Addressing Challenges of Within-School Randomization
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Introduction/Purpose.
This study’s purpose is to understand the nature and extent of teacher collaboration in elementary and middle schools in order to inform decisions about experimental randomization schemes. While randomized designs can provide unbiased estimates of the impact of interventions, they may be sensitive to the way a program is implemented and the modes of teacher collaboration that may be in place in school settings. While teacher-level randomization is more efficient in terms of the overall size of the experiment than school-level randomization, the design may interfere with the common practice of teacher collaboration, which may be important for the success of the intervention. This study investigated whether randomization at the level of the grade-level team might provide greater efficiency than school-level randomization while minimizing the negative impact on teacher collaboration by having teachers within the same school in different experimental conditions.

Research Questions.
1. What is the nature and extent of teacher collaboration in these schools?
   a. How do elementary and middle school teachers compare in the frequency of mathematics and science collaboration meetings?
   b. Is there a difference between the numbers of organized group activities and/or meetings teachers attend for instructional versus administrative purposes?
   c. What is the nature and extent of elementary teachers “swapping” students for mathematics and/or science instruction?
2. Is there a difference in the amount of teacher collaboration within grade-level teams compared to collaboration involving teachers from other grade levels?

Data Source/Question Surveys.
Five monthly surveys were deployed between January and May 2008 to approximately 600 elementary and middle school mathematics and science teachers. Survey questions addressed:
- Surveys 2-4: Frequency of collaboration meetings per month for mathematics and science
- Survey 3: Number of organized group activities or meetings teachers attended in school
- Surveys 1 and 3: Extent and nature of teachers teaching students not on their official rosters (i.e. “swapping”)
- Survey 5: Percent of teacher collaboration (as defined as receiving/providing input or advice from other teachers, participating in organized group activities or meetings involving other teachers) within grade-level teams and percent involving teachers from other grade levels.

Findings for Question 1. What is the nature and extent of teacher collaboration in these schools?

1a. Is there a difference in the frequency of mathematics and science collaboration meetings between elementary and middle school teachers?

1b. Is there a difference between the numbers of organized group activities and/or meetings teachers attend for instructional versus administrative purposes?

Teachers reported collaborating more for instructional purposes (m=3.16) than for administrative purposes (m=2.23) at a statistically significant level (\(p<.01\), effect size \(-0.29\)).

More teachers swapped some or all of their students for science instruction than for math (\(p=.05\), effect size \(-0.29\)).

There was no statistically significant difference between elementary (64.2%) and middle (60%) school teachers in the percent of instances of teachers teaching mathematics only, mathematics and science, or science only (\(p>.05\), effect size \(-0.29\)).

Mathematics/Science

Elementary School Middle School

Percent of teachers who “swapped” some or all of their students for...

Mathematics

Science

Average Number of Collaboration per Month

Average Number of Collaboration per Month

Teacher collaboration was more frequent for mathematics (m = 3.21) and science (m = 3.06) than for both mathematics and science instruction (m = 2.75) at a statistically significant level (\(p<.01\), effect size \(-0.34\)).

Elementary school teachers (m = 4.27) had more collaboration meetings per month than the middle school teachers (m = 3.73) at a statistically significant level (\(p<.01\), effect size \(-0.29\)).

1c. What is the nature and extent of elementary teachers “swapping” students for mathematics and/or science instruction?

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   c. What is the nature and extent of elementary teachers “swapping” students for mathematics and/or science instruction?
2. Is there a difference in the amount of teacher collaboration within grade-level teams compared to collaboration involving teachers from other grade levels?

Findings for Question 2. Is there a difference between the percent of teacher collaboration within grade-level teams versus the percent involving teachers from other grade levels?

Receiving/Providing Input.
Teachers reported that a higher percentage of interactions in writing about receiving/providing input or advice was with teachers within their school (64.4%) than with teachers from other grade levels (26.0%). This difference was statistically significant (\(p<.01\), effect size \(-0.82\)).

Within-grade Between-grade

Percent of instances of teachers teaching...

Mathematics only

Mathematics and Science

Science only

Confidence Interval

80% 95% 99%

Effect size

1.00 0.82 0.64

Implications for Randomization Schemes.
For experiments on math or science programs, our observations suggest that within-grade teacher-level randomization will interfere with teacher collaboration and potentially reduce the impact of the intervention. This was shown in the percentages of meetings, informal advice/input, and in swapping students. Findings from this study suggest that randomization of grade-level teams will interfere less with formal and informal communication and will have little effect on the practice of swapping students. Grade-level team randomization offers a relatively efficient alternative to school-level randomization and a potentially less intrusive alternative to teacher-level randomization.

This research was supported by a grant (#R305E040031) to Empirical Education Inc. from the U.S. Department of Education, National Center for Education Research.

Summary of Findings.
- Elementary teachers had more collaboration meetings than middle school teachers.
- Instructional meetings outnumbered administrative meetings.
- In elementary schools, 66% of teachers swapped students for mathematics and/or science.
- Virtually all swapping was within grade.
- Formal and informal teacher interactions occurred more often within grade-level teams than across grade levels.

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