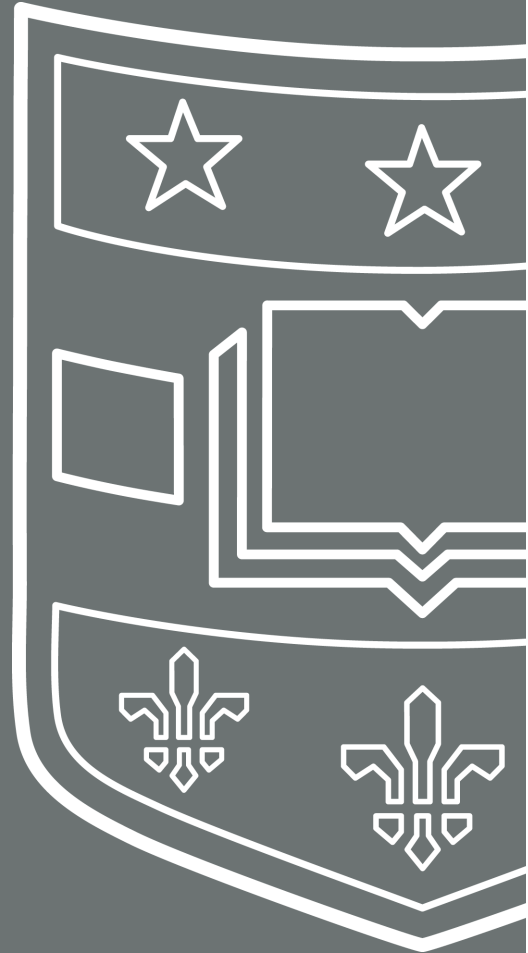


# Factors Associated with K-5 Science Teaching Time

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# K-5 Science Teaching Time



- NGSS Framework for K-12 Science Education (NRC, 2012)
- Link between K-5 science teaching time & science achievement (Judson, 2013, Curran & Kitchin, 2019)
- Science instructional time trends nationally (Blank, 2013, Banilower et al., 2018)
- Missouri Department of Elementary & Secondary Education (MO DESE) recommendations:
  - Lower Elementary (1-3): 150 minutes/week
  - Upper Elementary (4-5): 200 minutes/week



# mySci: A Research Practice Partnership (RPP)



- Focused on increasing science instructional time & quality since 2005
  - Institute for School Partnership
  - WashU STEM faculty
  - Informal science education institutions
  - Regional educators
- mySci Program components
  - Educative K-8 science curriculum
  - Comprehensive professional development
  - Hands-on science materials kits with leasing model
  - Partnership support & consulting services
- mySci serves **~3,500 K-5 teachers in 248 elementary schools**



# Approach to Research



- Improvement Science & Design-Based Implementation Research (DBIR)
  - Collaborative, grounded in systematic inquiry, focused on transformational change and the use of research to solve practical problems (Fishman et al., 2003, Bryk et al., 2015)
    - Research outcomes: production of change and improvement, along with production of theory
  - Data collection to analyze current system in context, delineate new problems, develop interventions, and measure impact
    - Program evaluation including biannual, voluntary Teacher Implementation Survey (TIS)

# mySci & K-5 Science Teaching Time



The problem...

- mySci teachers report problems with timing & length of lessons and units
- COVID response and the impact of virtual learning

Possible factors...

- Accountability pressure (Hayes & Trexler, 2016, Judson, 2013)
  - School FRL status
  - Student population & race
  - State testing structure & grade levels
- School / District policies
- Teacher science mindsets & beliefs
- Access to & appropriateness of materials

# Understanding K-5 Science Teaching Time



## Research Questions:

1. How much time do elementary school teachers spend on science?
2. What factors are associated with the amount of time elementary school teachers spend on science?
3. How do teachers perceive their level of control over the amount of time spent on science, and how is this associated with the amount of time spent on science teaching?





# Study Design & Methods



- Mixed-methods secondary analysis of evaluation survey using state district demographics
  - Thematic qualitative analysis using preset & emergent coding
- May 2021 mySci Teacher Implementation Survey
  - District, school, & primary grade level/band taught
  - Science instructional time (minutes per week)
  - Perception of science instructional time adequacy & control (categorical)
  - Factors influencing science instructional time allocation (open)
- Sample:
  - Voluntary survey with incentive raffle, sent via direct email & shared with district administrator partners
  - 11 independent schools & 26 public districts represented
  - 466 K-5 respondents



# Analyses & Findings: Time & Perceptions

How much time do elementary school teachers spend on science?

- All grade levels report mean below state benchmarks
- Upper elementary & lower elementary trends

How do teachers perceive their level of control over the amount of time spent on science?

- Perception of adequacy drops for 3rd grade teachers

Table 1. Descriptive statistics: Mean Weekly Minutes of Science Instruction, Control, and Perception

	<u>Control over science time (N=451)</u>				<u>Perception of Science Time (N=451)</u>	
	Mean weekly minutes of sci instr (N=459)	Makes most/all sci time decisions	Makes some sci time decisions	Makes few/no sci time decisions	Has enough time to teach sci	Does not have enough time to teach sci
All K-5	126.2	25.5%	34.6%	35.7%	48.3%	51.7%
K (N=58)	109.6	38.6%	31.6%	28.9%	52.6%	47.4%
1 (N=74)	91.5	29.2%	33.3%	37.5%	50.0%	50.0%
2 (N=83)	110.9	17.1%	43.9%	39.0%	53.7%	46.3%
3 (N=76)	127.4	18.4%	40.8%	40.8%	27.6%	72.4%
4 (N=81)	136.7	26.6%	30.4%	43.0%	49.4%	50.6%
5 (N=87)	170.4	32.9%	31.8%	35.3%	56.5%	43.5%



# Analyses & Findings: Mode of Instruction



What factors are associated with the amount of time elementary school teachers spend on science?

- Lower elementary remote or hybrid instruction associated with spending more time on science

			<i>Descriptive Statistics</i>		<i>Independent Samples T-Test</i>	
	Grade Band	Descriptor	Mean	StDev	Mean Diff	p-Value
Mode of instruction	1 to 3	Remote or hybrid only (N=90)	120	59.3	30.5	0.001***
		In-person only (N=60)	89.5	50.9		
	4 to 5	Remote or hybrid only (N=82)	160.2	77.8	4.9	0.788
		In-person only (N=40)	155.3	122.5		

# Analyses & Findings: Student Demographics



What factors are associated with the amount of time elementary school teachers spend on science?

- District racial majority
- Building Community Eligibility Provision (CEP) status for Free & Reduced Lunch (FRL) program

			Descriptive Statistics		Independent Samples T-Test	
	Grade Band	Descriptor	Mean	StDev	Mean Diff	p-Value
District Racial Majority	1 to 3	Majority Black Students (N=43)	124.6	62.8	15.8	0.142
		Majority White Students (N=161)	108.7	62.5		
	4 to 5	Majority Black Students (N=32)	173.9	67.7	19.9	0.281
		Majority White Students (N=116)	154	97.5		
School Building Free & Reduced Lunch Population	1 to 3	More than 40% FRL (N=99)	106.6	60.1	6.1	0.455
		Less than 40% FRL (N=133)	112.7	62.3		
	4 to 5	More than 40% FRL	147.4	65.1	12.2	0.386
		Less than 40% FRL	159.6	103.5		



# Analyses & Findings: Teacher Perceptions

What factors are associated with the amount of time elementary school teachers spend on science?

- Teachers perception of the adequacy of their science instructional time aligns with their reported time spent teaching science

			<i>Descriptive Statistics</i>		<i>Independent Samples T-Test</i>	
	Grade Band	Descriptor	Mean	StDev	Mean Diff	p-Value
Teacher Perception of Science Time Adequacy	1 to 3	Has enough (N=101)	118.9	70.6	14.3	0.076*
		Does not have enough (N=129)	104.6	51.4		
	4 to 5	Has enough (N=87)	171.7	80.2	32.8	0.017**
		Does not have enough (N=77)	139	94.3		
Teacher Control Over Sci Time	1 to 3	High control (N=49)	104.6	61	11.5	0.282
		Low control (N=87)	116.1	58.9		
	4 to 5	High control (N=49)	155.9	90.3	7.5	0.684
		Low control (N=64)	163.4	102.1		

# Analyses & Findings: Qualitative Themes



## **District & administration expectations, policies**

- Referenced at the same rate as teachers reporting lack of control over science time allocation (~1 out of 3)
- Evenly split between teachers feeling like they spent “enough” and “not enough” time on science
- Evenly split between those spending less than 130 min/week and those spending greater than 130 min/week
- Both lower and upper elementary teachers referenced district expectations as important to their decision making at roughly the same rate
- Teachers cited district or administration policy and expectations at roughly the same rates regardless of the student racial majority in their district

# Analyses & Findings: Qualitative Themes



## Everyday Schedule Issues Superseding Science

- Time of day and other activities “running long”
- Specials, assemblies, & “pull outs”
- Commonly cited across all subsets of teachers, no trends by student demographics, grade level, or teacher perceptions of science time adequacy



# Analyses & Findings: Qualitative Themes



## **Perceived importance of Math & ELA**

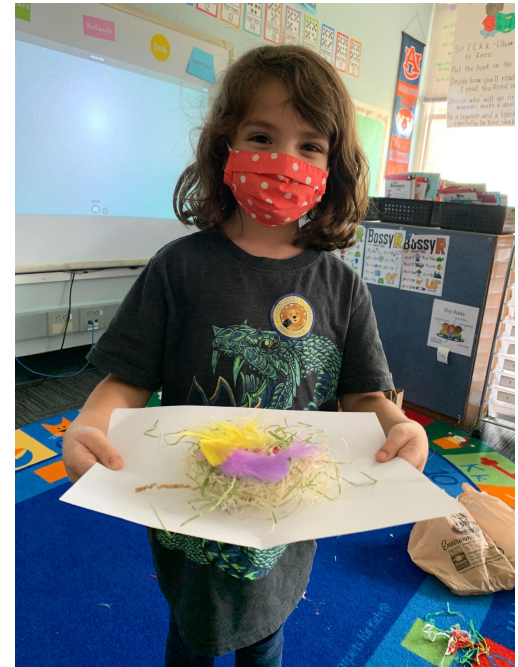
- Teachers who make all of their own decisions regarding science time tend to spend less time on science and cite the need to focus on math & ELA as a major factor
- Teachers who do not feel they spend enough time on science also cite math & ELA focus as a major factor
- Most often cited factor in schools serving racially diverse and majority Black student populations
- Science & Social Studies “split”

# Analyses & Findings: Qualitative Themes



## COVID-19

- Learning loss fears from administrators
- Sanitization precautions & technology issues more frequently cited by teachers serving schools with majority Black student population
- Virtual teaching cited both as “more flexible” and consistent
- Availability of virtual science resources through the mySci RPP
- Social-Emotional importance of “fun” through hands-on science activities





# Discussion



## Limitations:

- Specificity of sample to RPP participants
- Self-reported science teaching minutes
- 2020-2021 was not a typical year
- Quantity vs quality of science instruction

## Implications:

- 3rd Grade & the onset of standardized testing
- Interdisciplinary integration
- Hands-on science activities & social-emotional well-being
- De facto & de jure instructional time pressures and priorities



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INSTITUTE FOR SCHOOL PARTNERSHIP

Thank you!

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