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To cite this article: Elizabeth A. Davis & Christa Haverly (2024) Comprehensiveness, Frequency, and Consistency of Science in Elementary Schedules, *Science and Children*, 61:2, 12-15, DOI: [10.1080/00368148.2024.2315660](https://doi.org/10.1080/00368148.2024.2315660)

To link to this article: <https://doi.org/10.1080/00368148.2024.2315660>



Published online: 01 Apr 2024.



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Comprehensiveness, Frequency, and Consistency of Science in Elementary Schedules

The role of leaders in supporting elementary science

By Elizabeth A. Davis and Christa Haverly

ABSTRACT

Science in the elementary grades is often deprioritized in comparison to ELA and mathematics. We wondered, how comprehensively, frequently, and consistently is science included in elementary schools' schedules? We reviewed daily schedules for 14 schools in 9 districts across the U.S. to qualitatively examine how science is represented on the daily instructional schedule. These schools were selected as "best case scenarios" recommended by district or state science leaders as places where science is taken seriously. We complemented these schedules with data from 21 interviews with teachers, science specialists, and school leaders to better understand how science actually appears in children's daily instructional experiences. We found that, in these schools, science is taught comprehensively (though not as comprehensively as ELA or mathematics), has the potential for being taught frequently (even in the lower elementary grades), and is taught somewhat consistently (albeit usually in some kind of rotation with social studies). We present implications for how leaders can craft school schedules to make science comprehensive, frequent, and consistent in the elementary grades, to provide important opportunities to learn and thrive for all children.

Keywords: Schedules; elementary science; leaders; instructional time

What is the role of district and school leaders when it comes to supporting the teaching and learning of elementary science? Responsibility that it gets taught, for one. A recent report from the National Academies of Sciences, Engineering, and Medicine synthesized research on science and engineering in preschool through elementary grades (National Academies of Sciences Engineering and Medicine (NASEM) 2022). The "Brilliance and Strengths" report emphasizes that science is often put on the back burner in elementary schools, while English language arts and mathematics take priority, in part due to testing requirements around those subject areas. The report further notes that interventions to provide additional academic support (e.g., for emergent multilingual learners or children with learning differences) may negatively impact those students' science instructional time. The report put forward a set of recommendations, including two that suggest that state policy makers and district and school leaders, collectively, bear responsibility to ensure that science and engineering are "comprehensively, frequently, and consistently taught in all preschool through elementary settings" (NASEM 2022, 245). We define these terms as follows:

- *Comprehensively* means that science is taught across all grades and on par with how other subjects are taught in terms of amount of time per day.
- *Frequently* means that science is taught often during the school week and for sufficient blocks of time to allow for sensemaking about natural phenomena.
- *Consistently* means that science is taught in a regular routine, that students do not miss science for interventions or enrichments, and that the science block isn't dropped.

Figure 1 provides some national trends (Banilower et al. 2018). Summarizing the results of a national survey, Plumley (2019) writes, "the large majority of elementary classes receive science instruction only a few days a week or during some, but not all, weeks of the year" (15), and science receives fewer instructional minutes per day, as well. Statistically, this statement likely resonates with you.

We see this lack of science as an equity issue. Children deserve to experience the wonder and joy of learning about the natural world around them. Having opportunities to learn science at the elementary level can support the development

FIGURE 1

National trends in time devoted to teaching science.

National Trends in Elementary Science Instructional Time

In the elementary grades...

Science is taught around **20 minutes** per day

ELA is taught around **87 minutes** per day

Math is taught around **58 minutes** per day

In almost 40% of elementary classrooms, science is taught **3 or fewer days per week**

In almost 40% of elementary classrooms, science is taught **some weeks but not every week**

(Based on national survey data from Banilower et al., 2018; Plumley, 2019)

of their identities as science people and lays the foundation for future academic interest and success as well. When science is missing from the daily schedule, children who have historically been marginalized in science may be further marginalized.

STUDYING SCHOOL AND CLASSROOM SCHEDULES

We analyzed daily classroom and school schedules from districts across the country to determine how comprehensive, frequent, and consistent the scheduling of science is in “best case scenario” settings—schools and districts that were recommended to us as places where elementary science is taken seriously and done well. We also interviewed teachers and district and school leaders to learn more. [Table 1](#) summarizes the overall findings.

Making the time for science at the elementary level is a dilemma to be managed by educational leaders and classroom teachers. There is not an easy solution to navigating the competing demands in elementary education—but we have identified some strategies that leaders and teachers are using that may be transferable across settings. These are summarized in [Figure 2](#), and our suggestions and examples based on our findings are shared below.

INCLUDING SCIENCE ON THE SCHEDULE, K-5

Most schools in our sample included science on the schedule in every grade from kindergarten (or even pre-kindergarten) through fifth grade. Kent, the principal at Crossroads School (all proper names are pseudonyms), noted the importance of the schedule in his school:

The thing I constantly tell districts when they’re coming in here, or when we’ve been to conferences, is that

that master schedule was so key . . . It set the foundation for great ELA instruction, for great science instruction, for great math instruction. It’s really critical.

While including science on the schedule will not automatically result in science being taught, it’s an important starting point to drawing attention to its importance and starting to develop a culture of science teaching within a school.

VALUING AND LEVERAGING CHILDREN’S LOVE FOR SCIENCE

Educators we interviewed emphasized that they wanted to teach science—often because they saw how much the children enjoy it. For example, Tori (a second-grade teacher at Lakeview School) noted:

We know that the kids love science. . . . They’re eager and excited about it. When they’re excited about it, it makes it something that we know they want to learn, and we want to teach it to them.

Tori and other teachers and leaders knew that leveraging kids’ enthusiasm for science made their school days smoother and more enjoyable.

SWAPPING SCIENCE WITH SOCIAL STUDIES

Few schools in our sample had dedicated time exclusively for science, but even where science was swapped with social studies, teachers and leaders employed strategies to ensure that science was taught. Teagan, a teacher at Riverview School, had one consistent block for science and social studies. She organized this to teach science Monday through Thursday and social studies on Fridays. While this does not bode well for children’s social studies education, it does provide one way of managing the dilemma of prioritizing science time. More common was teaching science for a week

TABLE 1

Summary of findings from “best case scenario” schools.

Area of Focus	Key Findings
Comprehensiveness	• Wide coverage of science across grades 1–5 (and generally also in K) • About 2–4× more instructional time for ELA • About 2× more instructional time for math
Frequency	• The science block is usually shared, indicating science is not likely to be taught daily. • “Science” block is typically 45 minutes (for an average of about 20 minutes/day, given the shared block), but is fairly variable across schedules. • Less time in lower grades than in upper grades
Consistency	• Typically swapped with social studies • Most schedules show a designated time for interventions. • Most schedules show a designated time for specials. • Science occurs throughout the day (not only at the end of the day).

FIGURE 2

Strategies educators used for making science comprehensive, frequent, and/or consistent.

<i>Strategies for Scheduling Science</i>
• Including science on the schedule, K–5 • Valuing and leveraging children’s love for science • Swapping science and social studies • Infusing science into ELA and maintaining science time, rather than usurping science time by ELA • Dedicating time for interventions and specials • Using a science specialist or departmentalization • Supporting science through systemic infrastructure

and then social studies the next week, or science two or three days and social studies the other days during the week, or a science unit followed by a social studies unit. Most educators balanced the time for science and social studies to be roughly equal.

INFUSING SCIENCE INTO ELA AND MAINTAINING SCIENCE TIME

Many of the educators we interviewed acknowledged that ELA was their highest priority. However, these educators did not lean on the idea of simply reading about science and calling that “science.” In these schools, as Tessa, a third-grade teacher at New Rockford School, put it, “science time

is science time.” These schools were not usurping science time for ELA. Instead, we saw them increasing the time for science by infusing science *into* ELA time (e.g., for writing about science ideas) while *also* maintaining a science block for investigation. This is more aligned with the sort of integration that literacy scholars such as Duke (2016) have argued to be beneficial to student learning.

DEDICATING TIME FOR INTERVENTIONS AND SPECIALS

In settings where there was dedicated time on the schedule for interventions (e.g., What I Need time), educators said that—for the most part—children were not pulled from science. Some

teachers and leaders talked about science as an important part of the day when children with learning differences could experience success that they might not experience in other subject areas. Our findings were similar for specials: Generally, the schools in our sample had dedicated time set aside for specials, so children wouldn't be pulled from science to go to important enrichment classes like music or art.

USING A SCIENCE SPECIALIST OR DEPARTMENTALIZATION

Several schools relied on either a science specialist or departmentalization. Liam, Hope, and Kyler, for example—all teachers at different schools—each taught science to multiple classes within their grade. Practically, departmentalization serves two functions. First, it reduces the number of “preps” a teacher needs to manage and may further enhance the teacher's expertise. Second, because of the switch of children or classrooms, the time becomes protected for science. This approach can, of course, impact the classroom culture and community of a self-contained classroom, a hallmark of elementary education. While there are downsides to departmentalization, it does serve as another way of managing the dilemma to make science both more frequent and more consistent.

SUPPORTING SCIENCE THROUGH SYSTEMIC INFRASTRUCTURE

In one of our districts, a district-run science center had a strong presence. The educators in this district spoke powerfully about the role the science center played for them, providing curriculum materials and physical resources for investigations and even coming to teach science lessons for or with classroom teachers. While most districts didn't have a support like this one, it was clear that having district-level infrastructure was helpful for this district in making elementary science a priority on the schedule.

FINAL THOUGHTS

Schedules help school systems formalize and standardize opportunities to learn for students. These schedules are critical for enacting reform efforts like those embodied in *A Framework for K–12 Science Education* (National Research Council (NRC) 2012) and the *Next Generation Science Standards*. Yet even in these best-case scenario schools, children received far less science instruction than instruction in ELA or mathematics.

Instructional time for science is only the first step. To truly support every child in being able to experience the wonder

of science, educators must ensure that children can engage in science within a caring community, make sense of investigations, and learn with and from each other (NASEM 2022). None of these characteristics is possible, though, without science appearing in a comprehensive, frequent, and consistent manner during the elementary day and across the school year. Leaders have an important role to play in making that possible.

ACKNOWLEDGMENTS

Work on this paper was funded in part by the National Science Foundation (NSF Core Grant number 1761129). However, any opinions, findings, and conclusions or recommendations expressed here are those of the authors. We also express appreciation to the members of the Elementary Science Systems research group, particularly Angela Lyle, for their help in conceptualizing and conducting this study. This paper was adapted from Davis and Haverly 2023. Comprehensiveness, frequency, and consistency of science in elementary schedules: “Are we doing science yet?” Poster and paper presented at the NARST annual conference, Chicago.

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