This includes statistics related to schools' implementation of the three key steps to departmentalize instruction, teachers' classroom experiences, and the relationship between departmentalized instruction and key outcomes.

### **C.1 Schools implemented three key steps to departmentalize instruction, but not without challenges**

The study's first finding focuses on schools' implementation of the three key steps to departmentalize instruction, including: (1) the staffing models departmentalized schools used, (2) challenges schools encountered when developing and implementing a schoolwide schedule, and (3) whether schools assigned teachers to subjects based on relative strengths.

#### **C.1.1 Staffing models departmentalized schools used**

Exhibit 3 of the report showed that schools generally selected staffing models with a moderate level of teacher specialization. However, as discussed in Section A of this appendix, staffing model options depended on the number of teachers departmentalizing in each teacher team. Exhibit C.1 shows the staffing models that schools with an odd or even number of teachers departmentalizing used. The number of teachers in a grade level may also influence a school's staffing model options. Exhibit C.2 shows staffing models by number of teachers per grade.

Most teacher teams used staffing models with a moderate level of teacher specialization, regardless of whether they had an even or odd number of teachers departmentalizing (Exhibit C.1). For example, most teams with even numbers of teachers (68 percent) used the Paired Subjects model, which had a moderate level of specialization, and all the teams with odd numbers of teachers used the Math or English Language Arts Focus model, which also had a moderate level of specialization. Exhibit C.1 shows that the Paired Subjects model was also the most common staffing model in departmentalized elementary schools nationally (used in 57 percent of schools that used departmentalized instruction in 4th or 5th grade).

The pattern of selecting staffing models with a moderate level of teacher specialization still holds when looking at the models selected by number of teachers in a grade level (Exhibit C.2). If a grade has four teachers, the grade could use the Full Specialization model with each teacher in the grade teaching just one subject. On the other hand, if a grade has only two teachers, the school would have to select a model in which teachers teach multiple subjects. To use a model with more specialization, the school would need to form a cross-grade team. In the study sample, most grade levels with four teachers still chose a staffing model with a moderate level of teacher specialization (52 percent used the Paired Subjects model and 26 percent used the Math or English Language Arts Focus model). Only a small number (9 percent) of grade levels with four teachers used the Full Specialization model. Most grade levels with two teachers picked the Paired Subjects model in which each teacher would teach two subjects, and only 12 percent picked the more specialized model available to them (the Math or English Language Arts Focus model). The study sample had only seven cross-grade teams.

### Exhibit C.1. Staffing Models Departmentalized Schools Used

Staffing model	Percentage of teacher teams using staffing model in study schools			Percentage of teacher teams using staffing model in schools nationwide <sup>b</sup>
	Overall	Even number of teachers in team	Odd number of teachers in team	Overall
			team	
Full Specialization (each teacher teaches just one core subject)	1-2 <sup>a</sup>	1-3 <sup>a</sup>	0	5
Math or English Language Arts Focus (specific teachers teach math or English language arts and other teachers teach both science and social studies)	39	13-15 <sup>a</sup>	100	16
Paired Subjects (each teacher teaches two of the four core subjects)	47	68	0	57
Homeroom (each teacher teaches three of the four core subjects)	11-12 <sup>a</sup>	16	0	7
Could not be determined <sup>c</sup>	0	0	0	16
<b>Number of teacher teams</b>	<b>97</b>	<b>68</b>	<b>29</b>	<b>368</b>

Source: Principal interviews conducted in fall 2019. U.S. Department of Education, Institute of Education Sciences, Implementation of Title I/II Program Initiatives school survey on policies and practices promoted by Title I and Title II-A of the Elementary and Secondary Education Act conducted in the 2021-2022 school year.

Notes: Data from teacher teams in study schools are unweighted, and data from teacher teams nationwide are weighted estimates of the population.

<sup>a</sup> Exact percentage has been withheld to protect respondent confidentiality in accordance with National Center for Education Statistics statistical standards.

<sup>b</sup> The sample of schools nationwide was limited to principals whose schools included 4th or 5th grade and at least one of those grades was departmentalized. If teachers taught multiple classes of different students in one or more academic subjects, the grade was considered departmentalized. Unlike the study schools, teachers in the nationwide sample could have taught both math and English language arts. Principals answered questions about the number of teachers students had for their core subjects and, separately for 4th and 5th grades, the number of subjects that math and English language arts teachers taught. The study used the responses to these questions to determine the staffing model in each grade.

<sup>c</sup> Because data on individual teachers or teams were not available, the study assumed there was just one team per grade. For example, if a principal reported on both 4th grade and 5th grade, the study counted this as two teams in calculating the percentage of teams. In cases where schools used cross-grade level teams or multiple teams per grade level with different staffing models in each, the staffing models could not be determined based on the survey responses.

**Exhibit C.2. Staffing Models Used by Departmentalized Schools, by Number of Teachers Per Grade**

Staffing model	Percentage of grade levels using staffing model in study schools			
	Two teachers per grade	Three teachers per grade	Four teachers per grade	Five or six teachers per grade
Full Specialization (each teacher teaches just one core subject)	0	0	9	0
Math or English Language Arts Focus (specific teachers teach math or English language arts and other teachers teach both science and social studies)	12	100	26	25-50 <sup>a</sup>
Paired Subjects (each teacher teaches two of the four core subjects)	68	0	52	25-50 <sup>a</sup>
Homeroom (each teacher teaches three of the four core subjects)	20	0	13	0
Two or more models	0	0	0	25-50 <sup>a</sup>
<b>Number of grade levels</b>	<b>25</b>	<b>25</b>	<b>23</b>	<b>4</b>

Source: Principal interviews conducted in fall 2019.

Notes: Seven teacher teams taught both 4th and 5th grade. This exhibit counts each of those teams as a single grade level.

<sup>a</sup> Exact percentage has been withheld to protect respondent confidentiality in accordance with National Center for Education Statistics statistical standards.

## **C.1.2 Scheduling and other reported challenges and benefits of departmentalized instruction**

Exhibit 4 of the report showed that principals of departmentalized schools reported that departmentalized instruction made scheduling challenging. The most common scheduling challenges were developing a schoolwide schedule and scheduling special education, English learner, or other support services.

Exhibit C.3 provides information on these and other challenges that principals reported in the first year of implementation of departmentalized instruction (2019-2020), before schools closed due to the pandemic. In addition to scheduling-related challenges, principals most commonly reported challenges related to the following:

- Students transitioning between subjects (60 percent)
- Scheduling and attending parent-teacher conferences (35 percent)
- Teachers' concerns about departmentalized instruction, including worries about team dynamics or test score accountability (33 percent)

Assigning teachers to subjects could be challenging if teachers' preferences for which subjects to teach do not align with their strongest subjects based on their measured effectiveness. Although 14 percent of principals said that assigning teachers was a challenge, no principals specifically brought up the challenge of mismatches between teachers' preferences and their measured effectiveness.

### Exhibit C.3. Start-Up Challenges of Using Departmentalized Instruction

Challenge of departmentalized instruction	Percentage of principals who reported the challenge in fall 2019 or spring 2020
<b>Scheduling-related challenges</b>	
It was hard to develop the schoolwide schedule	42
It was hard to schedule or provide special education, ELL, or other services	37
It was hard to schedule departmentalized grades in a way that met instructional time requirements (for example, if English language arts needed 90 minutes and math needed 60 minutes)	19
Scheduled disruptions were more disruptive to a departmentalized grade level (for example, testing always occurred in the morning so the same subject was interrupted for one set of students)	14
It was hard to design the schedule when there was an odd number of teachers in the grade	9
<b>Reported at least one of the five scheduling challenges</b>	74
<b>Other challenges</b>	
It was hard for students to transition between subjects and teachers	60
Teachers and parents needed to schedule and attend more parent-teacher conferences	35
Teachers had concerns about departmentalized instruction (for example, they were worried about team dynamics or accountability for test scores)	33
It was hard for teachers to coordinate parent outreach and it was hard for parents to have more than one teacher point of contact	26
It was hard to teach more students (for example, it was hard to individualize instruction)	23
It was hard for teachers to manage student behavior	23
It was hard for students to adapt to multiple teachers' expectations, personalities, or teaching styles	23
Parents did not like departmentalized instruction because they could not request their child to be placed with (or not with) a certain teacher or they had other concerns about departmentalized instruction	23
It was hard for teachers to adjust the amount of time they spent on subjects during the day or hard for teachers to "fit it all in," or it was hard for students to finish work within the time constraints	21
It was hard for teachers to collaborate with other teachers (their students' other teachers or other teachers teaching the same subjects), and students received less cross-curricula instruction	16
It was hard for teachers to build strong relationships with students or parents, and it was hard for students to build relationships with multiple teachers	14

<b>Challenge of departmentalized instruction</b>	<b>Percentage of principals who reported the challenge in fall 2019 or spring 2020</b>
It was hard for principals to assign teachers to subjects or it was hard to adjust the staffing model to match changing school needs each year	14
Teachers experienced a heavier workload or uneven workload between teachers in a team (for example, grading for one subject took longer than grading for another)	12
It was challenging to offer professional development that was applicable to all teachers	12
It was hard to build community among students	7
It was hard to find students in the building, when necessary, because students were in multiple classrooms throughout the day	7
<b>Number of principals</b>	<b>43</b>

Source: Interviews conducted in fall 2019 and spring 2020 with principals of schools using departmentalized instruction at the time of the interview.

ELL = English language learner.

As discussed in the report, departmentalized instruction may yield benefits to schools as well as challenges. Exhibit C.4 shows the benefits principals reported in spring of the first year of implementation (2020). The most commonly reported benefit (65 percent) was that teachers gained more expertise in the subjects they taught. Just over half (53 percent) of the principals reported that the opportunity for teachers and students to build relationships with one another was a benefit. Contrary to the potential benefits of departmentalized instruction discussed in the report, few principals (7 percent) reported they believed departmentalized instruction allowed teachers to focus their professional development on specific subjects.

#### **Exhibit C.4. Start-Up Benefits of Using Departmentalized Instruction**

<b>Benefit of departmentalized instruction</b>	<b>Percentage of principals who reported the benefit in spring 2020</b>
Teachers gained more expertise in the subjects they taught	65
Teachers were able to build relationships with more students, and students were able to interact and build relationships with more adults at the school	53
Teachers collaborated more with other teachers	47
Teachers were better able to identify subject-specific student needs, and students received more individualized or in-depth instruction	47
Teachers focused on subjects they preferred teaching or were more confident in teaching, and students received instruction from teachers who were enthusiastic about their subject(s)	37
Planning was more efficient because it focused on fewer subjects	35
Students were exposed to various teaching styles and had the opportunity to change environments throughout the day (and this made them more productive)	33
Student achievement increased	33



<b>Benefit of departmentalized instruction</b>	<b>Percentage of principals who reported the benefit in spring 2020</b>
Teachers delivered and students received better instruction	33
Students were better prepared for middle school	30
Students developed better organizational skills or were empowered because they had more responsibility	16
Teacher teams supported each other when communicating with parents about student behavior and academic achievement	14
Teachers could focus their professional development on specific subjects	7
Teachers were more organized	7
Students within a grade received consistent instruction in each subject	7
Students were able to interact with more of their peers (in schools where students did not stay with the same group throughout the day)	7
Teachers had consistent expectations for students across the grade	7
Teachers experienced a lighter workload or had reduced stress, and students benefited from teachers being less stressed	7
Science and social studies received more instructional time because there were teachers dedicated to those subjects	7
<b>Number of principals</b>	<b>43</b>

Source: Interviews conducted in spring 2020 with principals of schools using departmentalized instruction at the time of the interview.

### **C.1.3 Assignment of teachers to subjects**

As discussed in the report, schools usually assigned teachers to math and English language arts in ways aligned to teachers' relative strengths in each subject. Exhibit C.5 provides details for this finding. For 83 percent of the teacher teams analyzed (those whose math and English language arts teachers had value-added scores), the study estimated that swapping any math and English language arts teachers would not have improved average teacher value-added scores in one subject without decreasing them in the other subject. On the other hand, for the other 17 percent of teacher teams, the study estimated that reassigning the math and English language arts teachers would have resulted in higher average teacher value-added scores in one subject without decreasing them in the other subject.

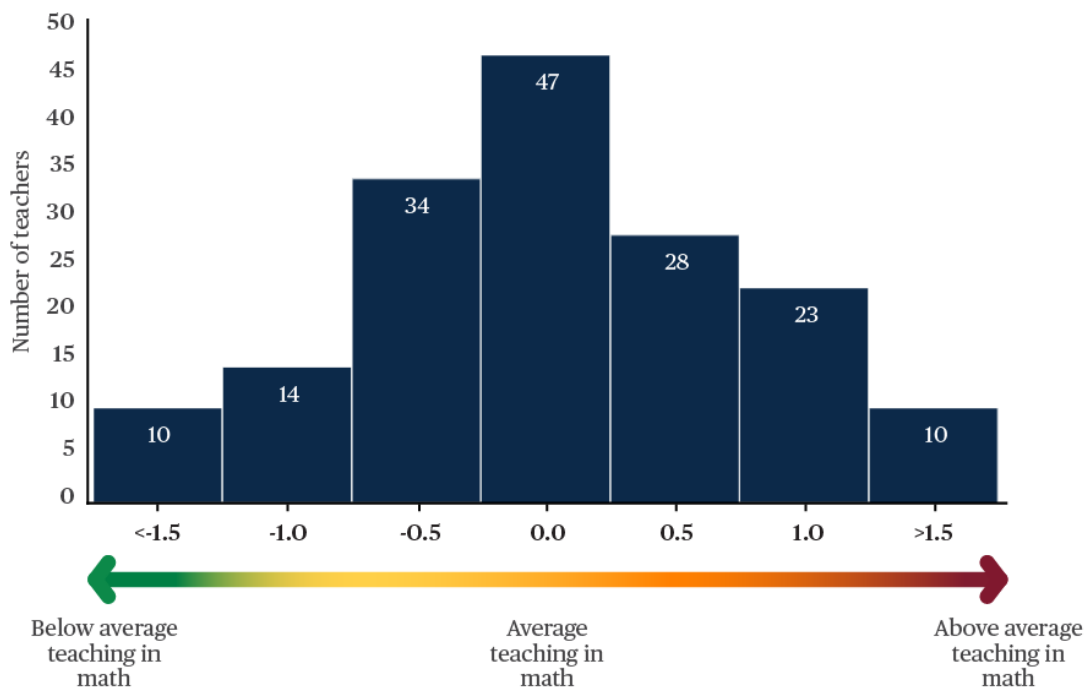
**Exhibit C.5. Alignment of Departmentalized Instruction Subject Assignments with Teacher Effectiveness**

Measure of alignment	Number (percentage) of teacher teams
Teams in which swapping some math and English language arts teachers could improve average teacher value-added scores in one subject without reducing them in the other subject	7 (17%)
Teams in which swapping any math or English language arts teachers could NOT improve average teacher value-added scores in one subject without reducing them in the other subject	35 (83%)
<b>Number of teachers</b>	<b>119</b>
<b>Number of departmentalized grades</b>	<b>42</b>
<b>Number of schools</b>	<b>33</b>

Source: Teacher administrative records from the 2018-2019 through 2020-2021 school years.

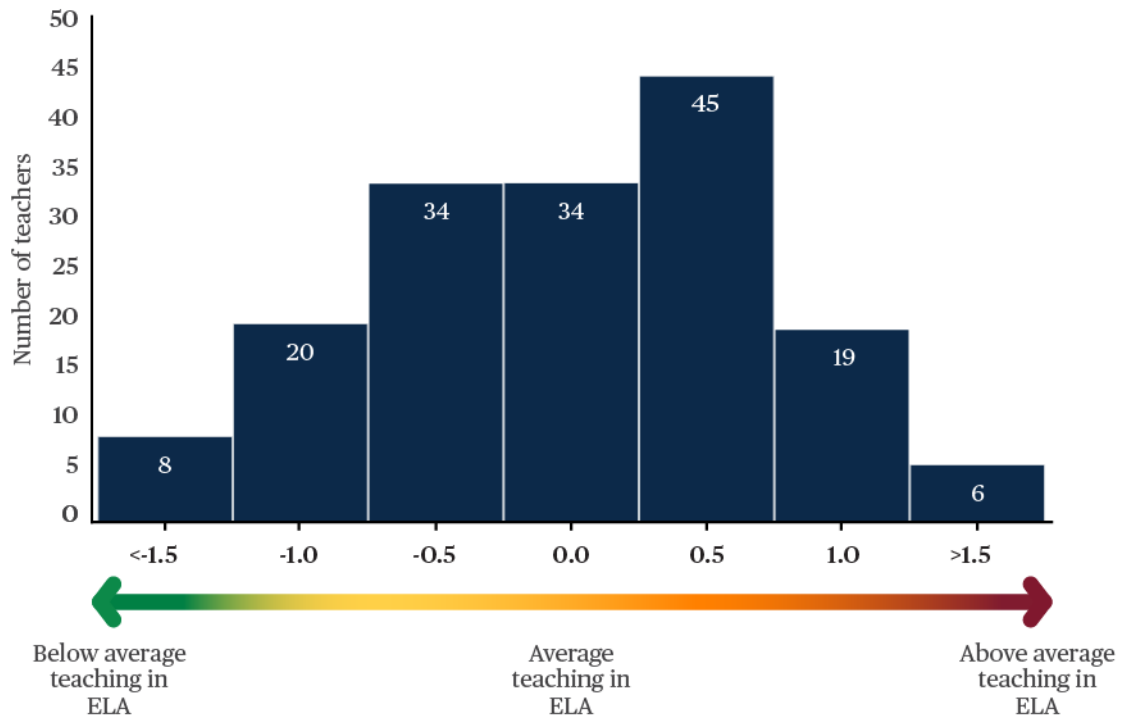
To provide additional context for the finding in Exhibit C.5, Exhibits C.6 through C.8 show distributions of value-added scores for the teachers in departmentalized schools who had value-added scores in both subjects. Exhibit C.6 shows the value-added scores in math, Exhibit C.7 shows the value-added scores in English language arts, and Exhibit C.8 shows the difference in teachers’ scores in math and English language arts. Most teachers tended to have similar value-added scores in math and English language arts, but the number of teachers who were better at teaching English language arts was greater than the number of teachers who were better at teaching math.

**Exhibit C.6. Distribution of Teachers’ Value-Added Scores in Math (Standard Deviation Units) in Departmentalized Schools**



Source: Teacher administrative records from the 2018-2019 school year.

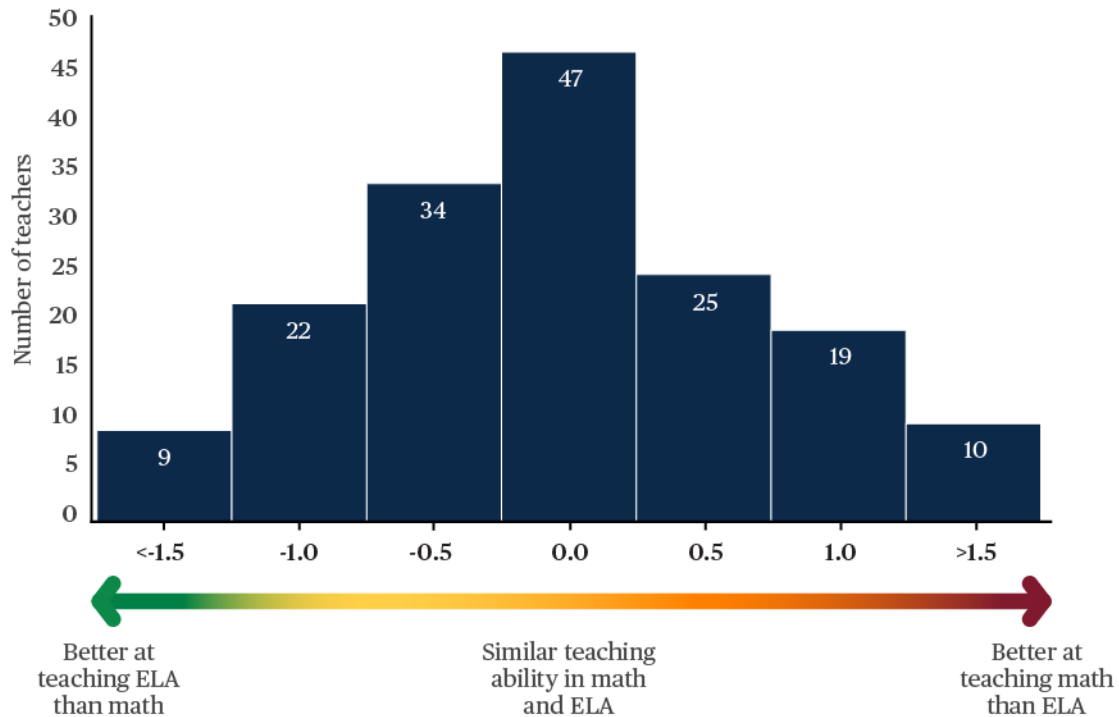
**Exhibit C.7. Distribution of Teachers' Value-Added Scores in English Language Arts (Standard Deviation Units) in Departmentalized Schools**



Source: Teacher administrative records from the 2018-2019 school year.

ELA = English language arts.

**Exhibit C.8. Distribution of Differences Between Teachers’ Value-Added Scores in Math and Their Value-Added Scores in English Language Arts (Standard Deviation Units) in Departmentalized Schools**



Source: Teacher administrative records from the 2018-2019 school year.

ELA = English language arts.

Exhibit 5 of the report also showed that principals reported considering several factors when assigning teachers to subjects. They most often cited teachers’ evaluation ratings based on student achievement, teachers’ preferences, their own perceptions of teachers’ knowledge of subjects, and observations of teachers.

Exhibit C.9 provides details on these findings, including the specific types of evaluation ratings that principals reported considering. Almost half of principals (49 percent) used an evaluation measure that was not based on value-added or student achievement growth, such as achievement score levels.

Exhibit C.9 also provides benchmarks for these findings from principals of schools nationwide in which the 4th or 5th grade was departmentalized. For example, 49 percent of principals of study schools considered teachers’ evaluation ratings based on student achievement as the most important factor when assigning teachers to grades and subjects, whereas only 38 percent of principals nationwide considered it a top-three factor.

### Exhibit C.9. Factors Principals Considered When Making Teacher Subject or Grade Assignments

Factors considered	Principals of schools in study sample using departmentalized instruction		Principals of departmentalized schools nationwide <sup>b</sup>
	Percentage who considered this factor when making teacher subject or grade assignments	Percentage who considered this factor the most important <sup>a</sup>	Percentage who considered this a top-three factor when making teacher subject assignments
<b>Teachers' evaluation ratings based on student achievement</b>	<b>88</b>	<b>49</b>	<b>38</b>
Value-added measures	21	12	n.a.
Achievement growth measures	19	12	n.a.
Not a value-added or achievement growth measure	49	26	n.a.
Teachers' preferences for a certain grade or subject	88	28	48
Teachers' knowledge of subjects (as perceived by the principal)	88	9	n.a.
Observations of teachers' classroom practices	86	7	58
Grade teachers taught the prior school year	53	<7 <sup>d</sup>	n.a.
Teacher team dynamics	21	<7 <sup>d</sup>	40
Teacher-student rapport (teacher's personality and ability to build relationships with students)	12	<7 <sup>d</sup>	16
Other factor <sup>c</sup>	12	<7 <sup>d</sup>	73
<b>Number of principals</b>	<b>43</b>	<b>43</b>	<b>226</b>

Source: Principal interviews conducted in spring 2020 for this study; U.S. Department of Education, Institute of Education Sciences, Implementation of Title I/II Program Initiatives school survey on policies and practices promoted by Title I and Title II-A of the Elementary and Secondary Education Act conducted in the 2021-2022 school year.

<sup>a</sup> The percentages in this column do not add up to 100 because some principals reported that multiple factors were most important when making teacher subject or grade assignments.

<sup>b</sup> The sample of schools nationwide was limited to principals whose schools included 4th or 5th grade and at least one of those grades was departmentalized. Data for principals of departmentalized schools nationwide are weighted estimates of the population.

<sup>c</sup> The survey of principals of departmentalized schools nationwide included several response options that are categorized as other factors in this exhibit, including teachers' certifications to teach certain core academic subjects, teachers' classroom management skills, and the subjects teachers taught the prior school year. These factors were either not relevant or not discussed during the interviews with principals in the study.

<sup>d</sup> Exact percentage has been withheld to protect respondent confidentiality in accordance with National Center for Education Statistics statistical standards.

n.a. = not applicable. The Title I/II survey did not list this as a factor that principals could select.

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## **C.2 Departmentalized teachers' reported implementation experiences were consistent with some of the potential benefits and challenges of the strategy**

The study's second finding focuses on teachers' experiences related to the implementation of departmentalized instruction, including (1) time spent on instruction, planning, transitions between classes, and professional development; (2) teacher satisfaction; and (3) time spent meeting with students and parents.

### **C.2.1 Time spent on instruction, planning, transitions between classes, and professional development**

The report noted several differences between departmentalized and self-contained teachers in time spent on planning and instruction. Exhibit 6 of the report showed that departmentalized teachers spent more time individually planning for the specific subjects they taught, and Exhibit 9 showed that departmentalized teachers spent less total time individually planning across all of their subjects. The report also noted that instructional time was similar for departmentalized and self-contained students for math, science, and social studies, but students in self-contained classrooms received about two hours more instructional time in English language arts per week. Exhibit C.10 provides details for these and other findings on planning and instructional time.

Exhibit C.11 compares instructional time for departmentalized teachers in study schools to self-contained teachers nationwide. Compared to departmentalized classrooms in study schools, self-contained classrooms nationwide received more than two hours less of instruction in English language arts, but about a half hour more of social studies per week.

The report also noted that departmentalized teachers who taught just one subject spent less time planning across all subjects than those who taught two or three subjects. Departmentalized teachers teaching two or three subjects spent more than two hours more in planning each week than departmentalized teachers who taught only one subject (Exhibit C.12). Student instructional time and transitions between subjects were similar between departmentalized teachers who taught one subject and those who taught two or three subjects.

**Exhibit C.10. Time Spent on Instruction, Planning, and Transitioning Between Classes**

Activity	Means			Difference	
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	p-value
<b>Collaborative planning (percentages)</b>					
Participated in collaborative planning period several times per week or daily	28	38	-11	6	0.08
<b>Individual planning (average hours per week)</b>					
English language arts	3.3	2.0	1.2*	0.3	<0.01
Math	2.9	1.9	1.0*	0.4	0.02
Science	1.4	1.0	0.4*	0.2	0.03
Social studies/history	1.6	0.8	0.8*	0.2	<0.01
Across all subjects	4.5	6.0	-1.5*	0.6	0.01
<b>Student instructional time (average hours per week)</b>					
English language arts	5.2	6.8	-1.6*	0.5	<0.01
Math	6.0	5.6	0.4	0.6	0.52
Science	2.5	2.5	0.1	0.3	0.78
Social studies/history	2.7	2.2	0.4	0.3	0.14
<b>Transitioning between subjects (average minutes per day)</b>					
Students transitioning between in-person subjects	13.9	14.6	-0.7	1.6	0.65
Students transitioning between distance-learning subjects	11.2	12.5	-1.3	2.2	0.55
<b>Number of teachers<sup>a</sup></b>	<b>35-101</b>	<b>101-235</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: The study reported teachers' planning time and student instructional time for individual subjects only for teachers who taught those subjects. All 235 self-contained teachers taught math and English language arts, but not all taught social studies or science. Of the self-contained teachers, 225 also taught social studies and 227 also taught science. Departmentalized teachers could teach up to three of these subjects but could not teach both math and English language arts. Of the departmentalized teachers, 40 taught math, 51 taught English language arts, 45 taught social studies, and 54 taught science. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and appears as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

**Exhibit C.11. Time Departmentalized Teachers in the Study Spent on Instruction Compared to Self-Contained Teachers Nationwide**

Student instructional time (average hours per week)	Means		Difference		
	Departmentalized teachers in study schools	Self-contained teachers nationwide	Difference	Standard error	<i>p</i> -value
English language arts	5.0	7.8	-2.7*	0.6	<0.01
Math	6.3	5.8	0.6	0.5	0.25
Science	2.5	2.3	0.2	0.3	0.48
Social studies/history	2.7	2.2	0.5*	0.3	0.04
<b>Number of teachers<sup>a</sup></b>	<b>35-45</b>	<b>2,360-2,790<sup>b</sup></b>			

Source: Teacher survey administered by the study in spring 2021. U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Teacher and Principal Survey 2020–2021.

Notes: The study reported teachers’ planning time and student instructional time for individual subjects only for teachers who taught those subjects. Departmentalized teachers could teach up to three of these subjects but could not teach both math and English language arts. Of the departmentalized teachers, 40 taught math, 51 taught English language arts, 45 taught social studies, and 54 taught science. Data for departmentalized teachers in study schools are unweighted, and data for self-contained teachers nationwide are weighted estimates of the population.

<sup>a</sup> Number of teachers is based on unweighted data and appears as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

<sup>b</sup> The study rounded the number of self-contained teachers has to the nearest 10 in accordance with Institute of Education Sciences guidelines for the National Teacher and Principal Survey restricted-use data.

\* Statistically significant at the .05 level, two-tailed test.



**Exhibit C.12. Time Departmentalized Teachers Spent on Instruction, Planning, and Transitioning, by Number of Subjects Taught**

Activity	Means		Difference		
	Teachers who taught one subject	Teachers who taught two to three subjects	Difference	Standard error	p-value
<b>Collaborative planning (percentages)</b>					
Participated in collaborative planning period several times per week or daily	34	29	5	10	0.60
<b>Individual planning (average hours per week)</b>					
English language arts	4.5	2.8	1.7	0.9	0.07
Math	2.0	3.7	-1.7	1.2	0.15
Across all subjects	3.4	5.3	-1.8*	0.9	0.04
<b>Student instructional time (average hours per week)</b>					
English language arts	5.4	4.7	0.7	0.7	0.36
Math	5.9	5.9	0.0	1.7	1.00
<b>Transitioning between subjects (average minutes per day)</b>					
Students transitioning between in-person subjects	16.1	11.7	4.4	2.3	0.06
Students transitioning between distance-learning subjects	14.1	11.0	3.1	2.6	0.24
<b>Number of teachers<sup>a</sup></b>	<b>14-34</b>	<b>21-67</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: The study reported teachers' planning time and student instructional time for individual subjects only for teachers who taught those subjects. In this exhibit, all teachers were departmentalized, which meant they could not teach both math and English language arts. Of those teaching one subject, 14 taught math and 18 taught English language arts. Those teaching two to three subjects taught either math or English language arts and one to two other subjects. Of these teachers, 33 taught English language arts and 26 taught math. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and appears as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

Exhibit 7 of the report showed that departmentalized teachers reported participating in similar amounts of professional development in the subjects they taught as self-contained teachers. However, Exhibit 9 showed that departmentalized teachers reported participating in less total professional development than self-contained teachers, suggesting their overall workload may have been lighter than that of self-contained teachers. Exhibit C.13 provides details for these findings.

The report also noted that departmentalized teachers who taught just one subject (math or English language arts) spent a similar amount of time participating in professional development in their subject as departmentalized teachers who also taught other subjects (Exhibit C.14). In addition, departmentalized teachers who taught just one subject reported participating in similar amounts of total professional development as departmentalized teachers who taught two or three subjects.

**Exhibit C.13. Average Hours of Teacher Professional Development During the School Year**

Type of professional development	Mean hours per year		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
Math-related <sup>a</sup>	4.6	5.9	-1.3	2.9	0.64
English language arts-related <sup>b</sup>	12.2	11.4	0.8	2.1	0.70
Any professional development <sup>c</sup>	27.8	35.7	-7.9*	3.7	0.03
<b>Number of teachers<sup>a</sup></b>	<b>38-100</b>	<b>219-229</b>			

Source: Teacher survey administered by the study in spring 2021. Teachers answered questions about professional development received during the 2020-2021 school year, including summer 2020.

Notes: The study reported hours of professional development for individual subjects only for teachers who taught the subjects. All 235 self-contained teachers taught math and English language arts. Departmentalized teachers could teach either math or English language arts but not both. Of the departmentalized teachers, 40 taught math and 51 taught English language arts. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

**Exhibit C.14. Average Hours of Professional Development During the School Year Among Departmentalized Teachers, by Number of Subjects Taught**

Type of professional development	Mean hours per year		Difference		
	Teachers who taught one subject	Teachers who taught two to three subjects	Difference	Standard error	<i>p</i> -value
Math-related	5.8	3.5	2.3	2.0	0.25
English language arts-related	14.6	12.1	2.6	4.2	0.54
Any professional development	27.0	26.8	0.2	5.4	0.97
<b>Number of teachers<sup>a</sup></b>	<b>14-34</b>	<b>24-66</b>			

Source: Teacher survey administered by the study in spring 2021. Teachers answered questions about professional development received during the 2020-2021 school year, including summer 2020.

Notes: The study only reports hours of professional development for individual subjects for teachers who taught the subjects. In this exhibit, all teachers were departmentalized, which meant that they could not teach both math and English language arts. Of those teaching one subject, 14 taught math and 18 taught English language arts. Of those teaching two or three subjects, 33 taught English language arts and 26 taught math. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

## C.2.2 Teacher satisfaction

Exhibit 8 of the report showed that teachers in departmentalized schools were more satisfied than self-contained teachers with the subjects they taught. However, it also showed that teachers were no more satisfied with their jobs overall. Exhibits C.15 and C.16 provide details for these and other findings on teachers' satisfaction with job-related factors. Exhibit C.15 compares departmentalized teachers in study schools to self-contained teachers in study schools, whereas Exhibit C.16 compares departmentalized teachers in study schools to self-contained teachers nationwide.<sup>23</sup>

**Exhibit C.15. Teacher Satisfaction with Job-Related Factors**

Statement	Percentage of teachers who somewhat or strongly agreed		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
I was satisfied with being a teacher at this school	89	86	3	4	0.50
I received the support I need to teach students	85	85	0	5	0.94
Routine duties and paperwork interfered with my teaching <sup>a</sup>	48	58	-9	6	0.14
I had sufficient instructional time to meet the needs of all students	62	62	0	6	0.97
Too much of students' time was spent transitioning between classrooms <sup>a</sup>	17	9	8	4	0.07
My class sizes were reasonable to meet the needs of all students	82	69	13*	6	0.02
I thought about transferring to another school <sup>a</sup>	22	22	0	5	0.97
I was satisfied with the subject or subjects that I taught	99	89	10*	3	<0.01
I had opportunities for professional growth	85	89	-4	4	0.37
I had the support and resources I needed to be an effective teacher	82	82	-0	5	0.95
I liked the way things were run at this school	82	82	0	5	0.98
My principal enforced school rules for students' conduct and backed me up when I needed it	77	89	-12*	4	0.01
Staff members cooperated with each other at this school	91	88	2	4	0.57
The school set high standards for academic performance	91	93	-2	3	0.53

Statement	Percentage of teachers who somewhat or strongly agreed		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	p-value
Teachers had a say in which subject or subjects they taught	88	58	29*	6	<0.01
Teachers had a say in which grade or grades they taught	84	73	10*	5	0.05
Teachers had time to collaborate with colleagues	85	78	7	5	0.18
Teachers had an appropriate amount of time for professional development	81	83	-2	5	0.68
<b>Number of teachers<sup>b</sup></b>	<b>100-101</b>	<b>229-233</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Data are weighted equally at the school level.

<sup>a</sup>This item is negatively worded, so higher percentages indicate less satisfaction.

<sup>b</sup>Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

### Exhibit C.16. Teacher Satisfaction with Job-Related Factors for Departmentalized Teachers in the Study Compared to Self-Contained Teachers Nationwide

Statement	Percentage of teachers who somewhat or strongly agreed		Difference		
	Departmentalized teachers in study schools	Self-contained teachers nationwide	Difference	Standard error	p-value
I was satisfied with being a teacher at this school	90	91	-1	4	0.85
Routine duties and paperwork interfered with my teaching <sup>a</sup>	50	66	-17*	6	<0.01
I thought about transferring to another school <sup>a</sup>	20	30	-10	6	0.08
I liked the way things were run at this school	81	79	3	5	0.62
My principal enforced school rules for students' conduct and backed me up when I needed it	81	84	-3	4	0.44
<b>Number of teachers<sup>b</sup></b>	<b>100-101</b>	<b>2,860<sup>c</sup></b>			

Source: Teacher survey administered by the study in spring 2021; U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Teacher and Principal Survey 2020-2021.

Notes: Data for self-contained teachers nationwide are weighted estimates of the population, and data from the study survey are based on unweighted data.

<sup>a</sup>This item is negatively worded, so higher percentages indicate less satisfaction.

<sup>b</sup>Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

<sup>c</sup>The study has rounded number of self-contained teachers to the nearest 10 in accordance with Institute of Education Sciences guidelines for the National Teacher and Principal Survey restricted-use data.

\* Statistically significant at the .05 level, two-tailed test.

### C.2.3 Time spent meeting with students and parents

Exhibit 10 of the report showed that departmentalized teachers reported spending less time meeting with students and parents than self-contained teachers. Exhibit C.17 provides details for these and other findings on time spent meeting with students and parents. In particular, it also shows time spent *per student* meeting with students and meeting with parents. Consistent with the fact that departmentalized teachers have more students, these teachers spent far less time per student—about 15 minutes less per month per student—meeting with students for academic reasons than self-contained teachers did. Teachers in departmentalized schools also reported meeting less frequently with a typical student’s parents to discuss their child’s progress (Exhibit C.18).

**Exhibit C.17. Time Spent Meeting with Students and Parents**

Type of meeting	Means		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
<b>Hours per month across all students</b>					
Meeting with students for academic purposes	4.5	7.3	-2.8*	1.1	0.01
Meeting with students for non-academic purposes	0.5	1.0	-0.5*	0.3	0.05
Meeting with parents	2.3	4.1	-1.8*	0.8	0.03
<b>Minutes per month per student</b>					
Meeting with students for academic purposes	4.5	19.8	-15.4*	3.0	<0.01
Meeting with students for non-academic purposes	0.7	2.6	-1.9*	0.6	<0.01
Meeting with parents	3.8	11.1	-7.3*	2.3	<0.01
<b>Number of teachers<sup>a</sup></b>	<b>98-101</b>	<b>227-231</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Data are weighted equally at the school level.

<sup>a</sup>Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

**Exhibit C.18. Communications to Share Student Progress with or Provide Feedback to Students and Parents**

Type of communication	Percentage of teachers who reported doing the activity “weekly or several times per month” or “daily or several times per week”		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
<b>Discussing progress and goals</b>					
Met or talked with students’ parents to discuss their progress	12	26	-15*	5	<0.01
Met with the student to set academic goals	11	18	-7	5	0.15
<b>Providing feedback</b>					
Sent examples of students’ classwork home to their parents	44	48	-4	6	0.56
Provided written feedback on students’ work (not counting grades)	64	69	-5	6	0.45
Provided verbal feedback on students’ work	84	88	-4	4	0.32
<b>Number of teachers<sup>a</sup></b>	<b>100</b>	<b>227-230</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

### **C.3 The effects of departmentalized instruction on student achievement and teacher retention remain unclear**

The study’s third finding is that the effects of departmentalized instruction on student achievement and teacher retention remain unclear. As discussed in the report, this study could not assess the effects of departmentalized instruction because it could not randomly assign schools to departmentalize. As a result, differences in outcomes between departmentalized and self-contained schools could have been due to underlying differences between the two groups. In addition, concerns about the pandemic led many schools to either switch from departmentalized back to self-contained instruction or drop out of the study entirely (Exhibit B.9). This resulted in a sample that was too small to reliably estimate the relationship between departmentalized instruction and outcomes.

For transparency, this section presents estimates of the relationship between departmentalized instruction and key outcomes, including student achievement and teacher retention. The analysis is based on the sample that the study deemed too small to reliably examine outcomes (Exhibit C.19). The standard errors on the estimates are large, consistent with concerns about reliability and the large minimum detectable impacts shown in Exhibit B.13.

**Exhibit C.19. Estimates of the Relationship Between Departmentalized Instruction and Key Outcomes**

Outcome	Means		Difference		
	Departmentalized schools	Self-contained schools	Difference	Standard error	<i>p</i> -value
Math achievement (5th-grade z-score)	0.08	0.11	-0.03	0.07	0.61
English language arts achievement (5th-grade z-score)	0.15	0.15	-0.01	0.05	0.90
Teacher retention (percentage of 4th- and 5th-grade teachers)	64	68	-4	5	0.35
<b>Number of schools<sup>a</sup></b>	<b>12-21</b>	<b>19-28</b>			

Source: Student administrative records from the 2020-2021 school year (student achievement); teacher administrative records from the 2018-2019 through 2020-2021 school years (teacher retention).

Notes: This exhibit reports the coefficients from linear regressions of the outcome variable on an indicator variable for membership in a school that implemented departmentalized instruction in both the 2019-2020 and 2020-2021 school years. The study used regression models to estimate the relationship between departmentalized instruction and outcomes, using school-level averages of the covariates and outcomes. To further adjust for preexisting differences between the two sets of schools, the regression models used weights from a propensity score model that predicted each school’s probability of being departmentalized for two years. The departmentalized schools each had a weight of 1, and the self-contained schools each had a weight equal to the inverse of the propensity score. The regression models that estimated the relationships between departmentalized instruction and outcomes used the same set of covariates as the propensity score models.

<sup>a</sup>The number of schools is based on unweighted data. The number of schools is reported as a range because it varied for each analysis depending on the availability of data. For the analysis of math achievement, the sample included 12 departmentalized and 19 self-contained schools. For the analysis of English language arts achievement, the sample included 14 departmentalized and 21 self-contained schools. For the analysis of teacher retention, the sample included 21 departmentalized and 28 self-contained schools.

\*Statistically significant at the .05 level, two-tailed test.

## SECTION D. ADDITIONAL FINDINGS NOT INCLUDED IN THE REPORT

This section includes additional information that might help readers better understand the study findings, including:

- The COVID-19 pandemic’s effects on the study schools’ mode of instruction
- The time study teachers spent on collaborative planning activities
- Professional development received and teacher perceptions of preparedness
- The number of students study teachers taught and class size
- Teachers’ perceptions of student behavior, student and parent engagement, and knowledge of their students

It also presents additional information on estimates of the relationship between departmentalized instruction and outcomes to support a systematic review of these findings.

### D.1 The COVID-19 pandemic’s effects on schools’ mode of instruction

The COVID-19 pandemic significantly affected instruction in study schools, which is important context for interpreting the study’s findings. In particular, the findings may not generalize to a more typical year or a more typical set of schools implementing departmentalized instruction.

All study schools closed in the spring of Year 1 of the study (the 2019-2020 school year) in response to the pandemic. For the rest of the school year, schools in at least 10 of the 12 study districts provided some distance instruction to students during Year 1.

In Year 2 (the 2020-2021 school year), schools provided a combination of distance and in-person instruction. Of the 10 districts that remained in the study in Year 2, 6 began the year offering only distance instruction. By the end of the year, all were offering in-person instruction to most or all students. Districts varied in how much of the year they provided distance instruction. Four districts provided distance-only instruction (with no option for in-person learning) for at least half of the school year, whereas the other six districts provided distance-only instruction for between zero and three months. On average, departmentalized and self-contained teachers reported using similar modes of instruction during Year 2 (Exhibit D.1).

**Exhibit D.1. Teachers’ Use of Distance, Hybrid, and In-Person Instruction During the 2020-2021 School Year**

Mode of instruction	Average percentage of the school year			Difference	
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
Distance only	35	39	-4	5	0.37
Hybrid of distance and in-person	29	23	6	5	0.24
In-person only	36	38	-2	5	0.73
<b>Number of teachers<sup>a</sup></b>	<b>100</b>	<b>234</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data.



## D.2 Time spent on collaborative planning activities

Although the report noted that similar percentages of teachers participated in collaborative planning (Exhibit C.7), departmentalized and self-contained teachers reported using their collaborative planning time for different activities (Exhibit D.2). Specifically, departmentalized teachers were more likely to report using this time to discuss classroom management strategies, review individual student needs and progress, and discuss parent communications. These topics are consistent with the focus of the collaborative planning time webinars for departmentalized schools (see Section A.2.2). In contrast, departmentalized teachers were less likely to collaborate on subjects other than math or English language arts. Departmentalized teachers might be less likely to collaborate on specific subjects because fewer, if any, teachers in their grade level would be assigned to teach their same subjects. These findings help shed light on how departmentalized teachers spent their collaborative planning time, which is a factor for schools to consider when departmentalizing instruction.

**Exhibit D.2. Collaborative Planning Period Activities**

Collaborative planning period activities	Percentage of teachers who reported doing activity somewhat or a great deal		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
Jointly planned lessons, assignments, assessments, or other aspects of instruction in...					
Math	53	67	-14	8	0.08
English language arts	66	69	-3	8	0.68
Subjects other than math or English language arts	38	56	-18*	7	0.01
Discussed classroom management strategies	57	41	17*	6	0.01
Reviewed individual student needs and progress	87	69	19*	6	<0.01
Discussed parent communications	65	44	21*	6	<0.01
Discussed strategies, tools, or resources for distance learning	70	68	2	6	0.79
Discussed strategies, tools, or resources to support students' social-emotional learning	54	55	-1	6	0.87
<b>Number of teachers<sup>a</sup></b>	<b>39-100</b>	<b>224-230</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Time spent jointly planning for specific subjects is reported only for teachers who taught those subjects. All 235 self-contained teachers taught math and English language arts, but not all taught social studies or science. Of the self-contained teachers, 225 also taught social studies and 227 also taught science. Departmentalized teachers could teach up to three of these subjects but could not teach both math and English language arts. Of the departmentalized teachers, 40 taught math, 51 taught English language arts, 45 taught social studies, and 54 taught science. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

### D.3 Professional development received and perceptions of preparedness

Exhibit 7 of the report showed that departmentalized teachers did not participate in more hours of professional development in math and English language arts than self-contained teachers. However, departmentalized instruction might have increased the focus of the professional development they did receive on topics relevant to the subjects they taught. Exhibit D.3 shows that was not the case. A similar percentage of departmentalized and self-contained teachers reported participating in professional development on both general topics and math-related topics. Furthermore, fewer departmentalized teachers who taught English language arts reported participating in professional development focused on English language arts-related topics than self-contained teachers. These findings cast doubt on one potential mechanism—more professional development relevant to teachers’ assigned subjects—through which departmentalized instruction might improve student achievement.

Although specializing in fewer subjects could have helped teachers feel more prepared for various job activities, Exhibit D.4 shows that was not the case. Departmentalized and self-contained teachers reported feeling similar levels of preparedness to teach specific subjects. They also reported feeling similar levels of preparedness for more general activities, such as teaching in a distance-learning format and addressing the needs of diverse learners.

**Exhibit D.3. Focus of Professional Development Teachers Received**

Professional development topics	Percentage of teachers who reported topic was somewhat or a great deal of the focus of the professional development they received		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
<b>General topics</b>					
Use of technology for in-person instruction	59	60	-1	6	0.82
Use of technology for distance learning	89	83	-6	5	0.20
Student discipline and classroom management	21	22	-1	6	0.82
Strategies for teaching diverse student populations	43	50	-7	6	0.29
General teaching methods	57	46	-12	6	0.07
Health and safety precautions	63	64	-1	6	0.89
Social-emotional learning	68	67	-1	6	0.91
<b>Number of teachers<sup>a</sup></b>	<b>94-97</b>	<b>217-221</b>			

Professional development topics	Percentage of teachers who reported topic was somewhat or a great deal of the focus of the professional development they received			Difference	
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
<b>Math related</b>					
Math curriculum (for example, units, texts, standards)	40	38	-2	8	0.79
Math-specific teaching methods	36	24	-12	7	0.11
Deepening your knowledge of math	26	24	-2	7	0.81
How students learn math	26	22	-4	7	0.60
<b>Number of teachers<sup>a</sup></b>	<b>37-38</b>	<b>214-218</b>			
<b>English language arts related</b>					
English language arts curriculum (for example, units, texts, standards)	76	60	-16*	7	0.03
English language arts-specific teaching methods	68	49	-19*	8	0.02
Deepening your knowledge of English language arts	63	44	-19*	8	0.02
How students learn English language arts	53	42	-11	8	0.17
<b>Number of teachers<sup>a</sup></b>	<b>48-49</b>	<b>216-220</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Survey questions about professional development for individual subjects are only reported for teachers who taught those subjects. All 235 self-contained teachers taught math and English language arts. Departmentalized teachers could teach either math or English language arts but not both. Of departmentalized teachers, 40 teachers taught math and 51 taught English language arts. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

#### Exhibit D.4. Teacher Perceptions of How Well Prepared They Were, by Activity

Activity	Percentage of teachers who felt they were well or very well prepared		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
	Teaching math	88	75	12	7
Teaching English language arts	86	81	6	6	0.38
Teaching in a distance-learning format	36	26	10	6	0.09
Addressing the needs of diverse learners	57	52	5	7	0.41
Handling a range of classroom behavior or discipline situations	82	78	4	5	0.44
<b>Number of teachers<sup>a</sup></b>	<b>40-100</b>	<b>231-234</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Survey questions about how prepared teachers felt to teach individual subjects are reported only for teachers who taught those subjects. All 235 self-contained teachers taught math and English language arts. Departmentalized teachers could teach either math or English language arts but not both. Of departmentalized teachers, 40 teachers taught math and 51 taught English language arts. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

#### D.4 Number of students taught and class size

As noted in the report, departmentalized instruction requires teachers to teach the same subject to multiple classes of students, increasing the total number of students they teach. This could make developing relationships with students and their parents more challenging. Exhibit D.5 reports the average number of students taught and class sizes for departmentalized and self-contained teachers. As expected, departmentalized teachers taught more students on average than self-contained teachers. This is because departmentalized teachers taught two to four sections or classes of students, rather than one section of students. Finally, the average class sizes for math and English language arts were similar for departmentalized and self-contained teachers, with about 20 students per class. This was not surprising because departmentalized instruction involves assigning teachers to specific subjects rather than hiring more teachers.

### Exhibit D.5. Total Number of Students Taught and Class Size

	Means		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	p-value
Number of students taught across all subjects and sections	47	27	20*	2	<0.01
Average class size for math	20	19	1	1	0.50
Average class size for English language arts	20	19	1	1	0.32
<b>Number of teachers<sup>a</sup></b>	<b>35-101</b>	<b>45-231</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Survey questions about class sizes for math and English language arts are reported only for teachers who taught those subjects. All 235 self-contained teachers taught math and English language arts. Departmentalized teachers could teach either math or English language arts but not both. Of departmentalized teachers, 40 taught math and 51 taught English language arts. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

## D.5 Perceptions of student behavior, student and parent engagement, and knowledge of their students

The study did not find any differences in departmentalized and self-contained teachers' perceptions of their connections to students and parents. For example, both groups of teachers reported similar perceptions about student behavior and student and parent engagement (Exhibit D.6). They also reported similar perceptions of how well they knew their students (Exhibit D.7).

**Exhibit D.6. Teacher Perceptions of Student Behavior and Student and Parent Engagement, by Type of Instruction**

Statement	Percentage of teachers who somewhat or strongly agreed		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
<b>In-person instruction</b>					
The level of student misbehavior and noise interfered with my teaching	26	29	-3	6	0.63
Most students were engaged and interested in learning	87	87	0	5	0.95
Lack of parental involvement was a problem	49	50	-1	7	0.84
I received a great deal of support from parents for the work I do	65	72	-7	6	0.28
I often had to wait for students to settle down at the beginning of a class	25	34	-9	6	0.16
<b>Number of teachers<sup>a</sup></b>	<b>82-84</b>	<b>185-190</b>			
<b>Distance-learning instruction</b>					
The level of student misbehavior and noise interfered with my teaching	37	43	-6	6	0.34
Most students were engaged and interested in learning	51	53	-2	6	0.74
Lack of parental involvement was a problem	71	68	3	6	0.64
I received a great deal of support from parents for the work I do	52	58	-6	6	0.36
I often had to wait for students to settle down at the beginning of a class	30	29	1	6	0.83
<b>Number of teachers<sup>a</sup></b>	<b>98-100</b>	<b>226-228</b>			

Source: Teacher survey administered by the study in spring 2021.

Notes: Teachers who taught both in-person and distance learning formats at any time during the school year responded to both sets of questions. Teachers who only taught in one type of learning format during the school year only answered one set of questions. Of departmentalized teachers, 84 responded to questions about in-person instruction and 100 responded to questions about distance-learning instruction. Of self-contained teachers, 190 responded to questions about in-person instruction and 228 responded to questions about distance-learning instruction. Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

### Exhibit D.7. Teacher Perceptions of How Well They Knew Their Students

Statement	Percentage of teachers who somewhat or strongly agreed		Difference		
	Departmentalized teachers	Self-contained teachers	Difference	Standard error	<i>p</i> -value
I knew my students well enough to incorporate their interests in learning activities	49	53	-5	6	0.46
Students trusted me with their personal problems	49	49	0	7	0.98
I knew what services my students receive (for example, IEPs/504 plans/services for gifted students)	81	87	-6	5	0.21
I knew about academic, social, or health challenges my students might be experiencing	54	55	-1	6	0.90
I had standardized test history information for all the students I teach	38	33	5	6	0.40
I knew my students' favorite subjects	39	44	-5	6	0.40
I knew my struggling students' needs well enough to adapt my teaching accordingly	63	54	9	6	0.15
I knew my strongest students' needs well enough to adapt my teaching accordingly	58	57	1	6	0.89
I knew my students' learning styles well enough to adapt my teaching accordingly	49	45	4	6	0.49
I knew my students' cultural backgrounds well enough to adapt my teaching accordingly	45	42	3	6	0.58
<b>Number of teachers<sup>a</sup></b>	<b>99-100</b>	<b>229-232</b>			

Source: Teacher survey administered by the study spring 2021.

Notes: Data are weighted equally at the school level.

<sup>a</sup> Number of teachers is based on unweighted data and is reported as a range because the number of teachers who responded differs across the survey items reported in the exhibit.

\* Statistically significant at the .05 level, two-tailed test.

IEP = individualized education program.

## D.6 Supplemental information for systematic reviews

Systematic reviews of evidence on the effects of educational programs or strategies, such as the What Works Clearinghouse reviews, often require specific types of information on study findings. For example, systematic

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reviews often call for information on the characteristics of the schools and students in the study in the baseline year—the year before the study began. To support a systematic review, Exhibits D.8-D.11 provide descriptive statistics and detailed results from the analysis of the relationship between departmentalized instruction and outcomes.



**Exhibit D.8. Descriptive Statistics for the Sample Used to Estimate the Relationship Between Departmentalized Instruction and Math Achievement**

Measure	Departmentalized schools				Self-contained schools				
	Number of schools <sup>a</sup>	Number of students <sup>b</sup>	Unadjusted mean	Standard deviation <sup>c</sup>	Number of schools <sup>a</sup>	Number of students <sup>b</sup>	Unadjusted mean	Adjusted mean <sup>d</sup>	Standard deviation <sup>c</sup>
Baseline: Math achievement (3rd-grade z-score)	12	3,284	0.25	0.38	19	4,544	0.23	n.a.	0.48
Outcome: Math achievement (5th-grade z-score)	12	966	0.08	0.46	19	1,051	-0.06	0.11	0.42

Source: Administrative records from the 2018-2019 through 2020-2021 school years.

Notes: All means and standard deviations are reported at the school level, consistent with the study’s school-level analysis. The study converted test scores from state assessments to z-scores by subtracting the mean and dividing by the standard deviation of scores for all students in that state and grade. The study converted test scores from district assessments to z-scores by subtracting the mean and dividing by the standard deviation of scores for all students in the district and grade. Baseline test scores are reported for 3rd-grade students because students in the outcome sample were in 3rd grade during the baseline year (2018-2019). Schools implemented departmentalized instruction during students’ 4th-grade and 5th-grade years from 2019-2020 to 2020-2021.

In this exhibit, the unadjusted and adjusted means use the same weights as in the analysis. The departmentalized schools each have an equal weight of 1. The self-contained schools each have a weight of the inverse of the propensity score.

<sup>a</sup> The number of schools is unweighted.

<sup>b</sup> The number of students is unweighted.

<sup>c</sup> The standard deviations reflect the variation across schools in the sample without propensity score weights or regression adjustments.

<sup>d</sup> The regression adjusted the mean of the outcome (5th-grade math achievement) in self-contained schools. It did not adjust the mean of the outcome in departmentalized schools. It also did not adjust the means of any baseline measures. For this reason, the baseline measure in this column is labeled as “n.a.”

n.a. = not applicable.

**Exhibit D.9. Descriptive Statistics for the Sample Used to Estimate the Relationship Between Departmentalized Instruction and English Language Arts Achievement**

Measure	Departmentalized schools				Self-contained schools				
	Number of schools <sup>a</sup>	Number of students <sup>b</sup>	Unadjusted mean	Standard deviation <sup>c</sup>	Number of schools <sup>a</sup>	Number of students <sup>b</sup>	Unadjusted mean	Adjusted mean <sup>d</sup>	Standard deviation <sup>c</sup>
Baseline: English language arts achievement (3rd-grade z-score)	14	3,833	0.19	0.37	21	5,179	0.09	n.a.	0.43
Outcome: English language arts achievement (5th-grade z-score)	14	1,046	0.15	0.42	21	1,135	0.00	0.15	0.42

Source: Administrative data from the 2018-2019 through 2020-2021 school years.

Notes: All means and standard deviations are reported at the school level, consistent with the study’s school-level analysis. The study converted test scores from state assessments to z-scores by subtracting the mean and dividing by the standard deviation of scores for all students in that state and grade. The study converted test scores from district assessments to z-scores by subtracting the mean and dividing by the standard deviation of scores for all students in the district and grade. Baseline test scores are reported for 3rd-grade students, because students in the outcome sample were in 3rd grade during the baseline year (2018-2019). Schools implemented departmentalized instruction during students’ 4th-grade and 5th-grade years from 2019-2020 to 2020-2021.

In this exhibit, the unadjusted and adjusted means use the same weights as in the analysis. The departmentalized schools each have an equal weight of 1. The self-contained schools each have a weight of the inverse of the propensity score.

<sup>a</sup> The number of schools is unweighted.

<sup>b</sup> The number of students is unweighted.

<sup>c</sup> The standard deviations reflect the variation across schools in the sample without propensity score weights or regression adjustments.

<sup>d</sup> The regression adjusted the mean of the outcome (5th-grade English language arts achievement) in self-contained schools. It did not adjust the mean of the outcome in departmentalized schools. It also did not adjust the means of any baseline measures. For this reason, the baseline measure in this column is labeled as “n.a.”

n.a. = not applicable.

**Exhibit D.10. Descriptive Statistics for the Sample Used to Estimate the Relationship Between Departmentalized Instruction and Teacher Retention**

Measure	Departmentalized schools				Self-contained schools				
	Number of schools <sup>a</sup>	Number of individuals (students or teachers) <sup>b</sup>	Unadjusted mean	Standard deviation <sup>c</sup>	Number of schools <sup>a</sup>	Number of individuals (students or teachers) <sup>b</sup>	Unadjusted mean	Adjusted mean <sup>d</sup>	Standard deviation <sup>c</sup>
Baseline teaching experience (years)	21	171	11.8	3	28	214	11.9	n.a.	4
<b>Baseline student achievement</b>									
Math achievement (mean 3rd-grade z-scores)	21	5,981	0.13	0.54	28	7,513	0.09	n.a.	0.52
English language arts achievement (mean 3rd-grade z-scores)	21	5,993	0.06	0.51	28	7,479	0.02	n.a.	0.49
<b>Baseline student characteristics</b>									
Eligible for free or reduced-price lunch	21	n.a.	53	n.a.	28	n.a.	57	n.a.	n.a.
<b>Race and ethnicity<sup>e</sup></b>									
Black	21	n.a.	18	n.a.	28	n.a.	14	n.a.	n.a.
Hispanic	21	n.a.	27	n.a.	28	n.a.	30	n.a.	n.a.
White	21	n.a.	44	n.a.	28	n.a.	43	n.a.	n.a.
Other	21	n.a.	11	n.a.	28	n.a.	13	n.a.	n.a.

Measure	Departmentalized schools				Self-contained schools				
	Number of schools <sup>a</sup>	Number of individuals (students or teachers) <sup>b</sup>	Unadjusted mean	Standard deviation <sup>c</sup>	Number of schools <sup>a</sup>	Number of individuals (students or teachers) <sup>b</sup>	Unadjusted mean	Adjusted mean <sup>d</sup>	Standard deviation <sup>c</sup>
<b>Outcome</b>									
Teacher retention (percentage of 4th- and 5th-grade teachers)	21	171	64	0.22	28	214	68	68	0.23

Source: Administrative data from the 2018-2019 school year (teaching experience and student achievement data from the year before the study); administrative data from the 2018-2019 through 2020-2021 school years (teacher retention data); Common Core of Data from the 2018-2019 school year (student characteristics).

Notes: In this exhibit, the unadjusted and adjusted means use the same weights as in the analysis. The departmentalized schools each have an equal weight of 1. The self-contained schools each have a weight of the inverse of the propensity score.

All student and teacher characteristics are reported at the school level, consistent with the study’s school-level analysis. School-level test scores are reported for a sample of students in 3rd grade because students in the outcome sample for the retention analysis were in 2nd and 3rd grade during the year before the study (2018-2019). However, 2nd-grade students were not tested in the year before the study and could not be included. Test scores are aggregated across math and English language arts for all students in 3rd grade with test scores. The sample for teacher characteristics includes all 4th- and 5th-grade teachers identified as core subject teachers who had available data. The study identified core teachers as teachers assigned to teach math or English language arts and either had a value-added score (for schools in districts that provided value-added scores) or at least 10 students assigned to them (for schools in districts that did not provide value-added scores). Student characteristics (race, ethnicity, and free or reduced-price lunch status) are reported at the school level for all students in the school.

<sup>a</sup> The number of schools is unweighted.

<sup>b</sup> The number of students is unweighted.

<sup>c</sup> The standard deviations reflect the variation across schools in the sample without the propensity score weights. The standard deviations are not reported for binary outcomes because they are not needed to calculate baseline equivalence using the Cox Index.

<sup>d</sup> The regression adjusted the mean of the outcome (percentage of 4th- and 5th-grade teachers retained) in self-contained schools. It did not adjust the mean of the outcome in departmentalized schools. It also did not adjust the means of any baseline measures. For this reason, the baseline measures in this column are labeled as “n.a.”

<sup>e</sup> Race and ethnicity categories are not mutually exclusive unless the district reported mutually exclusive categories, so percentages may sum to more than 100.

n.a. = not applicable.

## ENDNOTES

<sup>1</sup> Condie et al. 2014; Fox 2016; Goldhaber et al. 2013.

<sup>2</sup> Fryer 2018; McGrath and Rust 2002; Taylor-Buckner 2014; and Baroody 2017. In addition, two studies published after this study began also found that departmentalized instruction was negatively related to student achievement (Bastian and Fortner 2018; Hwang and Kisida 2022).

<sup>3</sup> Bastian et al. 2023.

<sup>4</sup> Specifically, to be included in the study, schools could not already have separate teachers teaching math and English language arts (the study's definition of departmentalized instruction). They could have already had separate teachers for science or social studies.

<sup>5</sup> To convert this difference from standard deviations to months of learning, the study team first converted to years of learning by dividing the difference by the average one-year standard deviation gain in achievement on nationally normed assessments for 4th and 5th grades (Hill et al. 2007). The study then multiplied the difference in years of learning by 10 (the typical number of months in a school year) to convert to months of learning.

<sup>6</sup> Condie et al. 2014; Fox 2016; Goldhaber et al. 2013.

<sup>7</sup> In a few cases, schools departmentalized across 4th and 5th grades, with teachers teaching students from both grades. The study counted these cases as a single departmentalized grade. In other cases, schools had dual-language and multi-language classes within the same grade, and schools could not reassign teachers from one group to the other. The study counted these cases as two separate departmentalized grades.

<sup>8</sup> Value-added scores were unavailable for various reasons. One district was unable to provide links to match its value-added scores to the teachers in the study. In other districts, scores were unavailable for teachers who were new to the district or did not teach math and English language arts in a tested grade (3rd through 8th) in the prior school year.

<sup>9</sup> Walsh et al. 2015.

<sup>10</sup> Walsh and Isenberg 2015; Hock and Isenberg 2017. Under the Full Roster Method, each student contributed one observation to the model for each teacher by whom they were taught in a given subject that year. Because students could be taught by multiple teachers, the study team used an approach known as weighted least squares. In this approach, the study assumes each student contributed the same amount to the results as all other students, with the student's contribution divided equally across all of their teachers.

<sup>11</sup> Measurement error in students' current test scores does not lead to bias. However, measurement error in prior test scores can, if unaddressed, produce estimates of the relationship between prior and current achievement that are biased toward zero, resulting in biased estimates of teacher effectiveness. To address this issue, the study team drew on public documentation from test publishers on the reliability of each test. Using this information, the team implemented an errors-in-variables correction that adjusted the estimated coefficients of Equation (1) to account for the reliability of the prior test scores (Buonaccorsi 2010).

<sup>12</sup> Liang and Zeger 1986; Arellano 1987.

<sup>13</sup> When calculating this standard deviation, the study team removed the contribution of estimation error in the value-added scores based on the method recommended by Morris (1983).

<sup>14</sup> Morris 1983.

<sup>15</sup> Morris 1983.

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<sup>16</sup> Additional factors the study did not measure could influence the relationship between departmentalized instruction and student achievement and teacher retention. For example, teachers may differ in their skills at forming supportive relationships with students and families, and students may differ in their skills at forming relationships with multiple teachers. These factors may influence the extent to which departmentalized instruction improves or harms student and teacher outcomes. Although the study did not measure these factors, they may be worth investigating in future research on departmentalized instruction.

<sup>17</sup> Results were similar when limited to teachers who were either departmentalized or self-contained for two consecutive years.

<sup>18</sup> All but one district provided scores from state assessments. The final district instead provided scores from district assessments because schools did not conduct state assessments in spring 2021 due to the COVID-19 pandemic.

<sup>19</sup> Shadish et al. 2008; Fortson et al. 2015; Dehejia and Wahba 2002.

<sup>20</sup> Lee et al. 2011.

<sup>21</sup> What Works Clearinghouse 2022.

<sup>22</sup> Austin 2009.

<sup>23</sup> Percentages for departmentalized schools differ slightly in Exhibits C.15 and C.16. Exhibit C.15 gives equal weight to each school, for easy comparison of departmentalized and self-contained schools in the study sample, without giving more weight to schools with more teachers. Exhibit C.16 gives equal weight to each teacher, for comparability with the national data for self-contained teachers.

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