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Responding to a Global Pandemic: The Role of K–12 Science Teachers

Technical Report

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INTRODUCTION

Across the US, tens of thousands of science teachers have been doing their best to answer student questions about coronavirus and COVID-19.[1] For biology/life science teachers, the moment presents a powerful opportunity to engage students in the science of viruses and how to prevent their transmission. But it is not just biology teachers who have been fielding student questions. It is also high school chemistry and physics teachers, middle school general science teachers, and elementary teachers. The vast majority of K–12 students interact with a science teacher daily or almost daily, much more frequently than with a health professional. Thus, when a global health crisis emerges, students of all ages turn to their science teachers for information and, at times, reassurance. In this way, science teachers become a critical part of the nation's response to a public health crisis.

In the spring of 2020, Horizon Research, Inc. (HRI) received support from the National Science Foundation to study how science teachers respond when urgent science-related issues such as COVID emerge and what guides their responses to these issues. The study addressed the following research questions:

1. Where do K–12 teachers of science get their information about COVID, and what types of resources do they find most useful? What resources do teachers need but not have access to?
2. What factors influence whether and how science teachers address COVID in their instruction?
3. How have science teachers adapted their teaching in response to COVID, whether viruses and disease transmission are part of their curriculum or not? How is their instruction similar to and different from their typical instruction?

The study was motivated by interest in helping teachers respond to this and the next such public health crisis. Findings about where teachers get their information, what formats are most useful, and how they use the information have the potential to help education and health organizations target their dissemination efforts so schools can serve as an outlet for accurate information and resources. Additionally, findings about factors that influence teachers' decision to teach about these types of situations can help school leaders and policy makers consider school contexts that are supportive of science instruction that has a timely and real-world focus.

[1] Throughout the remainder of this report, we will use the term "COVID" to refer to both the virus and the disease. However, we will use the individual terms if we are specifically referring to one or the other.

The Theory of Planned Behavior

Understanding what factors influence teachers' decisions about whether to address COVID was a focus of the study given the role science teachers play in disseminating accurate information during a public health crisis. Thus, this aspect of the work was situated within the Theory of Planned Behavior (TPB) (Ajzen, 2012), a prominent and comprehensive framework in social psychology for understanding human behavior.

The TPB holds that three types of beliefs indirectly influence behavior: behavioral beliefs, normative beliefs, and control beliefs. Beliefs regarding the expected outcome of a behavior, along with subjective values about the outcome, influence an individual's attitude toward the behavior. A science teacher may believe that addressing COVID will alleviate student concerns. If the teacher attaches a positive value to this outcome, then the teacher's overall attitude toward teaching about COVID may be positive. However, the same teacher may also believe that addressing COVID will take time away from topics that are included in their curriculum and on state-mandated tests. If this belief and the associated value of the outcome are strong enough, they may outweigh perceived benefits, and the teacher may have an overall negative attitude toward teaching about COVID. Normative beliefs, or what individuals believe influential others will think about them if they exhibit the behavior, combined with motivation to comply, form a subjective norm. For example, if a teacher works in a school or district where administrators support teachers addressing COVID, and if the teacher is motivated to comply with administrators, then the teacher may have a positive subjective norm toward this behavior. Finally, an individual's ability to engage in a behavior has to do with factors both internal and external to the individual. The individual's perception of the presence of these factors, along with the perceived power of each factor, constitute control beliefs, which shape the individual's perceived behavioral control. For instance, if a teacher does not have the content knowledge (an internal factor) or access to resources (an external factor) for teaching about COVID, the teacher may have low perceived behavioral control.

Attitude toward a behavior, subjective norms, and perceived behavioral control influence each other and together shape an individual's intention toward the behavior. Intention, combined with actual behavioral control, predicts the likelihood of the behavior. To the extent that perceived behavioral control is accurate, it can serve as a proxy for actual behavioral control in predicting behavior. Figure 1 represents these relationships graphically.

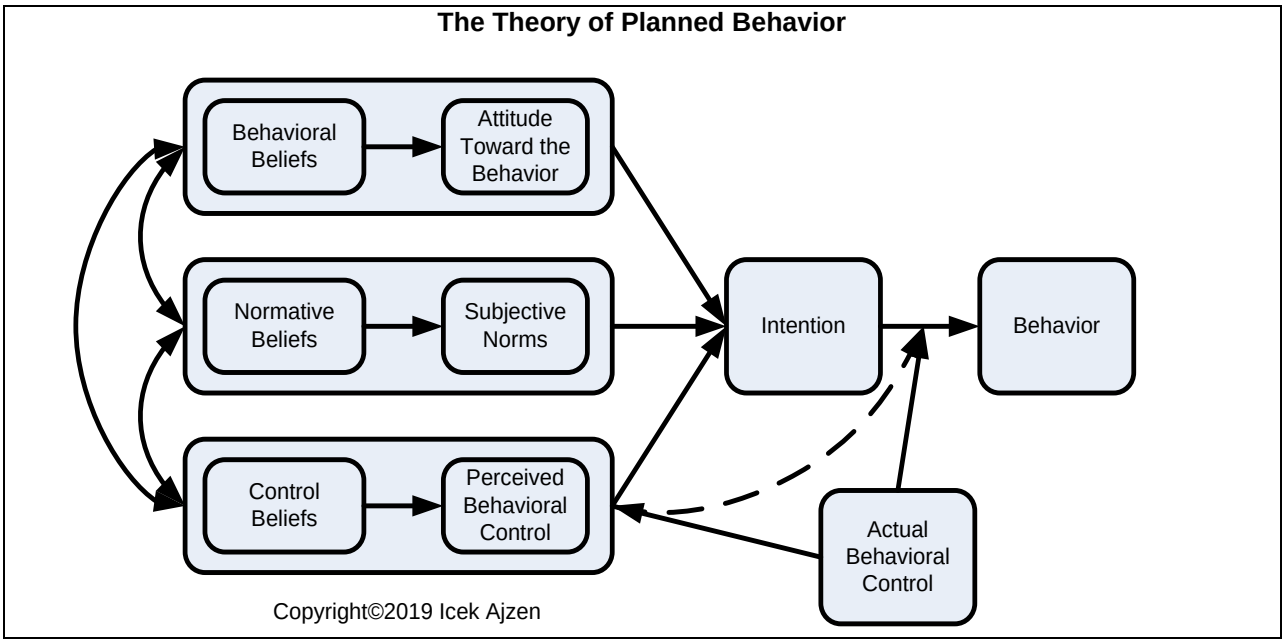
The Theory of Planned Behavior
Behavioral Beliefs
Attitude Toward the Behavior
Normative Beliefs
Subjective Norms
Control Beliefs
Perceived Behavioral Control
Intention
Behavior
Actual Behavioral Control
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Figure 1

METHODOLOGY

The methodology for this study involved developing a teacher questionnaire and interview protocol, recruiting participants, collecting data, reducing the sample, and analyzing data. This section provides a description of each of these components of the methodology, as well as important information on interpreting the findings of the study while reading the report.

Instrument Development

Questionnaire

The teacher questionnaire covered a broad range of topics, including instructional activities used to teach about COVID (e.g., lecture, group discussion, investigations), specific topics addressed (e.g., how COVID is diagnosed, how COVID is transmitted), and where teachers acquired information about COVID (e.g., websites, television news stations, print media). Because most school buildings closed for a period of time as a result of the pandemic, the survey collected information about teachers' response both before and after school buildings closed.

The survey also included items aligned with the TPB, which gathered information about factors that affected teachers' decision to teach or not teach about COVID. Consistent with guidance provided by Francis et. al (2004), we administered a set of open-ended items to a sample of teachers to determine (1) the most frequently perceived advantages and disadvantages of teaching about COVID, (2) the most important people or groups of people who would approve or disapprove of teaching about COVID, and (3) the perceived factors that could make it easier or more difficult to teach about COVID. Teachers' responses informed the development of these questionnaire items.

Once all survey items had been drafted, cognitive interviews (Desimone & Le Floch, 2004) were conducted with a sample of teachers to ensure that (1) the items were being interpreted as intended[2] and (2) the online questionnaire functioned according to design specifications. Information from the interviews was used to revise the questionnaire, which is included in Appendix A.

Interview Protocol

The teacher interview protocol focused on many of the same topics as the teacher questionnaire and was intended to elicit additional information about the varied contexts in which teachers worked, factors that influenced their teaching about COVID, and how they are likely to respond

[2] For example, the survey asked about several possible topics of COVID instruction. One topic originally read "Survival rates of coronavirus victims." However, interviewees found the term "victims" ambiguous. Consequently, the item was revise to "Survival rates of those infected with coronavirus."

to similar situations in the future. The interview protocol was piloted with a small number of teachers prior to broader use to ensure that the questions were clear and interpreted as intended.

Study Recruitment

HRI recruited teachers for the study from two sources. First, we used email lists from MCH Strategic Data. MCH maintains a database of email addresses for almost five million school and district personnel, from which we constructed a sample of teachers with science in their teaching assignment (including teachers in self-contained classrooms). MCH sent the sampled teachers a link to the study registration form. We also enlisted the help of the National Science Teaching Association (NSTA), which has a membership of over 55,000 teachers and a mailing list of over 200,000. NSTA sent a description of the study and link to the study registration form to a substantial portion of their members. Between the two recruiting strategies, we registered just over 3,500 K–12 science teachers for the study.

Data Collection and Sample Reduction

Questionnaire

Administering the questionnaire to teachers before the end of the 2020–21 school year was important both for the validity of responses and achieving an adequate response rate. The questionnaire was launched in June 2020 and closed at the end of July 2020 with a response rate of 67 percent.[3]

The study timeline and budget precluded drawing a nationally representative sample for the teacher questionnaire. Instead, HRI attempted to register and survey enough teachers that a representative group could be constructed from respondents for analysis purposes. We used demographic data from the 2018 National Survey of Science and Mathematics Education (Banilower et al., 2018) to specify the target sample characteristics. For example, survey respondents were removed from the sample until it closely resembled population parameters for race/ethnicity. Ultimately, 36 percent of respondents were excluded from the analysis to achieve this goal.

HRI segmented the sample into elementary, middle, and high school teachers. In addition, middle and high school teachers were split into life science and non-life science teaching assignments. The final sample sizes are:

[3] Teachers who registered for the study received an initial email with instructions for accessing and completing the questionnaire. Up to three email reminders were sent to those who had not yet completed the questionnaire.

Table 1
Sample Size

	Number of Teachers		
	All	Teaching Assignment	
		Any Life Science	Non-Life Science Only
Elementary	272	n/a	n/a
Middle	560	273	287
High	599	323	276

More detailed information about the sample is included in Appendix B.

Interviews

Teachers who completed the questionnaire were asked if they were willing to participate in a follow-up interview. HRI drew a purposive sample from those who agreed to participate, with the goal of balancing the sample in terms of teachers' grade range (elementary, middle, high), life science/non-life science teaching assignment, community type (rural, urban, suburban), and whether or not they addressed COVID in their instruction. The initial sample consisted of 40 teachers and 80 matched backups. When a teacher in the original sample declined or did not respond, their matched backup was contacted as a replacement. Using this approach, we were able to interview our targeted 40 teachers, 30 from the original sample and 10 backups.

Data Analysis

Questionnaire

To facilitate the reporting of large amounts of survey data, and because individual questionnaire items are potentially unreliable, HRI used factor analysis to identify survey items that could be combined into "composites." Each composite represents an important construct related to COVID in science education and is reported on a scale from 0 to 100. A detailed description of the composite creation and composite definitions are included in Appendix C.

Although not designed primarily as an equity study, the survey also provides some data about the extent to which students across the nation had equitable opportunities to learn about COVID. Data were analyzed by four factors[4] historically associated with differences in educational opportunities:

[4] Three factors—percentage of students eligible for FRL, percentage of students from URM groups, and community type—are school-level factors. The fourth—political leaning—is a county-level factor. For analysis purposes, all factors were assigned to individual teachers' responses about the class for which they responded.

- **Percentage of students in the school eligible for free/reduced-price lunch (FRL)**
  Classes were grouped into 1 of 4 categories based on the percentage of students in the school eligible for FRL. The categories were defined as quartiles within groups of schools serving the same grades (e.g., schools with grades K–5, schools with grades 6–8). Cut points for these quartiles are included in Appendix C.

- **Percentage of students in the school from historically underrepresented minority (URM) groups**
  Classes were grouped into 1 of 4 quartiles based on the percentage of students in the school from race/ethnicity groups historically underrepresented in STEM (i.e., American Indian or Alaskan Native, Black or African American, Hispanic or Latino, Native Hawaiian or Other Pacific Islander, multi-racial). Cut points for these quartiles are included in Appendix C.

- **Community type**
  Classes were coded into 1 of 3 types of communities:
  - Urban: central city;
  - Suburban: area surrounding a central city, but still located within the counties constituting a Metropolitan Statistical Area (MSA); or
  - Rural: area outside any MSA.

- **Political leaning**
  Classes were coded into 1 of 2 categories based on whether the majority of voters in the county voted for the Democratic presidential candidate or Republican presidential candidate in the 2020 election.

Equity analyses of selected survey items and composites include all teachers (grades K–12) and cover instruction both before and after school buildings closed.

While the TPB survey items were written with three specific constructs in mind (attitude toward the behavior, subjective norm, and perceived behavioral control), the factor analysis revealed four intention-related composites: attitude toward the behavior, subjective norms, self-efficacy, and control. These composites, along with several other reporting variables, were analyzed using path modeling—a form of regression analysis that estimates both direct and indirect effects (i.e., through intermediary variables)—to examine relationships between teacher, classroom, and school factors, and how often teachers taught about COVID. The results are discussed later in this report.

Interviews

Interview data were used to write brief vignettes, which provide illustrative examples of the interplay among numerous factors that influenced teachers' response to COVID. Teacher quotes from the vignettes are also interspersed throughout the report to supplement the survey findings.

Organization of This Report

The results of the study, like those from any survey based on a sample of a population (rather than on the entire population), are subject to sampling variability. The sampling error (or standard error) provides a measure of the range within which a sample estimate can be expected to fall a certain proportion of the time. For example, survey findings may indicate that 15 percent of elementary teachers gave a lecture when they addressed COVID with their students. If the sampling error for this estimate was 3 percent, then, according to the Central Limit Theorem, 95 percent of all possible samples of that same size selected in the same way would yield estimates between 9 percent and 21 percent (that is, 15 percent ± 2 standard error units). The standard errors for the estimates presented in this report are included in parentheses in the tables (see Figure 2.

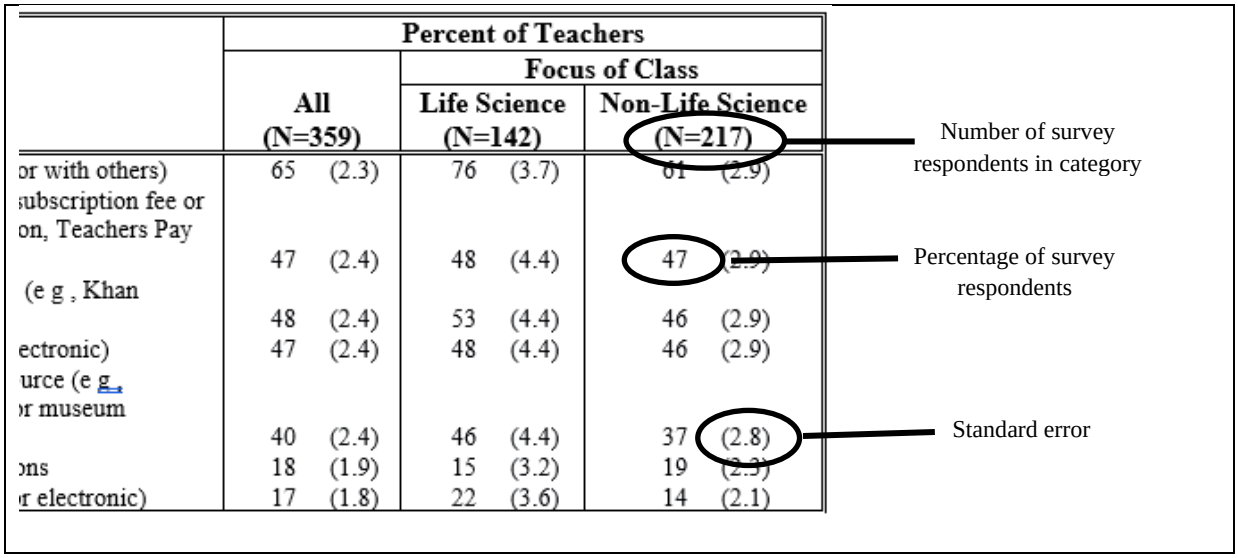

Figure 2

In most tables, results for middle and high school teachers are reported separately for life science and non-life science teachers. This distinction was not appropriate for elementary teachers, who typically teach Earth, life, and physical science. When the data are similar before and after school buildings closed, they are combined into a single table. When there are notable differences between the two timepoints, those data are reported separately. A summary of each

table highlighting or interpreting the results precedes the table. The summary points out only those differences that are substantial as well as statistically significant at the 0.05 level.[5]

Comparisons were made between groups within each equity factor. For FRL and URM, comparisons were made between the highest and lowest quartiles. For community type, comparisons were made among all three locales (urban vs. suburban, urban vs. rural, and rural vs. suburban). For political leaning, comparisons were made between Democratic- and Republican-leaning counties.

[5] Given the exploratory nature of this report, all tests of significance were conducted without controlling the Type 1 error rate.

FINDINGS

Sources of Information About COVID

To find out where teachers accessed information about COVID, the survey asked them what media sources they consulted and how useful they found those sources. Findings regarding sources of information about COVID, combined before and after schools closed, are described below.

Large percentages of teachers at each grade band relied on health information websites to learn about COVID. Teachers who taught about COVID were generally more likely to access health information websites to a substantial extent than teachers who did not teach about COVID.

Whether or not they taught about COVID, more than two-thirds of elementary teachers relied on the CDC website and local news stations to a substantial extent (i.e., those responding 3 or 4 on a four-point scale ranging from 1 "Not at all" to 4 "To a great extent") as sources of information about COVID. However, the CDC website was more likely to be accessed by elementary teachers who taught about COVID than those who did not (84 vs. 73 percent). Elementary teachers who taught about COVID were also more likely than those who did not to access other health organization websites to a substantial extent, including the National Institutes of Health (NIH) website, (42 vs. 27 percent) and the Johns Hopkins Coronavirus Resource Center website (41 vs. 25 percent).

Table 2
Elementary Teachers Indicating That Various Media Served as a Source of Information About COVID to a Substantial Extent†

	Percent of Teachers (N = 272)			
	Did not teach about COVID (N = 69)		Did teach about COVID (N = 203)	
Centers for Disease Control and Prevention (CDC) website	73	(5.4)	84	(2.6)
Local news station (e.g., NBC4), via radio, TV, or Internet	76	(5.2)	67	(3.3)
National broadcast TV news program (e.g., NBC Nightly News, CBS Nightly News)	58	(6.0)	58	(3.5)
24-hour TV news (e.g., CNN, MSNBC, FOX, BBC)	45	(6.1)	49	(3.5)
Newspapers, whether print or online (e.g., NY Times, Boston Globe)	45	(6.1)	49	(3.5)
Online-only sources (e.g., Huffington Post, Yahoo News, AOL)	46	(6.1)	46	(3.5)
Conversations with health professionals (e.g., nurses, doctors)	36	(5.9)	44	(3.5)
National Institutes of Health (NIH) website	27	(5.4)	42	(3.5)
World Health Organization (WHO) website	39	(6.0)	42	(3.5)
Johns Hopkins Coronavirus Resource Center website	25	(5.3)	41	(3.5)
Websites from teacher professional organizations (e.g., National Science Teachers Association, National Association of Biology Teachers)	28	(5.5)	40	(3.5)
Websites from other health organizations (besides CDC, Johns Hopkins, NIH, and WHO)	21	(5.0)	39	(3.4)
Conversations with other teachers	36	(5.9)	39	(3.4)
Conversations with others (i.e., not health professionals or teachers)	31	(5.7)	37	(3.4)
Social media (e.g., Facebook, Instagram, LinkedIn, Twitter)	33	(5.7)	30	(3.2)
Popular science magazines (e.g., Scientific American, Discover)	18	(4.7)	28	(3.2)
Radio talk show	28	(5.5)	26	(3.1)
Other magazines, whether print or online (e.g., Time, New Yorker)	18	(4.7)	23	(3.0)
Resources provided by your school district	25	(5.3)	22	(2.9)

† Includes teachers indicating 3 or 4 on a four-point scale ranging from 1 "Not at all" to 4 "To a great extent."

At the middle and high school levels, teachers also accessed a variety of media sources to find information about COVID (see Tables 3 and 4). However, there were many differences between teachers who taught about COVID and those who did not in the extent to which these media sources were utilized. For example, middle school teachers who taught about COVID were more likely than those who did not to access the CDC website (91 vs. 79 percent), WHO website (62 vs. 40 percent), NIH website (58 vs. 41 percent), popular science magazines (55 vs. 28 percent), and the Johns Hopkins Coronavirus Resource Center website (54 vs. 39 percent) to a substantial extent. Similarly, high school teachers who taught about COVID were more likely than those who did not to access the CDC website (90 vs. 80 percent), Johns Hopkins Coronavirus Resource Center website (67 vs. 41 percent), NIH website (66 vs. 46 percent), WHO website (66 vs. 40 percent), newspapers (60 vs. 45 percent), and popular science magazines (60 vs. 45 percent) to a substantial extent.

Table 3
Middle School Teachers Indicating That Various Media Served as a Source of Information About COVID to a Substantial Extent†

	Percent of Teachers (N = 560)	
	Did not teach about COVID (N = 120)	Did teach about COVID (N = 440)
Centers for Disease Control and Prevention (CDC) website	79 (3.7)	91 (1.4)
Local news station (e.g., NBC4), via radio, TV, or Internet	71 (4.1)	63 (2.3)
World Health Organization (WHO) website	40 (4.5)	62 (2.3)
National Institutes of Health (NIH) website	41 (4.5)	58 (2.4)
National broadcast TV news program (e.g., NBC Nightly News, CBS Nightly News)	52 (4.6)	55 (2.4)
Popular science magazines (e.g., Scientific American, Discover)	28 (4.1)	55 (2.4)
Johns Hopkins Coronavirus Resource Center website	39 (4.5)	54 (2.4)
Newspapers, whether print or online (e.g., NY Times, Boston Globe)	48 (4.6)	50 (2.4)
Websites from other health organizations (besides CDC, Johns Hopkins, NIH, and WHO)	36 (4.4)	45 (2.4)
Websites from teacher professional organizations (e.g., National Science Teachers Association, National Association of Biology Teachers)	33 (4.3)	45 (2.4)
Online-only sources (e.g., Huffington Post, Yahoo News, AOL)	58 (4.5)	42 (2.4)
Conversations with health professionals (e.g., nurses, doctors)	35 (4.4)	42 (2.4)
24-hour TV news (e.g., CNN, MSNBC, FOX, BBC)	42 (4.5)	40 (2.3)
Conversations with other teachers	24 (3.9)	36 (2.3)
Radio talk show	19 (3.6)	35 (2.3)
Other magazines, whether print or online (e.g., Time, New Yorker)	18 (3.5)	27 (2.1)
Conversations with others (i.e., not health professionals or teachers)	32 (4.2)	24 (2.0)
Social media (e.g., Facebook, Instagram, LinkedIn, Twitter)	34 (4.3)	16 (1.7)
Resources provided by your school district	18 (3.5)	13 (1.6)

† Includes teachers indicating 3 or 4 on a four-point scale ranging from 1 "Not at all" to 4 "To a great extent."

Table 4
High School Teachers Indicating That Various Media Served as a Source of Information About COVID to a Substantial Extent†

	Percent of Teachers (N = 599)	
	Did not teach about COVID (N = 111)	Did teach about COVID (N = 488)
Centers for Disease Control and Prevention (CDC) website	80 (3.8)	90 (1.3)
Johns Hopkins Coronavirus Resource Center website	41 (4.7)	67 (2.1)
National Institutes of Health (NIH) website	46 (4.7)	66 (2.1)
World Health Organization (WHO) website	40 (4.6)	66 (2.2)
Newspapers, whether print or online (e.g., NY Times, Boston Globe)	45 (4.7)	60 (2.2)
Popular science magazines (e.g., Scientific American, Discover)	45 (4.7)	60 (2.2)
Local news station (e.g., NBC4), via radio, TV, or Internet	59 (4.7)	58 (2.2)
Websites from other health organizations (besides CDC, Johns Hopkins, NIH, and WHO)	34 (4.5)	50 (2.3)
Websites from teacher professional organizations (e.g., National Science Teachers Association, National Association of Biology Teachers)	32 (4.4)	49 (2.3)
National broadcast TV news program (e.g., NBC Nightly News, CBS Nightly News)	46 (4.7)	48 (2.3)
Online-only sources (e.g., Huffington Post, Yahoo News, AOL)	49 (4.7)	45 (2.3)
Conversations with health professionals (e.g., nurses, doctors)	24 (4.1)	41 (2.2)
24-hour TV news (e.g., CNN, MSNBC, FOX, BBC)	34 (4.5)	40 (2.2)
Radio talk show	25 (4.1)	39 (2.2)
Conversations with other teachers	22 (3.9)	39 (2.2)
Other magazines, whether print or online (e.g., Time, New Yorker)	25 (4.1)	33 (2.1)
Conversations with others (i.e., not health professionals or teachers)	22 (3.9)	23 (1.9)
Social media (e.g., Facebook, Instagram, LinkedIn, Twitter)	21 (3.8)	19 (1.8)
Resources provided by your school district	5 (2.0)	10 (1.3)

† Includes respondents indicating 3 or 4 on a four-point scale ranging from 1 "Not at all" to 4 "To a great extent."

I did refer to the CDC, Johns Hopkins, the National Science Teaching Association, because they have a lot of really good up-to-date information that was timely. . . . So that's pretty much the resources that I used, ones that I felt were reputable and that I trusted and have used in the past.
(Middle School Teacher)

So we use Discovery Education science textbooks, and they had some COVID-19 resources. And prior to the shutdown, I would bring in those resources to help teach my students about viruses and how to prevent the spread of viruses, and then what COVID-19 was and what we knew about COVID at the time. . . . We also used daily news reports that talked about COVID. It was in China and was moving into the United States and how that impacted people.
(Elementary School Teacher)

At that time, I was just kind of a little bit crazy obsessive about trying to figure out what was going on with it because the students had had so many questions. So anything that I could read about it and try to verify information, and pull multiple sources where possible, because there was a lot of conflicting stuff at that time. . . . I don't know when along the process it was, but Dr. Fauci kind of was coming through, and he kind of emerged as someone I was like, "Okay, that guy seems to know what he's talking about and uses scientific language and evidence when he talks." I started paying more attention to what he was saying, but at first I didn't know who to trust or what to try to believe.
(High School Teacher)

Teachers were increasingly likely to rely on written news sources and health/science organization websites with increasing grade range. These sources were also more likely to be accessed by teachers who taught about COVID than those who did not.

The items shown in Tables 2–4 were combined into five composite variables: (1) local/national television news stations, (2) online news/social media, (3) written news sources, (4) health/science organization websites, and (5) personal conversations. As can be seen in Table 5, as grade range increased, teachers were more likely to rely on written news sources (34, 43, and 49, respectively) and health/science organization websites (46, 59, and 64, respectively). Additionally, there were significant differences between teachers who taught about COVID and those who did not. Written news sources were more likely to be accessed by middle and high school teachers who taught about COVID than those who did not. Similarly, elementary, middle, and high school teachers who taught about COVID were more likely to utilize health/science organization websites than those who did not teach about COVID.

Table 5
Extent to Which Teachers Indicated That Various Media Served as a Source of Information About COVID Composites

	Mean Score†					
	All		Did not teach about COVID		Did teach about COVID	
Local/National Television News Stations						
Elementary	56	(1.8)	56	(2.0)	58	(3.5)
Middle	51	(1.1)	51	(1.2)	52	(2.2)
High	47	(1.1)	47	(1.2)	47	(2.4)
Online News/Social Media						
Elementary	31	(1.5)	30	(1.8)	35	(2.7)
Middle	29	(1.0)	29	(1.1)	29	(2.1)
High	32	(0.9)	33	(1.1)	29	(2.1)
Written News Sources						
Elementary	34	(1.6)	35	(1.8)	31	(3.1)
Middle	41	(1.1)	43	(1.2)	33	(2.2)
High	47	(1.0)	49	(1.2)	38	(2.1)
Health/Science Organization Websites						
Elementary	46	(1.6)	48	(1.8)	39	(2.8)
Middle	56	(1.1)	59	(1.2)	47	(2.5)
High	61	(1.0)	64	(1.1)	47	(2.3)
Personal Conversations						
Elementary	42	(1.5)	42	(1.7)	41	(3.2)
Middle	38	(0.9)	38	(1.1)	38	(1.8)
High	37	(0.8)	38	(0.9)	32	(1.8)

† N for all categories: All Elementary, 272; Did not teach about COVID, 69; Did teach about COVID, 203
All Middle School, 560; Did not teach about COVID, 120; Did teach about COVID, 440
All High School, 599; Did not teach about COVID, 111; Did teach about COVID, 488

There were some differences in the types of media teachers consulted for information about COVID by the political leaning of the county.

The five composite variables related to teachers' sources of information about COVID (shown in Table 5) were examined by equity factors. As can be seen in Table 6, two differences were noted based on political leaning, although the magnitude of these differences is small. Teachers in Democratic-leaning counties were more likely than those in Republican-leaning counties to rely on online news/social media (32 vs. 28) and written news sources (45 vs. 38). Looking at these data by community type, teachers in rural schools were more likely than those in suburban or urban schools to rely on written news sources (45, 42, and 38, respectively). Additionally, teachers in schools in the highest URM quartile were more likely than those in the lowest URM quartile to rely on local or national television news stations as a source of information about COVID (54 vs. 48).

Table 6
Equity Analysis of the Extent to Which Teachers Indicated That Various Media Served as a Source of Information About COVID Composites

	Mean Score									
	Local/National Television News Stations		Online News/Social Media		Written News Sources		Health/ Science Organization Websites		Personal Conversations	
FRL (N = 1161)										
Lowest Quartile	52	(1.5)	32	(1.4)	42	(1.5)	57	(1.5)	41	(1.3)
Second Quartile	50	(1.5)	29	(1.3)	40	(1.5)	54	(1.5)	37	(1.2)
Third Quartile	50	(1.6)	31	(1.5)	39	(1.6)	55	(1.6)	37	(1.3)
Highest Quartile	53	(1.6)	30	(1.4)	44	(1.5)	58	(1.6)	38	(1.3)
URM (N = 1424)										
Lowest Quartile	48	(1.3)	30	(1.2)	41	(1.4)	54	(1.3)	38	(1.0)
Second Quartile	49	(1.3)	31	(1.2)	43	(1.4)	56	(1.3)	40	(1.2)
Third Quartile	51	(1.4)	31	(1.3)	41	(1.3)	56	(1.5)	38	(1.2)
Highest Quartile	54	(1.5)	31	(1.4)	44	(1.4)	58	(1.5)	38	(1.3)
Community Type (N = 1431)										
Rural	49	(1.5)	29	(1.4)	38	(1.6)	53	(1.6)	37	(1.3)
Suburban	51	(1.0)	31	(0.9)	42	(1.0)	58	(1.0)	39	(0.8)
Urban	50	(1.3)	31	(1.1)	45	(1.2)	56	(1.3)	38	(1.0)
Political Leaning (N = 1431)										
Democratic Presidential Candidate	51	(0.9)	32	(0.8)	45	(0.9)	57	(0.9)	38	(0.7)
Republican Presidential Candidate	49	(1.1)	28	(1.0)	38	(1.1)	55	(1.1)	39	(0.9)

Teaching About COVID

The survey asked teachers whether they devoted class time to COVID, both before and after school buildings closed, and what influenced their decision. Teachers who addressed COVID were also asked how much class time they devoted, what instructional activities were used, and what specific topics of the virus/disease were addressed. These data are discussed in this section of the report.

Large proportions of teachers at each grade band and across all equity factors devoted class time to COVID.

As can be seen in Table 7, three-fourths or more of teachers at each grade band devoted class time to COVID. Life science teachers were more likely than non-life science teachers to address COVID at both the middle and high school levels (84 vs. 73 percent and 92 vs. 69 percent, respectively). However, it is noteworthy that approximately 7 in 10 non-life science teachers at the middle and high school levels also took up the topic.

Table 7
Teachers Who Addressed COVID†

	Percent of Teachers‡		
	All	Teaching Assignment	
		Any Life Science	Non-Life Science Only
Elementary	75 (2.6)	n/a	n/a
Middle	79 (1.7)	84 (2.2)	73 (2.6)
High	81 (1.6)	92 (1.5)	69 (2.8)

† Data from before and after school building closures are combined.

‡ N for all categories: All Elementary, 272
All Middle School, 560; Teachers of ANY life science, 273; Non-life science ONLY teachers, 287
All High School, 599; Teachers of ANY life science, 323; Non-life science ONLY teachers, 276

Table 8 shows percentages of classes in which COVID was addressed by various equity factors. Large percentages of teachers addressed COVID across equity factors, with no significant differences observed.

Table 8
Equity Analysis of Classes In Which COVID Was Addressed†

	Percent of Classes
FRL (N = 1161)	
Lowest Quartile	77 (2.5)
Second Quartile	76 (2.4)
Third Quartile	83 (2.3)
Highest Quartile	83 (2.2)
URM (N = 1424)	
Lowest Quartile	79 (2.1)
Second Quartile	76 (2.2)
Third Quartile	81 (2.1)
Highest Quartile	81 (2.2)
Community Type (N = 1431)	
Rural	78 (2.4)
Suburban	78 (1.6)
Urban	81 (1.9)
Political Leaning (N = 1431)	
Democratic Presidential Candidate	80 (1.4)
Republican Presidential Candidate	78 (1.8)

† Data from before and after school building closures are combined.

Of those teachers who devoted class time to COVID, most spent more than one class session. Life science teachers at the high school level were more likely than non-life science teachers to devote more than three class sessions to the topic.

At each grade band, a majority of teachers who taught about COVID devoted more than one class session to the topic (see Table 9). Additionally, the distribution of class sessions is significantly different between life science and non-life science classes at the high school level. This difference can potentially be attributed to the fact that life science teachers were more likely than non-life science teachers to spend three or more class sessions on COVID.

Table 9
Number of Class Sessions Devoted to COVID†

	Percent of Teachers		
		Focus of Class	
	All	Life Science	Non-Life Science
Elementary School	**(N = 203)**		
1 Class Session	21 (2.8)	n/a	n/a
2 Class Sessions	23 (3.0)	n/a	n/a
3 Class Sessions	19 (2.7)	n/a	n/a
>3 Class Sessions	37 (3.4)	n/a	n/a
Middle School	**(N = 422)**	**(N = 130)**	**(N = 292)**
1 Class Session	19 (1.9)	16 (3.2)	20 (2.3)
2 Class Sessions	27 (2.2)	25 (3.8)	28 (2.6)
3 Class Sessions	23 (2.0)	23 (3.7)	23 (2.4)
>3 Class Sessions	31 (2.3)	36 (4.2)	29 (2.7)
High School	**(N = 471)**	**(N = 265)**	**(N = 206)**
1 Class Session	15 (1.7)	9 (1.7)	24 (3.0)
2 Class Sessions	27 (2.0)	25 (2.6)	31 (3.2)
3 Class Sessions	20 (1.8)	20 (2.5)	19 (2.8)
>3 Class Sessions	38 (2.2)	47 (3.1)	26 (3.1)

† Only those who indicated devoting class time to COVID are included in this table. Data from before and after school building closures are combined.

The numbers of class sessions devoted to COVID were generally equitably distributed.

Analyses were conducted to examine COVID-focused class time by equity factors. As can be seen in Table 10, few differences were apparent, suggesting that student access to instruction focused on COVID was generally equitably distributed. However, there was one notable difference. The distribution of class sessions is significantly different between the highest and lowest FRL quartiles, likely because classes in high-poverty schools were more likely than those in low-poverty schools to devote more than three class sessions to COVID.

Table 10
Equity Analysis of Number of Class Sessions Devoted to COVID†

	Percent of Classes				
	0 Class Sessions	1 Class Session	2 Class Sessions	3 Class Session	>3 Class Sessions
FRL (N = 1161)					
Lowest Quartile	24 (2.5)	14 (2.1)	21 (2.4)	17 (2.2)	24 (2.5)
Second Quartile	24 (2.5)	16 (2.2)	20 (2.3)	17 (2.2)	24 (2.5)
Third Quartile	17 (2.2)	14 (2.0)	23 (2.5)	17 (2.2)	29 (2.7)
Highest Quartile	17 (2.2)	13 (2.0)	21 (2.4)	13 (2.0)	36 (2.8)
URM (N = 1424)					
Lowest Quartile	21 (2.1)	15 (1.8)	21 (2.1)	17 (1.9)	26 (2.2)
Second Quartile	24 (2.2)	13 (1.7)	20 (2.1)	19 (2.0)	25 (2.2)
Third Quartile	19 (2.1)	13 (1.8)	20 (2.2)	19 (2.1)	28 (2.5)
Highest Quartile	19 (2.2)	13 (1.9)	23 (2.3)	12 (1.8)	34 (2.6)
Community Type (N = 1431)					
Rural	22 (2.4)	18 (2.2)	17 (2.2)	18 (2.2)	26 (2.6)
Suburban	22 (1.6)	13 (1.3)	22 (1.6)	16 (1.4)	27 (1.7)
Urban	19 (1.9)	12 (1.5)	22 (2.0)	17 (1.8)	31 (2.2)
Political Leaning (N = 1431)					
Democratic Presidential Candidate	20 (1.4)	13 (1.1)	20 (1.4)	17 (1.3)	29 (1.5)
Republican Presidential Candidate	22 (1.8)	14 (1.5)	22 (1.8)	16 (1.6)	25 (1.8)

† Data from before and after school building closures are combined.

Large percentages of life science teachers addressed COVID as part of their curriculum. Elementary teachers and non-life science teachers were more likely to address COVID as a standalone topic.

When they addressed COVID, over 80 percent of life science teachers at the middle and high school levels reported doing so as part of their curriculum (see Table 11). Conversely, non-life science teachers were more likely than their life science counterparts to treat COVID as a standalone topic, unrelated to the rest of their science curriculum. At the elementary level, teachers were more likely to address COVID as a standalone topic than as part of their curriculum.

Table 11
How Teachers Addressed COVID in Relation to Their Curriculum†

	Percent of Teachers‡		
		Focus of Class	
	All	Life Science	Non-Life Science
Addressed as part of curriculum			
Elementary	63 (3.4)	n/a	n/a
Middle	64 (2.3)	82 (3.4)	55 (2.9)
High	69 (2.1)	85 (2.2)	49 (3.5)
Addressed as a standalone topic			
Elementary	79 (2.9)	n/a	n/a
Middle	72 (2.2)	56 (4.4)	78 (2.4)
High	72 (2.1)	68 (2.9)	78 (2.9)

† Only those who indicated devoting class time to COVID-19 are included in this table. Data from before and after school building closures are combined.

‡ N for all categories: All Elementary, 203
All Middle School, 422; Life science, 130; Non-life science, 292
All High School, 471; Life science, 265; Non-life science, 206

Regardless of grade range, over 80 percent of teachers indicated that their students asked about COVID before they addressed it.

The survey included an item regarding whether students asked about COVID before teachers began addressing it. Across grade ranges, nearly 80 percent of teachers who devoted some class time to COVID indicated that their students asked questions about it first (see Table 12). There was no significant difference between life science classes and non-life science classes at the middle or high school level, suggesting that students turned to science teachers in all disciplines for information about COVID.

Table 12
Teachers Indicating Students Asked About COVID Before They Began Addressing It†

	Percent of Teachers‡		
		Focus of Class	
	All	Life Science	Non-Life Science
Elementary	80 (2.8)	n/a	n/a
Middle	78 (2.0)	77 (3.7)	79 (2.4)
High	79 (1.9)	80 (2.5)	78 (2.9)

† Only those who indicated devoting class time to COVID-19 are included in this table. Data from before and after school building closures are combined.

‡ N for all categories: All Elementary, 203
All Middle School, 422; Life science, 130; Non-life science, 292
All High School, 471; Life science, 265; Non-life science, 206

I think the first time I mentioned COVID in class, it would have been in January, when we first started to see news come out of WHO about the situation. And students asked me about it actually. Science news is something we regularly talk about in class. It's a part of the curriculum to keep up-to-date with events. And students asked me if I had heard about this virus in China and could we please talk about it. And so I gathered up materials, mostly general knowledge at that time about this is what a virus is, this is how they spread.
(Middle School Teacher)

There were days where it was really important. Like, it was clear that they needed to talk about it, and they needed to ask me questions. And so those days, if we needed to dedicate the whole class period to it, I dedicated the whole class period to it.
(High School Teacher)

Differences in percentages of students who asked about COVID before teachers addressed it were seen based on political leaning of the county and URM quartile of the school.

Although large percentages of teachers who devoted some class time to COVID indicated that their students asked questions about it first, there were a few differences by equity factors. As can be seen in Table 13, teachers in schools in the highest URM quartile were more likely than those in the lowest URM quartile to indicate that students asked questions about COVID before they addressed it (85 vs. 76 percent). In addition, teachers in Democratic-leaning counties were more likely to report that students asked questions about COVID before they addressed it than teachers in Republican-leaning counties (81 vs. 76 percent).

Table 13
Equity Analysis of Classes Where Students Asked About COVID Before Teachers Began Addressing It†

	Percent of Classes	
FRL (N = 924)		
Lowest Quartile	81	(2.7)
Second Quartile	78	(2.8)
Third Quartile	74	(2.8)
Highest Quartile	85	(2.3)
URM (N = 1126)		
Lowest Quartile	76	(2.5)
Second Quartile	78	(2.4)
Third Quartile	78	(2.5)
Highest Quartile	85	(2.2)
Community Type (N = 1131)		
Rural	75	(2.9)
Suburban	80	(1.7)
Urban	81	(2.1)
Political Leaning (N = 1131)		
Democratic Presidential Candidate	81	(1.5)
Republican Presidential Candidate	76	(2.1)

† Only those who indicated devoting class time to COVID are included in this table. Data from before and after school building closures are combined.

There was a great deal of variation in the types of questions students asked about COVID.

As previously mentioned, student questions played a large part in teachers' response to COVID. To learn more about these questions, the survey asked teachers to list the five most common questions they received, which researchers coded into categories. As can be seen in Table 14, there was a great deal of variation in the types of questions students asked at all three grade bands, including preventing transmission, changes to schools, risk of infection, and what the virus/disease is. However, it appears that students generally asked similar types of questions in life science and non-life science classes.

Table 14
Topics of Most Common Student Questions About COVID[†]

	Percent of Questions[‡]		
		Focus of Class	
	All	Life Science	Non-Life Science
Actions to prevent transmission			
Elementary	14 (1.2)	n/a	n/a
Middle	12 (0.8)	13 (1.5)	12 (1.0)
High	11 (0.7)	9 (0.9)	13 (1.2)
School changes			
Elementary	14 (1.2)	n/a	n/a
Middle	9 (0.7)	7 (1.2)	10 (0.9)
High	9 (0.7)	7 (0.8)	11 (1.2)
Transmission			
Elementary	10 (1.1)	n/a	n/a
Middle	11 (0.8)	11 (1.4)	11 (0.9)
High	10 (0.7)	11 (1.0)	9 (1.1)
Risk for infection			
Elementary	10 (1.1)	n/a	n/a
Middle	10 (0.8)	9 (1.3)	11 (0.9)
High	8 (0.7)	8 (0.8)	9 (1.0)
Nature of the virus			
Elementary	9 (1.0)	n/a	n/a
Middle	8 (0.7)	9 (1.3)	7 (0.8)
High	6 (0.5)	6 (0.7)	6 (0.8)
Mortality			
Elementary	8 (1.0)	n/a	n/a
Middle	7 (0.6)	5 (1.0)	8 (0.8)
High	6 (0.6)	6 (0.7)	7 (0.9)
Origins			
Elementary	7 (0.9)	n/a	n/a
Middle	9 (0.7)	10 (1.4)	8 (0.8)
High	9 (0.7)	11 (1.0)	7 (0.9)
Negative implications			
Elementary	6 (0.9)	n/a	n/a
Middle	6 (0.6)	6 (1.0)	6 (0.7)
High	7 (0.6)	6 (0.8)	7 (1.0)
Outbreak duration			
Elementary	5 (0.8)	n/a	n/a
Middle	3 (0.4)	3 (0.7)	3 (0.5)
High	3 (0.4)	3 (0.5)	4 (0.7)
Virus characteristics			
Elementary	4 (0.7)	n/a	n/a
Middle	7 (0.6)	8 (1.2)	6 (0.7)
High	8 (0.7)	10 (0.9)	6 (0.9)
(Potential) extent/rate of spread			
Elementary	4 (0.7)	n/a	n/a
Middle	4 (0.5)	5 (1.0)	4 (0.6)
High	7 (0.6)	6 (0.8)	7 (0.9)
Immunity/antibodies/vaccine			
Elementary	2 (0.5)	n/a	n/a
Middle	5 (0.6)	6 (1.0)	5 (0.7)
High	8 (0.6)	10 (0.9)	5 (0.8)

[†] Only those who indicated their students asked questions about COVID-19 are included in this table.

[‡] N for all categories: All Elementary, 768 responses from 201 teachers
All Middle School, 1669 responses from 431 teachers; Life science, 498 responses from 127 teachers; Non-life science, 1104 responses from 286 teachers
All High School, 1847 responses from 472 teachers; Life science, 1021 responses from 257 teachers; Non-life science, 758 responses from 198 teachers

So then eventually the questions turned to, "How does using soap kill it?" And that was great because they had had some chemistry, they had already had some life sciences, we had already talked about cells. And so I was able to talk about how soaps interact with membranes. . . . And then what I discovered is that they were taking it home and telling their parents, "This is why you need to wash your hands so often."
(Middle School Teacher)

I know a lot of the kids were really worried and brought up things like, "What if our parents die or we die?" Just very, like, sensitive subjects that I didn't necessarily feel equipped to talk about. And then a lot of things about questioning or wondering where it came from, which I don't think I necessarily had the tools to talk about that.
(Elementary School Teacher)

Large majorities of teachers would have addressed COVID even if their students had not asked, regardless of grade range, teaching assignment (life/non-life) and equity factors.

As can be seen in Table 15, over 80 percent of teachers at each grade range said they would have addressed COVID even if students had not asked about it. At the middle and high school levels, life science and non-life science teachers were equally likely to indicate that they would have addressed COVID even if students had not asked. This is a particularly striking finding given that viruses are usually not a topic of instruction in non-life science classes.

Table 15
Teachers Indicating They Would Have
Addressed COVID Even if Students Had Not Asked†

	Percent of Teachers‡		
		Focus of Class	
	All	Life Science	Non-Life Science
Elementary	86 (2.7)	n/a	n/a
Middle	87 (1.8)	88 (3.2)	87 (2.2)
High	89 (1.6)	91 (1.9)	85 (2.8)

† Only those who indicated their students asked questions about COVID-19 are included in this table. Data from before and after school building closures are combined.

‡ N for all categories: All Elementary, 162
All Middle School, 331; Life science, 100; Non-life science, 231
All High School, 371; Life science, 211; Non-life science, 161

Teachers' inclination to address COVID were also examined by equity factors, with only one significant difference apparent. As can be seen in Table 16, teachers in Democratic-leaning counties were more likely than teachers in Republican-leaning counties to indicate they would have addressed COVID even if students had not asked (90 vs. 85 percent).

Table 16
Equity Analysis of Teachers Who Would Have Addressed COVID Even if Students Had Not Asked†

	Percent of Teachers	
FRL (N = 924)		
Lowest Quartile	89	(2.4)
Second Quartile	91	(2.2)
Third Quartile	87	(2.5)
Highest Quartile	87	(2.3)
URM (N = 1126)		
Lowest Quartile	84	(2.4)
Second Quartile	88	(2.1)
Third Quartile	91	(2.0)
Highest Quartile	88	(2.1)
Community Type (N = 1131)		
Rural	85	(2.7)
Suburban	88	(1.6)
Urban	90	(1.7)
Political Leaning (N = 1131)		
Democratic Presidential Candidate	90	(1.3)
Republican Presidential Candidate	85	(2.0)

† Only those who indicated their students asked questions about COVID-19 are included in this table. Data from before and after school building closures are combined.

While school buildings were open, teachers utilized class discussions driven by student questions to teach about COVID. After school buildings closed, teachers increasingly relied on readings and videos.

The survey presented teachers with a list of instructional activities that could have been used to address COVID. As can be seen in Tables 17–19, regardless of grade range or focus of the class (life science or not), the most prevalent instructional activities used by teachers while school buildings were open were answering student questions (ranging from 85 to 87 percent of teachers) and whole class discussion (ranging from 72 to 74 percent of teachers).

Interestingly, after school buildings closed, instructional activities used to address COVID were quite different from before school buildings closed. Although teachers across grade levels still devoted class time to answering student questions, this activity was less prevalent than before school buildings closed (87 vs. 73 percent at the elementary level, 87 vs. 60 percent at the middle school level, and 87 vs. 59 percent at the high school level). Whole class discussions and teacher lectures were also less likely to occur at each grade band after school buildings closed, likely due to the shift to online instruction and limited/disrupted instructional time.

Conversely, teachers at each grade band were more likely to have students read about COVID after school buildings closed. At the high school level, teachers were also more likely to have students watch videos about COVID after school buildings closed, an activity that was more common in life than non-life science classes. This shift toward readings and videos is likely due to the fact that these activities are amenable to an online format. Further, it is possible that readings and videos about COVID became more prevalent and readily available to teachers over time.

Table 17
Elementary Teachers' Use of Instructional Activities to Address COVID†

	Percent of Teachers (N = 203)	
I answered questions about coronavirus/COVID-19 asked by students.		
While school buildings were open	87	(2.7)
After school buildings closed	73	(3.7)
I led a whole class discussion about coronavirus/COVID-19.		
While school buildings were open	74	(3.6)
After school buildings closed	38	(4.1)
Students watched a video about coronavirus/COVID-19.		
While school buildings were open	36	(3.9)
After school buildings closed	35	(4.0)
I lectured or gave a presentation about coronavirus/COVID-19.		
While school buildings were open	32	(3.8)
After school buildings closed	15	(3.0)
Students read about coronavirus/COVID-19.		
While school buildings were open	15	(2.9)
After school buildings closed	34	(4.0)
Small groups discussed coronavirus/COVID-19.		
While school buildings were open	13	(2.7)
After school buildings closed	15	(3.0)
Students searched the internet for information or current events related to coronavirus/COVID-19.		
While school buildings were open	13	(2.7)
After school buildings closed	15	(3.0)
Students did a hands-on activity or laboratory investigation about coronavirus/COVID-19.		
While school buildings were open	12	(2.6)
After school buildings closed	5	(1.8)
Students used a simulation or model to explore coronavirus/COVID-19.		
While school buildings were open	9	(2.4)
After school buildings closed	5	(1.8)
Students did a worksheet or answered written questions about coronavirus/COVID-19.		
While school buildings were open	7	(2.0)
After school buildings closed	17	(3.2)
A student (or students) gave a presentation about coronavirus/COVID-19.		
While school buildings were open	3	(1.3)
After school buildings closed	6	(1.9)
A guest speaker talked about coronavirus/COVID-19.		
While school buildings were open	4	(1.6)
After school buildings closed	2	(1.2)
I recorded a video of myself addressing coronavirus/COVID-19 for students to watch.		
While school buildings were open	0	---‡
After school buildings closed	9	(2.3)

† Only those who indicated devoting class time to COVID are included in this table.

‡ No elementary teachers in the sample selected this option. Thus, it is not possible to calculate the standard error of this estimate.

Table 18
Middle School Teachers' Use of Instructional Activities to Address COVID†

	Percent of Teachers		
		Focus of Class	
	All (N = 422)	Life Science (N = 130)	Non-Life Science (N = 292)
I answered questions about coronavirus/COVID-19 asked by students.			
While school buildings were open	87 (1.8)	86 (3.4)	87 (2.2)
After school buildings closed	60 (2.8)	60 (5.1)	60 (3.3)
I led a whole class discussion about coronavirus/COVID-19.			
While school buildings were open	73 (2.4)	69 (4.6)	74 (2.9)
After school buildings closed	25 (2.5)	22 (4.3)	26 (3.0)
Students watched a video about coronavirus/COVID-19.			
While school buildings were open	39 (2.7)	45 (4.9)	37 (3.2)
After school buildings closed	46 (2.8)	52 (5.2)	44 (3.4)
I lectured or gave an in-class presentation about coronavirus/COVID-19.			
While school buildings were open	38 (2.7)	40 (4.9)	37 (3.2)
After school buildings closed	14 (1.9)	14 (3.6)	13 (2.3)
Students read about coronavirus/COVID-19.			
While school buildings were open	31 (2.5)	40 (4.9)	27 (2.9)
After school buildings closed	45 (2.8)	50 (5.2)	43 (3.4)
Students searched the internet for information or current events related to coronavirus/COVID-19.			
While school buildings were open	20 (2.2)	21 (4.0)	20 (2.6)
After school buildings closed	26 (2.5)	27 (4.6)	26 (3.0)
Small groups discussed coronavirus/COVID-19.			
While school buildings were open	13 (1.8)	16 (3.6)	12 (2.1)
After school buildings closed	15 (2.1)	7 (2.7)	19 (2.7)
Students used a simulation or model to explore coronavirus/COVID-19.			
While school buildings were open	13 (1.8)	14 (3.4)	12 (2.1)
After school buildings closed	18 (2.2)	21 (4.2)	17 (2.5)
Students did a hands-on activity or laboratory investigation about coronavirus/COVID-19.			
While school buildings were open	9 (1.6)	12 (3.2)	8 (1.8)
After school buildings closed	6 (1.4)	6 (2.5)	6 (1.6)
Students did a worksheet or answered written questions about coronavirus/COVID-19.			
While school buildings were open	8 (1.5)	9 (2.8)	8 (1.8)
After school buildings closed	22 (2.4)	26 (4.5)	20 (2.7)
A student (or students) gave a presentation about coronavirus/COVID-19.			
While school buildings were open	4 (1.1)	6 (2.3)	3 (1.1)
After school buildings closed	6 (1.3)	5 (2.3)	6 (1.6)
A guest speaker talked about coronavirus/COVID-19.			
While school buildings were open	1 (0.7)	0 ---‡	2 (0.9)
After school buildings closed	4 (1.1)	4 (2.1)	4 (1.4)
I recorded a video of myself addressing coronavirus/COVID-19 for students to watch outside of class.			
While school buildings were open	1 (0.5)	0 ---‡	1 (0.7)
After school buildings closed	9 (1.7)	9 (2.9)	10 (2.0)

† Only those who indicated devoting class time to COVID are included in this table.

‡ No life science middle school teachers in the sample selected this option. Thus, it is not possible to calculate the standard error of this estimate.

Table 19
High School Teachers' Use of Instructional Activities to Address COVID†

	Percent of Teachers					
			Focus of Class			
	All (N = 471)		Life Science (N = 265)		Non-Life Science (N = 206)	
I answered questions about coronavirus/COVID-19 asked by students.						
While school buildings were open	87	(1.7)	89	(2.1)	85	(2.8)
After school buildings closed	59	(2.6)	58	(3.4)	62	(4.0)
I led a whole class discussion about coronavirus/COVID-19.						
While school buildings were open	73	(2.3)	73	(3.0)	72	(3.5)
After school buildings closed	24	(2.2)	23	(2.9)	24	(3.5)
Students watched a video about coronavirus/COVID-19.						
While school buildings were open	29	(2.3)	35	(3.2)	22	(3.2)
After school buildings closed	43	(2.6)	51	(3.5)	32	(3.8)
I lectured or gave an in-class presentation about coronavirus/COVID-19.						
While school buildings were open	43	(2.5)	46	(3.4)	40	(3.8)
After school buildings closed	21	(2.2)	23	(2.9)	18	(3.2)
Students read about coronavirus/COVID-19.						
While school buildings were open	25	(2.2)	31	(3.1)	18	(3.0)
After school buildings closed	54	(2.6)	58	(3.4)	47	(4.1)
Students searched the internet for information or current events related to coronavirus/COVID-19.						
While school buildings were open	23	(2.1)	28	(3.0)	16	(2.9)
After school buildings closed	30	(2.4)	36	(3.3)	22	(3.4)
Small groups discussed coronavirus/COVID-19.						
While school buildings were open	13	(1.7)	16	(2.5)	10	(2.3)
After school buildings closed	14	(1.8)	16	(2.5)	11	(2.5)
Students used a simulation or model to explore coronavirus/COVID-19.						
While school buildings were open	14	(1.8)	16	(2.5)	12	(2.6)
After school buildings closed	27	(2.3)	33	(3.2)	18	(3.2)
Students did a hands-on activity or laboratory investigation about coronavirus/COVID-19.						
While school buildings were open	7	(1.3)	6	(1.7)	7	(2.1)
After school buildings closed	8	(1.5)	11	(2.1)	5	(1.8)
Students did a worksheet or answered written questions about coronavirus/COVID-19.						
While school buildings were open	11	(1.6)	14	(2.3)	8	(2.1)
After school buildings closed	32	(2.5)	40	(3.4)	22	(3.4)
A student (or students) gave a presentation about coronavirus/COVID-19.						
While school buildings were open	6	(1.2)	7	(1.7)	4	(1.6)
After school buildings closed	8	(1.4)	10	(2.0)	5	(1.7)
A guest speaker talked about coronavirus/COVID-19.						
While school buildings were open	1	(0.6)	1	(0.6)	2	(1.1)
After school buildings closed	3	(0.9)	3	(1.2)	3	(1.3)
I recorded a video of myself addressing coronavirus/COVID-19 for students to watch outside of class.						
While school buildings were open	1	(0.4)	0	(0.5)	1	(0.6)
After school buildings closed	13	(1.8)	16	(2.6)	7	(2.1)

† Only those who indicated devoting class time to COVID are included in this table.

We did a germ activity where they all had glue on their hands and lotion. . . . And then one kid had glitter and they touched something. And then another student came over and touched it, so just showing how the germs transferred from hands to objects. And we watched a few videos just about germs, and then we mostly just had discussions about it.
(Elementary School Teacher)

Also, one of the activities that we did was building a plan for your family for how you can take care of not just your physical health, in the early days, encouraging them to practice good hygiene and things like that, but also how do you take care of your mental health, your emotional health, your social health, or community health. Trying to create an opportunity to have those conversations in my class has always been really important to me.
(Middle School Teacher)

I mostly answered questions and tried to help them understand the science. I tried to give kids opportunities to ask questions and also shared with them places where they could find information and answers. Most of the questions were based on if I was afraid of the virus, and I tried to share that, you know, as a scientist, I don't allow fear to drive my life. I try to really access good information because fear doesn't really serve us very well. So I did those kinds of lessons and tried to gear them towards the questions that the students had because if you're answering their questions, then there's going to be some learning going on.
(High School Teacher)

Composite mean scores indicate that teachers were generally unlikely to use active learning strategies to teach about COVID, relying more on group/whole class discussions.

The items in Tables 17–19 were combined into three composite variables: (1) Group/Whole Class Discussions, (2) Individual Active Learning Strategies, and (3) Individual Passive Learning Strategies. As can be seen in Table 20, composite means suggest that teachers across grade bands were moderately likely to use group/whole class discussions to address COVID but unlikely to use active learning strategies (e.g., do a hands-on/laboratory investigation about COVID). The composite means also reveal differences in teachers' use of instructional activities at the secondary level. Middle and high school life science teachers were more likely than their non-life science counterparts to use passive learning strategies (40 vs. 33 and 46 vs. 28, respectively). High school life science teachers were also more likely than non-life science teachers to address COVID via active learning strategies (22 vs. 14).

Table 20
Teachers' Use of Instructional Activities to Address COVID Composites†

	Mean Score‡		
		Focus of Class	
	All	Life Science	Non-Life Science
Group/Whole Class Discussions			
Elementary	60 (2.2)	n/a	n/a
Middle	60 (1.6)	60 (2.8)	61 (1.9)
High	64 (1.5)	66 (2.0)	61 (2.1)
Active Learning Strategies			
Elementary	12 (1.4)	n/a	n/a
Middle	17 (1.1)	17 (2.0)	17 (1.3)
High	18 (1.1)	22 (1.5)	14 (1.4)
Passive Learning Strategies			
Elementary	24 (1.8)	n/a	n/a
Middle	35 (1.5)	40 (2.6)	33 (1.8)
High	38 (1.5)	46 (2.1)	28 (2.1)

† Only those who indicated devoting class time to COVID are included in this table. Data from before and after school building closures are combined.

‡ N for all categories: All Elementary, 203
All Middle School, 422; Life science, 130; Non-life science, 192
All High School, 471; Life science, 265; Non-life science, 206

Teachers of classes in high-poverty schools were more likely to use group/whole class discussions and passive learning strategies than teachers in low-poverty schools.

Looking at these composites by equity factors reveals some significant differences by FRL. As can be seen in Table 21, teachers of classes in high-poverty schools were more likely than teachers of classes in low-poverty schools to utilize group/whole class discussions (65 vs. 59) and passive learning strategies (39 vs. 30). Although the use of active learning strategies was uncommon across quartiles, it was more likely to occur in classes in high-poverty schools than classes in low-poverty schools (18 vs. 13).

Table 21
Equity Analysis of Teachers' Use of
Instructional Activities to Address COVID Composites†

	Mean Score		
	Group/Whole Class Discussions	**Active Student Activities**	**Passive Student Activities**
FRL (N = 924)			
Lowest Quartile	59 (2.2)	13 (1.4)	30 (2.0)
Second Quartile	61 (2.1)	14 (1.3)	34 (2.1)
Third Quartile	58 (2.2)	17 (1.5)	34 (2.1)
Highest Quartile	65 (2.0)	18 (1.5)	39 (2.0)
URM (N = 1126)			
Lowest Quartile	60 (1.9)	15 (1.2)	34 (1.8)
Second Quartile	63 (1.9)	16 (1.2)	34 (1.8)
Third Quartile	63 (1.9)	18 (1.4)	34 (1.9)
Highest Quartile	61 (2.0)	18 (1.5)	37 (2.0)
Community Type (N = 1131)			
Rural	61 (2.0)	14 (1.4)	32 (2.1)
Suburban	61 (1.4)	16 (0.9)	34 (1.3)
Urban	63 (1.7)	19 (1.3)	37 (1.7)
Political Leaning (N = 1131)			
Democratic Presidential Candidate	62 (1.2)	18 (0.9)	36 (1.2)
Republican Presidential Candidate	62 (1.6)	15 (1.0)	33 (1.5)

† Only those who indicated devoting class time to COVID are included in this table. Data from before and after school building closures are combined.

Across grade bands, the most commonly addressed topics while school buildings were open included ways to prevent coronavirus transmission, how coronavirus is transmitted, and what coronavirus/COVID-19 is. After school buildings closed, there was an increased focus on topics related to public health, including the impacts of social distancing and factors that place people at risk.

The survey provided a list of topics teachers could have addressed during COVID instruction while their school building was still open (see Tables 22–24). Across grade ranges, the topics most commonly addressed were ways to prevent coronavirus transmission from one individual to another, how coronavirus is transmitted among humans, and what coronavirus/COVID-19 is. Additional topics were also frequently addressed at the high school level, including symptoms of COVID-19 (66 percent), where coronavirus originated (64 percent), likelihood that coronavirus/COVID-19 would spread throughout the United States (56 percent), and factors that place people at risk for contracting coronavirus (54 percent).

After school buildings closed, many of the same topics continued to be addressed in instruction across grade bands. However, topics with a public health focus became increasingly prominent, including the impacts of social distancing and factors that place people at risk for contracting coronavirus.

Several differences in topics addressed were apparent when comparing life and non-life science teachers at the secondary level. Life science teachers were more likely than their non-life science counterparts to address a range of topics, both before and school buildings closed. These differences were also generally larger at the high school level than at the middle school level.

Table 22
Topics Addressed by Elementary Teachers During COVID Instruction†

	Percent of Teachers (N = 203)	
Ways to prevent coronavirus transmission from one individual to another (e.g., washing hands, covering mouth when you cough, staying away from people with symptoms)		
While school buildings were open	95	(1.8)
After school buildings closed	89	(2.7)
How coronavirus is transmitted among humans		
While school buildings were open	84	(3.0)
After school buildings closed	68	(3.9)
What coronavirus/COVID-19 is (e.g., the difference between the virus and the disease)		
While school buildings were open	59	(4.0)
After school buildings closed	55	(4.2)
Symptoms of COVID-19		
While school buildings were open	43	(4.0)
After school buildings closed	41	(4.1)
Where coronavirus originated (i.e., what part of the world)		
While school buildings were open	38	(3.9)
After school buildings closed	14	(2.9)
Likelihood that coronavirus/COVID-19 would spread throughout the United States		
While school buildings were open	26	(3.6)
After school buildings closed	18	(3.3)
Factors that place people at risk for contracting coronavirus		
While school buildings were open	31	(3.8)
After school buildings closed	38	(4.1)
Common misconceptions about coronavirus/COVID-19 (e.g., coronavirus doesn't affect young people, coronavirus is spread only by people with symptoms)		
While school buildings were open	31	(3.8)
After school buildings closed	27	(3.7)
Impacts of social distancing		
While school buildings were open	34	(3.9)
After school buildings closed	77	(3.5)
Survival rates of those infected with coronavirus		
While school buildings were open	9	(2.4)
After school buildings closed	7	(2.2)
How COVID-19 is diagnosed		
While school buildings were open	10	(2.4)
After school buildings closed	16	(3.1)
How COVID-19 is treated		
While school buildings were open	9	(2.3)
After school buildings closed	11	(2.7)

† Only those who indicated devoting class time to COVID are included in this table.

Table 23
Topics Addressed by Middle School Teachers During COVID Instruction†

	Percent of Teachers					
			Focus of Class			
	All (N = 422)		Life Science (N = 130)		Non-Life Science (N = 292)	
Ways to prevent coronavirus transmission from one individual to another (e.g., washing hands, covering mouth when you cough, staying away from people with symptoms)						
While school buildings were open	92	(1.5)	93	(2.5)	91	(1.8)
After school buildings closed	83	(2.1)	88	(3.3)	81	(2.7)
How coronavirus is transmitted among humans						
While school buildings were open	82	(2.1)	90	(2.9)	79	(2.7)
After school buildings closed	75	(2.5)	74	(4.5)	75	(3.0)
What coronavirus/COVID-19 is (e.g., the difference between the virus and the disease)						
While school buildings were open	75	(2.4)	85	(3.5)	71	(3.0)
After school buildings closed	55	(2.8)	61	(5.0)	53	(3.4)
Symptoms of COVID-19						
While school buildings were open	67	(2.6)	75	(4.3)	63	(3.2)
After school buildings closed	48	(2.8)	46	(5.1)	49	(3.4)
Where coronavirus originated (i.e., what part of the world)						
While school buildings were open	57	(2.7)	61	(4.8)	55	(3.3)
After school buildings closed	28	(2.6)	24	(4.4)	30	(3.1)
Likelihood that coronavirus/COVID-19 would spread throughout the United States						
While school buildings were open	59	(2.7)	59	(4.9)	59	(3.2)
After school buildings closed	30	(2.6)	21	(4.2)	34	(3.2)
Factors that place people at risk for contracting coronavirus						
While school buildings were open	49	(2.7)	48	(4.9)	49	(3.3)
After school buildings closed	48	(2.8)	47	(5.1)	48	(3.4)
Common misconceptions about coronavirus/COVID-19 (e.g., coronavirus doesn't affect young people, coronavirus is spread only by people with symptoms)						
While school buildings were open	47	(2.7)	48	(4.9)	47	(3.3)
After school buildings closed	49	(2.8)	52	(5.2)	48	(3.4)
Impacts of social distancing						
While school buildings were open	33	(2.6)	30	(4.6)	35	(3.1)
After school buildings closed	65	(2.7)	62	(5.0)	67	(3.2)
Survival rates of those infected with coronavirus						
While school buildings were open	25	(2.4)	25	(4.3)	25	(2.8)
After school buildings closed	27	(2.5)	23	(4.4)	28	(3.1)
How COVID-19 is diagnosed						
While school buildings were open	14	(1.9)	18	(3.8)	12	(2.2)
After school buildings closed	26	(2.5)	27	(4.6)	25	(3.0)
How COVID-19 is treated						
While school buildings were open	12	(1.8)	13	(3.3)	11	(2.1)
After school buildings closed	27	(2.5)	26	(4.5)	28	(3.0)

† Only those who indicated devoting class time to COVID are included in this table.

Table 24
Topics Addressed by High School Teachers During COVID Instruction†

	Percent of Teachers					
			Focus of Class			
	All (N = 471)		Life Science (N = 265)		Non-Life Science (N = 206)	
Ways to prevent coronavirus transmission from one individual to another (e.g., washing hands, covering mouth when you cough, staying away from people with symptoms)						
While school buildings were open	88	(1.7)	89	(2.1)	86	(2.7)
After school buildings closed	82	(2.0)	83	(2.6)	80	(3.3)
How coronavirus is transmitted among humans						
While school buildings were open	85	(1.8)	88	(2.2)	80	(3.1)
After school buildings closed	76	(2.2)	84	(2.6)	66	(3.9)
What coronavirus/COVID-19 is (e.g., the difference between the virus and the disease)						
While school buildings were open	77	(2.2)	83	(2.5)	68	(3.7)
After school buildings closed	64	(2.5)	74	(3.0)	49	(4.1)
Symptoms of COVID-19						
While school buildings were open	66	(2.4)	72	(3.0)	56	(3.9)
After school buildings closed	55	(2.6)	66	(3.3)	40	(4.0)
Where coronavirus originated (i.e., what part of the world)						
While school buildings were open	64	(2.5)	70	(3.1)	55	(3.9)
After school buildings closed	40	(2.6)	46	(3.4)	32	(3.8)
Likelihood that coronavirus/COVID-19 would spread throughout the United States						
While school buildings were open	56	(2.5)	56	(3.4)	57	(3.9)
After school buildings closed	42	(2.6)	45	(3.4)	37	(4.0)
Factors that place people at risk for contracting coronavirus						
While school buildings were open	54	(2.6)	58	(3.3)	48	(3.9)
After school buildings closed	52	(2.6)	59	(3.4)	42	(4.0)
Common misconceptions about coronavirus/COVID-19 (e.g., coronavirus doesn't affect young people, coronavirus is spread only by people with symptoms)						
While school buildings were open	48	(2.6)	49	(3.4)	47	(3.9)
After school buildings closed	58	(2.6)	62	(3.4)	52	(4.1)
Impacts of social distancing						
While school buildings were open	39	(2.5)	39	(3.3)	40	(3.9)
After school buildings closed	67	(2.5)	70	(3.2)	62	(4.0)
Survival rates of those infected with coronavirus						
While school buildings were open	32	(2.4)	36	(3.2)	27	(3.5)
After school buildings closed	35	(2.5)	43	(3.4)	23	(3.5)
How COVID-19 is diagnosed						
While school buildings were open	20	(2.1)	25	(2.9)	14	(2.7)
After school buildings closed	39	(2.6)	49	(3.5)	25	(3.5)
How COVID-19 is treated						
While school buildings were open	18	(2.0)	21	(2.8)	14	(2.7)
After school buildings closed	35	(2.5)	44	(3.4)	24	(3.5)

† Only those who indicated devoting class time to COVID are included in this table.

I realized that they were getting tons of misinformation and I said, "Well, we've got to start addressing where do you go to get the proper information?". . . . They were suddenly just like, "It's spreading and it's going all over the place," and they were panicking from misinformation. So that gave me a chance to really focus in on that, as like, "How do you know if the information is correct? Where are you getting it from? What's the source? How do you validate it? How do you verify it?" And so that was pretty important. They liked that because that really calmed them down. Because then they kept hearing rumors and they realized, "Wait a minute, that's just a rumor. Let's wait until we know something more definitive."
(Middle School Teacher)

While we were trying not to make it too heavy on students that are home and worried, we did want them to still understand what's happening with the world and what's happening with this virus . . . . Having students understand how what we knew about the virus was morphing and changing and how there's still some standard pieces to keep ourselves safe. And that's why we were in shutdown and social distancing and separating.
(Elementary School Teacher)

As we were talking about the natural selection unit, we were looking at the evolution of the virus and looking at some research coming out of Washington about how the virus changed over time and some of the tracing they were doing of who was getting the virus based on the . . . RNA sequence of the virus.
(High School Teacher)

Elementary teachers were less likely than middle or high school teachers to address COVID transmission, COVID treatment/diagnosis, or further/advanced COVID topics. Further, high school life science teachers were more likely than non-life science teachers to cover each topic area.

The items shown in Tables 22–24 were combined into three composite variables: (1) COVID transmission, (2) COVID treatment/diagnosis, and (3) Further/advanced COVID topics. Composite means shown in Table 25 indicate that COVID transmission was commonly addressed in instruction across grade bands (composite mean scores ranging from 79 to 87). However, these data also point to differences in the focus and scope of instruction by grade band and teaching assignment. Elementary teachers were less likely than middle and high school teachers to address COVID transmission (79, 84, and 87, respectively), COVID treatment/diagnosis (13, 25, and 36, respectively) and further/advanced COVID topics (31, 50, and 62, respectively). Similarly, at the high school level, teachers of life science classes were

more likely than teachers of non-life science classes to cover COVID transmission (92 vs. 80), COVID treatment/diagnosis (45 vs. 23) and further/advanced COVID topics (65 vs. 57).

Table 25
Topics Addressed During COVID Instruction Composites†

	Mean Score‡		
		Focus of Class	
	All	Life Science	Non-Life Science
COVID transmission			
Elementary	79 (2.0)	n/a	n/a
Middle	84 (1.3)	90 (1.8)	82 (1.7)
High	87 (1.2)	92 (1.1)	80 (2.2)
COVID treatment/diagnosis			
Elementary	13 (2.2)	n/a	n/a
Middle	25 (2.0)	26 (3.6)	25 (2.4)
High	36 (2.0)	45 (2.8)	23 (2.7)
Further/advanced COVID topics			
Elementary	31 (2.6)	n/a	n/a
Middle	50 (1.9)	52 (3.3)	50 (2.3)
High	62 (1.7)	65 (2.2)	57 (2.5)

† Only those who indicated devoting class time to COVID are included in this table. Data from before and after school building closures are combined.

‡ N for all categories: All Elementary, 203
All Middle School, 422; Life science, 130; Non-life science, 192
All High School, 471; Life science, 265; Non-life science, 206

There were significant differences in topics addressed during COVID instruction based on FRL quartile, each of which favored classes in high-poverty schools.

The composites related to topics addressed during COVID instruction were also examined by equity factors. As can be seen in Table 26, there were significant differences based on FRL quartile, each in favor of classes in high-poverty schools. Teachers in high-poverty schools were more likely than teachers in low-poverty schools to address COVID transmission (87 vs. 82), COVID treatment/diagnosis (31 vs. 22), and further/advanced COVID topics (56 vs. 46).

Table 26
Equity Analysis of Topics Addressed During COVID Instruction Composites†

	Mean Score		
	COVID transmission	**COVID treatment/diagnosis**	**Further/advanced COVID topics**
FRL (N = 924)			
Lowest Quartile	82 (1.9)	22 (2.5)	46 (2.5)
Second Quartile	85 (1.7)	33 (3.0)	50 (2.6)
Third Quartile	81 (1.9)	23 (2.6)	49 (2.6)
Highest Quartile	87 (1.6)	31 (2.7)	56 (2.5)
URM (N = 1126)			
Lowest Quartile	81 (1.6)	28 (2.4)	48 (2.2)
Second Quartile	87 (1.4)	27 (2.4)	54 (2.2)
Third Quartile	84 (1.7)	28 (2.5)	52 (2.3)
Highest Quartile	85 (1.7)	28 (2.6)	52 (2.5)
Community Type (N = 1131)			
Rural	82 (1.9)	24 (2.6)	49 (2.6)
Suburban	84 (1.2)	29 (1.8)	50 (1.7)
Urban	87 (1.2)	29 (2.2)	55 (2.0)
Political Leaning (N = 1131)			
Democratic Presidential Candidate	84 (1.0)	29 (1.6)	53 (1.4)
Republican Presidential Candidate	85 (1.3)	25 (2.0)	50 (1.9)

† Only those who indicated devoting class time to COVID are included in this table. Data from before and after school building closures are combined.

Elementary teachers tended to use commercially published materials to teach about COVID, while middle and high school teachers relied heavily on units and lessons they created.

Teachers were asked to think about the instructional materials they utilized to teach about COVID. As can be seen in Table 27, 87 percent of elementary teachers relied on commercially published materials, and over half used units or lessons they created. At the secondary level, teachers were even more likely to create their own units or lessons for teaching about COVID, as 65 percent of middle school teachers and 70 percent of high school teachers reported using self-created instructional materials (see Tables 28 and 29).

Table 27
Instructional Materials Used by Elementary Teachers to Address COVID†

	Percent of Teachers (N=113)
Commercially published materials (printed or electronic)	87 (2.7)
Units or lessons you created (either by yourself or with others)	53 (3.5)
Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPop, ShareMyLesson, Teachers Pay Teachers)	52 (3.5)
Lessons or resources from websites that are free (e.g., Khan Academy)	49 (3.5)
Units or lessons you collected from any other source (e.g., conferences, journals, colleagues, university, or museum partners)	37 (3.4)
State, county, or district-developed units or lessons	31 (3.2)
Commercially published kits/modules (printed or electronic)	21 (2.9)

† Only those who indicated devoting class time to COVID are included in this table.

Table 28
Instructional Materials Used by Middle School Teachers to Address COVID†

	Percent of Teachers		
		Focus of Class	
	All (N=359)	Life Science (N=142)	Non-Life Science (N=217)
Units or lessons you created (either by yourself or with others)	65 (2.3)	76 (3.7)	61 (2.9)
Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPop, ShareMyLesson, Teachers Pay Teachers)	47 (2.4)	48 (4.4)	47 (2.9)
Lessons or resources from websites that are free (e.g., Khan Academy)	48 (2.4)	53 (4.4)	46 (2.9)
Commercially published materials (printed or electronic)	47 (2.4)	48 (4.4)	46 (2.9)
Units or lessons you collected from any other source (e.g., conferences, journals, colleagues, university, or museum partners)	40 (2.4)	46 (4.4)	37 (2.8)
State, county, or district-developed units or lessons	18 (1.9)	15 (3.2)	19 (2.3)
Commercially published kits/modules (printed or electronic)	17 (1.8)	22 (3.6)	14 (2.1)

† Only those who indicated devoting class time to COVID are included in this table.

Table 29
Instructional Materials Used by High School Teachers to Address COVID†

	Percent of Teachers		
		Focus of Class	
	All (N=429)	Life Science (N=303)	Non-Life Science (N=126)
Units or lessons you created (either by yourself or with others)	70 (2.1)	73 (2.7)	67 (3.3)
Units or lessons you collected from any other source (e.g., conferences, journals, colleagues, university, or museum partners)	48 (2.3)	50 (3.1)	47 (3.5)
Lessons or resources from websites that are free (e.g., Khan Academy)	48 (2.3)	49 (3.1)	47 (3.5)
Commercially published materials (printed or electronic)	44 (2.3)	44 (3.0)	44 (3.5)
Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPop, ShareMyLesson, Teachers Pay Teachers)	23 (1.9)	22 (2.5)	25 (3.0)
Commercially published kits/modules (printed or electronic)	16 (1.7)	16 (2.2)	17 (2.6)
State, county, or district-developed units or lessons	15 (1.6)	13 (2.1)	17 (2.6)

† Only those who indicated devoting class time to COVID are included in this table.

Mostly I just put in "COVID for kids" or "teaching COVID to kids" and Googled. At the time, that's all I could do.
(Elementary School Teacher)

I took [the information from an AP Biology Facebook group] and modified it for an AP class so that they were looking through a bunch of the different things. I would snip parts of the research articles and give it out. . . . So they were looking at some of the primary research in an easy-to-swallow chunk with links to the actual journal articles that things were coming out of.
(High School Teacher)

The method that I chose to share information and do their assignments was called an agency board or choice board. . . . And so one of the boards that I did, the very first board I did, was just about COVID stuff. And so I would pull resources from online.
(High School Teacher)

Student Engagement

Teachers and students had to navigate a very atypical set of circumstances after school buildings closed, many of which altered the way teachers taught and the way students learned. Therefore, the survey asked teachers to reflect on student engagement during this time. Findings pertaining to teachers' impressions of student engagement after school buildings closed are discussed in this section of the report.

Student engagement across grade bands was substantially lower after school buildings closed.

As might be expected, over 80 percent of teachers indicated that student engagement was substantially lower after school buildings closed (see Table 30). This finding was consistent across grade bands and teaching assignments.

Table 30
Teachers Indicating Student Engagement Was Substantially Lower† After School Buildings Closed

	Percent of Teachers‡		
		Focus of Class	
	All	Life Science	Non-Life Science
Elementary	87 (2.1)	n/a	n/a
Middle	86 (1.7)	83 (3.4)	87 (2.0)
High	85 (1.7)	86 (2.2)	85 (2.6)

† Includes teachers indicating "somewhat lower" or "much lower" on a five-point scale ranging from "much lower" to "much higher."

‡ N for all categories: All Elementary, 251
All Middle School, 406; Life science, 124; Non-life science, 282
All High School, 455; Life science, 259; Non-life science, 196

Differences in student engagement were apparent based on community type and political leaning of the county.

Teachers' impressions of student engagement after school buildings closed were also examined by equity factors. As can be seen in Table 31, teachers in schools in urban settings were more likely to rate student engagement as substantially lower after school buildings closed than teachers in suburban or rural settings (82, 87, and 90 percent, respectively). Further teachers in Republican-leaning counties were more likely than teachers in Democratic-leaning counties to report substantially lower student engagement after school buildings closed (90 vs. 84 percent).

Table 31
Equity Analysis of Teachers Indicating Student Engagement Was Substantially Lower After School Buildings Closed

	Percent of Teachers
FRL (N = 1107)	
Lowest Quartile	89 (1.8)
Second Quartile	88 (2.0)
Third Quartile	89 (1.9)
Highest Quartile	89 (1.9)
URM (N = 1354)	
Lowest Quartile	85 (1.9)
Second Quartile	87 (1.8)
Third Quartile	85 (2.0)
Highest Quartile	88 (1.9)
Community Type (N = 1361)	
Rural	90 (1.8)
Suburban	87 (1.3)
Urban	82 (1.9)
Political Leaning (N = 1361)	
Democratic Presidential Candidate	84 (1.3)
Republican Presidential Candidate	90 (1.3)

Teacher Decision Making

A major focus of the survey was identifying factors that influenced teachers' decisions regarding whether to address COVID or not. Teachers were presented with open-ended items that asked them to identify the most important reasons why they either did or did not address COVID in

their instruction. Additionally, teachers were asked to respond to a set of survey items aligned with the TPB. Data about teacher decision making are discussed in this section of the report.

The most common reason why middle and high school teachers taught about COVID was that it was a relevant and current event. The most common reason why elementary teachers taught about COVID was to address student fear and anxiety.

Teachers who addressed COVID were asked to list the most important reasons why they decided to do so. Across grades bands, about 30 percent of teachers decided to teach about COVID because they felt that it was a relevant and current event for students (see Table 32). At the elementary level, about one-third of teachers taught about COVID in efforts to address student fears/anxiety, a reason that was less commonly given by middle or high school teachers. High school teachers were more likely than middle school or elementary teachers to address COVID because it was related to their standards or curriculum (20, 12, and 5 percent, respectively).

Table 32
Most Common Reasons Why Teachers Addressed COVID†

	Percent of Teachers		
	Elementary (N=201)	**Middle (N=419)**	**High (N=458)**
Relevant/current event	29 (3.2)	29 (2.2)	33 (2.1)
Student curiosity/ interest/ questions	19 (2.8)	20 (1.9)	22 (1.9)
Related to standards/ curriculum/ course	5 (1.5)	12 (1.5)	20 (1.8)
Protecting students and others	22 (2.9)	18 (1.8)	15 (1.6)
Address fear/ anxiety	34 (3.3)	22 (2.0)	14 (1.6)
Address misconceptions/ misinformation	9 (2.1)	15 (1.7)	12 (1.5)
Give students information	8 (2.0)	10 (1.4)	10 (1.4)
Other	6 (1.7)	6 (1.2)	5 (1.0)

† Only those who indicated devoting class time to COVID are included in this table.

[COVID] was just becoming public knowledge not long before our school shut down, so we didn't have a lot of time go into it. But the kids were scared. They were nervous about it, and so we just talked about what it was and compared it to other diseases. Just trying to ease their fears basically last year. (Elementary School Teacher)

I felt it was important for my students to be educated about what was happening. They were very concerned, and so I decided to bring that in as part of our discussion, especially when we're talking about the current events. (Elementary School Teacher)

We don't have any specific COVID or disease-oriented standards for our disciplinary core ideas, but for the [Next Generation Science Standards] stuff, a lot of it is integrating the practices and the cross-cutting concepts. And so

really, you're talking about scientific practices. So we were talking a lot about social distancing and then models along with that. Just the process of science itself. Like why is there so much confusion and misunderstanding around the virus at that time. So a lot of it was related back to really core questions about the nature of science, which is in our standards. It was a very unique application of that I would say.
(High School Teacher)

There were few differences in the most common reasons why teachers decided to address COVID by equity factors.

Examining these data by equity factors reveals few differences in the reasons why teachers addressed COVID (see Table 33). Teachers in schools in the highest URM quartile were less likely than teachers in schools in the lowest URM quartile to address COVID because it was a relevant/current event (25 vs. 34 percent). In addition, teachers in high-FRL schools were less likely than those in low-FRL schools to address COVID because it was related to their standards/curriculum course (8 vs. 16 percent).

Table 33
Equity Analysis of the Most Common Reasons Why Teachers Addressed COVID†

	Percent of Teachers				
	Relevant/ current event	Student curiosity/ interest/ questions	Related to standards/ curriculum/ course	Protecting students and others	Address fear/anxiety
FRL (N = 924)					
Lowest Quartile	33 (3.2)	21 (2.8)	16 (2.5)	16 (2.4)	21 (2.7)
Second Quartile	30 (3.1)	22 (2.8)	18 (2.6)	14 (2.3)	22 (2.8)
Third Quartile	34 (3.1)	17 (2.4)	14 (2.2)	21 (2.6)	22 (2.7)
Highest Quartile	26 (2.8)	21 (2.6)	8 (1.7)	18 (2.5)	24 (2.8)
URM (N = 1126)					
Lowest Quartile	34 (2.7)	23 (2.4)	16 (2.1)	13 (1.9)	21 (2.3)
Second Quartile	30 (2.7)	20 (2.4)	17 (2.2)	17 (2.2)	20 (2.4)
Third Quartile	33 (2.9)	20 (2.4)	13 (2.0)	21 (2.5)	22 (2.5)
Highest Quartile	25 (2.7)	20 (2.5)	11 (1.9)	19 (2.4)	22 (2.6)
Community Type (N = 1131)					
Rural	26 (2.9)	20 (2.7)	15 (2.4)	15 (2.4)	22 (2.8)
Suburban	33 (2.0)	22 (1.8)	13 (1.5)	17 (1.6)	22 (1.8)
Urban	29 (2.4)	19 (2.1)	15 (1.9)	20 (2.2)	19 (2.1)
Political Leaning (N = 1131)					
Democratic Presidential Candidate	32 (1.8)	20 (1.5)	15 (1.3)	16 (1.4)	20 (1.5)
Republican Presidential Candidate	28 (2.2)	22 (2.0)	14 (1.7)	19 (1.9)	22 (2.0)

† Only those who indicated devoting class time to COVID are included in this table.

The most common reason why middle and high school teachers did not address COVID was that the topic was not related to their standards or curriculum. Several reasons were common among elementary teachers, including the age of their students, lack of stable knowledge about COVID, and the desire to avoid causing fear/anxiety.

Teachers who did not teach about COVID were asked to list the most important reasons behind their decision. Interestingly, there was a great deal of overlap in the reasons why teachers did and did not teach about COVID. As can be seen in Table 34, the single most prominent reason why middle and high school teachers decided not to address COVID was because the topic was not related to their standards or curriculum (50 percent of high school teachers and 43 percent of middle school teachers). However, a mixture of factors appeared to steer elementary teachers away from teaching about COVID, including the age of their students (25 percent), lack of alignment to standards or curriculum (21 percent), lack of stable knowledge about COVID (16 percent), the desire to avoid causing fear/anxiety (15 percent), and that the topic was prohibited by their district or school (15 percent).

Table 34
Most Common Reasons Why Teachers Did Not Teach About COVID†

	Percent of Teachers					
	Elementary (N=67)		Middle (N=119)		High (N=111)	
Not related to standards/curriculum/course	21	(5.0)	44	(4.5)	51	(4.7)
Lack of time	10	(3.7)	13	(3.1)	19	(3.7)
Lack of stable knowledge about COVID-19	16	(4.5)	17	(3.4)	11	(2.9)
Prohibited	15	(4.4)	11	(2.9)	9	(2.7)
Oversaturation of COVID-19 news	0	---‡	8	(2.4)	9	(2.7)
Avoid causing fear/anxiety	15	(4.4)	14	(3.2)	6	(2.3)
Sensitivity toward students and their families	13	(4.2)	7	(2.3)	6	(2.3)
Lack of teacher knowledge/expertise	4	(2.5)	3	(1.7)	5	(2.1)
Age of students	25	(5.3)	2	(1.2)	0	---‡

† Only those who indicated not devoting class time to COVID are included in this table.

‡ No teachers in the mentioned this reason. Thus, it is not possible to calculate the standard error of this estimate.

Third graders are only eight or nine years old and a little bit unsure about what exactly [COVID] is. We didn't want to raise the anxiety with the students, and I felt that that was more of the parent's job to kind of say what's going on.
(Elementary School Teacher)

When we went totally virtual, the focus at that point was making sure that the students are getting the reading, writing, and math. I think that's another reason where we weren't really focusing on COVID. Unfortunately, the science and social studies . . . got pushed off to the side as far as what we would teach virtually.
(Elementary School Teacher)

I didn't teach on the topic of COVID. I have standards I have to cover, and we get only so much time. And then when the pandemic hit and I did not meet with my students, really I couldn't meet with all my students, so when I did get them, I had to stick with my standards. And so, no, I never did talk about COVID. It was like, "Gosh, I don't have enough time to open that can of worms."
(Middle School Teacher)

There was some variation in the most common reasons why teachers decided not to address COVID based on community type and political leaning of the county.

Examining the most common reasons why teachers did not teach about COVID by equity factors revealed some significant differences. Teachers in urban settings were more likely than teachers in suburban settings not to teach about COVID because it was not related to their standards or curriculum (55 vs. 44 percent). Additionally, teachers in rural settings were more likely than

those in urban settings to avoid teaching about COVID because they did not want to cause fear/anxiety for their students (20 vs. 6 percent). Differences were also seen based on political leaning. Teachers in Democratic-leaning counties were more likely than those in Republican-leaning counties to cite a lack of time to teach about COVID (19 vs. 9 percent). Conversely, teachers in Republican-leaning counties were more likely than teachers in Democratic-leaning counties to not teach about COVID because of a lack of stable knowledge about the virus/disease (23 vs. 9 percent).

Table 35
Equity Analysis of the Most Common
Reasons Why Teachers Did Not Teach About COVID†

	Percent of Teachers				
	Not related to standards/ curriculum/ course	**Lack of time**	**Lack of stable knowledge about COVID**	**Prohibited**	**Avoid causing fear/ anxiety**
FRL (N = 237)					
Lowest Quartile	37 (5.9)	13 (4.2)	19 (4.8)	15 (4.4)	15 (4.4)
Second Quartile	49 (6.0)	14 (4.2)	10 (3.6)	10 (3.6)	12 (3.9)
Third Quartile	35 (6.8)	12 (4.7)	20 (5.8)	14 (5.0)	6 (3.4)
Highest Quartile	37 (6.9)	24 (6.1)	16 (5.3)	8 (3.9)	6 (3.4)
URM (N = 298)					
Lowest Quartile	33 (5.2)	14 (3.9)	13 (3.7)	11 (3.5)	14 (3.9)
Second Quartile	47 (5.2)	11 (3.3)	14 (3.7)	12 (3.4)	15 (3.8)
Third Quartile	42 (6.2)	20 (5.0)	19 (4.9)	9 (3.6)	9 (3.6)
Highest Quartile	42 (6.4)	17 (4.8)	13 (4.4)	12 (4.1)	5 (2.8)
Community Type (N = 300)					
Rural	44 (6.2)	14 (4.3)	13 (4.1)	8 (3.4)	20 (5.0)
Suburban	33 (3.8)	15 (2.9)	17 (3.1)	11 (2.6)	11 (2.5)
Urban	55 (5.5)	16 (4.0)	11 (3.5)	13 (3.8)	6 (2.6)
Political Leaning (N = 300)					
Democratic Presidential Candidate	43 (3.7)	19 (3.0)	9 (2.1)	12 (2.5)	11 (2.4)
Republican Presidential Candidate	39 (4.4)	9 (2.6)	23 (3.8)	10 (2.7)	11 (2.9)

† Only those who indicated not devoting class time to COVID are included in this table.

Teacher attitudes toward teaching about COVID, perceptions of control over teaching about COVID, and feelings of self-efficacy had a substantial influence on whether they addressed COVID in their instruction.

As previously mentioned, the survey included several items aligned with the TPB. These items were intended to measure the extent to which various factors influenced whether teachers addressed COVID in their instruction. The items were combined into four composite variables:

- Attitude Towards Teaching About COVID[6]
    - Teaching about COVID is undesirable/desirable.

[6] Items in this composite were ranked on a 7-point semantic differential scale, with the two polar opposite adjectives as the endpoints.

    - Teaching about COVID is the wrong thing to do/right thing to do.
    - Teaching about COVID is harmful/beneficial.
    - Teaching about COVID is unimportant/important.
    - Teaching about COVID is uninteresting/interesting.
    - Teaching about COVID is a waste of my time/a good use of my time.

- Subjective Norm[7]
    - I felt pressure from others to teach about coronavirus/COVID-19.
    - It was expected that I teach about coronavirus/COVID-19.

- Self-Efficacy
    - I am confident in my ability to successfully teach about coronavirus/COVID-19.
    - It was difficult for me to teach about coronavirus/COVID-19.

- Control
    - It was up to me whether or not to teach about coronavirus/COVID-19.
    - The decision about whether or not to teach about coronavirus/COVID-19 was beyond my control.

The composite mean scores, shown in Table 36, highlight important aspects of teacher decision making. Across grade bands, attitude (composite means ranging from 74 to 83) and control beliefs (composite means ranging from 78 to 87) had a substantial influence on whether teachers taught about COVID, although both factors were more influential at the secondary level than at the elementary level. Self-efficacy also had a major influence on whether teachers taught about COVID at the middle and high school levels (composite means of 68 and 72, respectively), but less so at the elementary level (composite mean of 57). Conversely, subjective norms had very little influence on teacher decision making at any grade band.

These data were also analyzed by whether or not teachers taught about COVID. For those who did *not* teach about COVID, attitude, self-efficacy, and control beliefs were about equally influential. However, among those who did teach about COVID, attitude and control beliefs appear to be somewhat more influential than self-efficacy beliefs and substantially more influential than subjective norm.

[7] Items in the following three composites were ranked on a 7-point scale from Strongly Disagree to Strongly Agree.

Table 36
Theory of Planned Behavior Composites

	Mean Score†		
	All	**Did not teach about COVID**	**Did teach about COVID**
Attitude			
Elementary	74 (1.2)	58 (2.7)	79 (1.2)
Middle	79 (0.8)	61 (2.1)	83 (0.8)
High	83 (0.7)	64 (1.9)	87 (0.7)
Subjective Norm			
Elementary	10 (1.0)	4 (1.2)	12 (1.3)
Middle	11 (0.8)	6 (1.3)	12 (1.0)
High	10 (0.7)	6 (1.2)	11 (0.8)
Self-Efficacy			
Elementary	57 (1.5)	52 (3.0)	59 (1.7)
Middle	68 (1.0)	58 (2.6)	70 (1.1)
High	72 (0.9)	61 (2.5)	74 (1.0)
Control			
Elementary	78 (1.8)	49 (4.1)	88 (1.4)
Middle	81 (1.3)	52 (3.4)	89 (1.0)
High	87 (1.0)	71 (3.2)	91 (0.9)

† N for all categories: Elementary: All, 271; Did not teach about COVID, 69; Did teach about COVID, 202
Middle: All, 558; Did not teach about COVID, 120; Did teach about COVID, 438
High: All, 597; Did not teach about COVID, 111; Did teach about COVID, 486

Using their reports of the number of days and class periods spent on COVID instruction before and after school buildings closed, teachers were grouped into five ordinal categories, with the lowest level being no COVID instruction and the highest being four or more days of COVID instruction. A path model was then constructed to test relationships among amount of instruction, TPB factors, and other variables of interest. Both direct and indirect relationships were tested. Figure 3 displays the path model with all variables, but only the statistically significant relationships are shown. Because the coefficients are not straightforward to interpret, line weights represent the relative strength of the relationships. Note that the strongest predictors are teachers' attitudes toward COVID instruction and their sense of control. The other TPB factors (subjective norm and self-efficacy) are also predictors but not as strong. The subject of the class (life science vs. other) predicted amount of instruction both directly and indirectly through control and self-efficacy. Similarly, whether the teacher had taken life science classes beyond the introductory level in college predicted instruction directly and through self-efficacy. None of the equity factors predicted instruction directly, but both school locale and political leaning of the county had a weak, indirect influence through attitude.

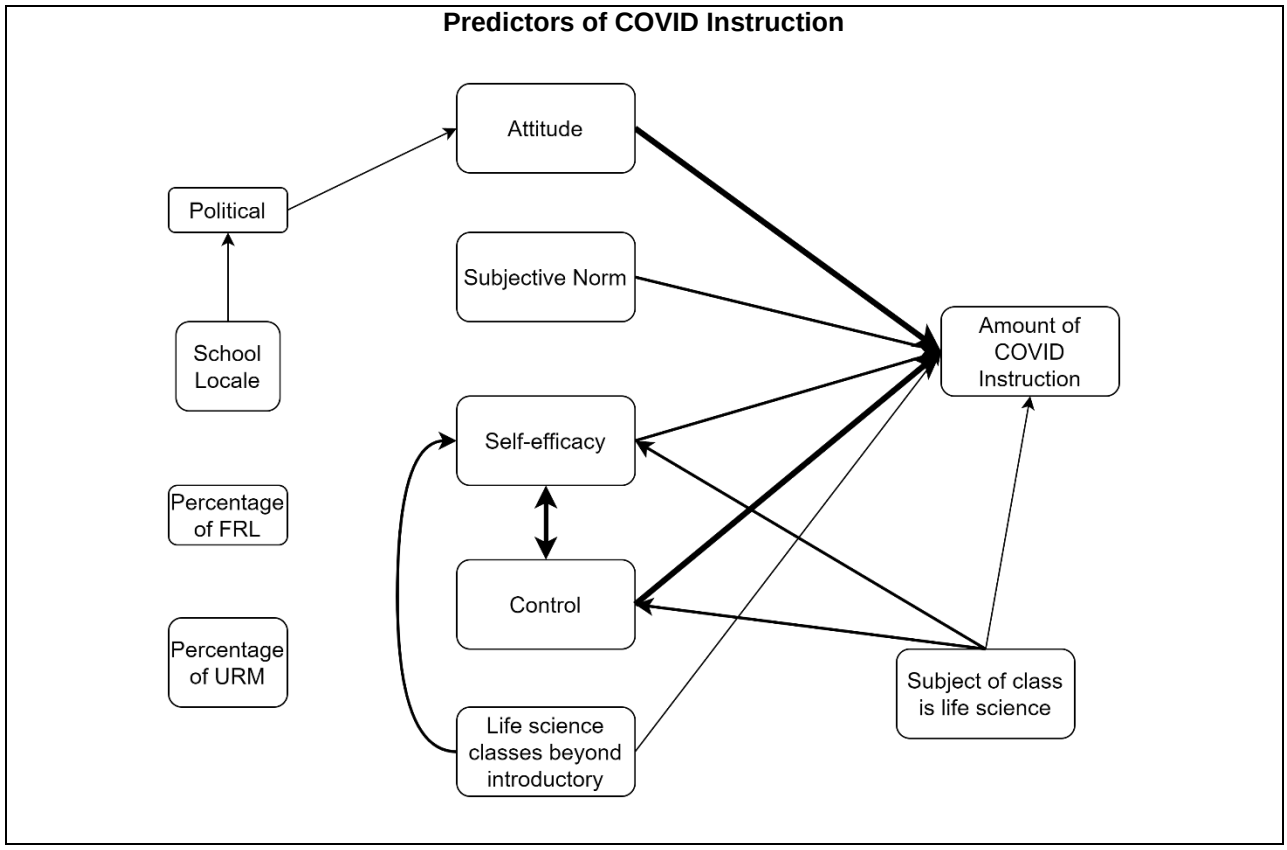

Figure 3

There were some small differences by community type and political leaning in the extent to which various TPB factors influenced teachers' COVID instruction, but they were small.

The TPB composites were also examined by equity factors (see Table 37). In no case did differences between groups amount to more than five percentage points, suggesting no substantial differences. However, some were statistically significant. For example, for teachers in high-URM schools, control tended to be less influential than for those in low-URM schools (mean scores of 80 and 85, respectively). In addition, for teachers in urban schools, attitude toward teaching about COVID appeared to be more influential than for teachers in rural schools (mean scores of 82 and 78, respectively). The same was true of self-efficacy (mean scores of 70 and 65 for urban and rural teachers, respectively).

Table 37
Equity Analysis of the Theory of Planned Behavior Composites

	Mean Score			
	Attitude Toward Teaching About COVID	Subjective Norms	Self-Efficacy	Control
FRL (N = 1161)				
Lowest Quartile	79 (1.1)	8 (0.9)	66 (1.5)	81 (1.8)
Second Quartile	79 (1.1)	9 (0.9)	66 (1.5)	83 (1.3)
Third Quartile	80 (1.1)	12 (1.2)	67 (1.5)	84 (1.5)
Highest Quartile	80 (1.2)	12 (1.2)	69 (1.4)	83 (1.6)
URM (N = 1424)				
Lowest Quartile	78 (1.0)	9 (0.8)	67 (1.2)	85 (1.3)
Second Quartile	79 (1.0)	10 (0.9)	67 (1.2)	82 (1.5)
Third Quartile	81 (1.1)	11 (1.1)	68 (1.3)	84 (1.5)
Highest Quartile	80 (1.1)	12 (1.1)	68 (1.4)	80 (1.6)
Community Type (N = 1431)				
Rural	78 (1.2)	10 (0.9)	65 (1.5)	84 (1.6)
Suburban	79 (0.7)	11 (0.7)	67 (0.9)	83 (1.0)
Urban	82 (0.9)	11 (0.9)	70 (1.2)	83 (1.3)
Political Leaning (N = 1431)				
Democratic Presidential Candidate	81 (0.6)	11 (0.6)	68 (0.8)	82 (1.0)
Republican Presidential Candidate	77 (0.8)	10 (0.7)	66 (1.1)	85 (1.1)

TEACHER VIGNETTES

The previous sections of this report highlighted survey data focused on whether, how, and why COVID was addressed in K–12 classrooms (e.g., sources of information, instructional activities, student engagement, and key influences on teacher decision making). Findings were also presented about differences and similarities in student opportunities to learn about COVID based on grade band, teaching assignment (life vs. non-life science), and equity factors (FRL, URM, community type, political leaning). However, interviews with a sample of teachers highlighted the interplay among multiple factors that influenced their response to COVID.

This section of the report includes 12 vignettes that illustrate the range of intertwined circumstances teachers faced during the COVID pandemic and the ways in which teachers' unique contexts shaped their instruction. A brief description of the teachers featured in these vignettes is provided in Table 38.[8]

[8] All teacher names are pseudonyms.

Table 38
Vignette Teachers

	Grade Band	Teaching Assignment	State	Community Type
Ms. Neville	Elementary	—	New Mexico	Urban
Ms. Smith	Elementary	—	Illinois	Suburban
Ms. Edmonds	Elementary	—	Michigan	Rural
Ms. Logan	Elementary	—	Alabama	Rural
Ms. Lee	Middle	Life Science	West Virginia	Urban
Mr. Kennedy	Middle	Non-life Science	California	Urban
Ms. Richmond	Middle	Life Science	Arizona	Suburban
Ms. Morris	Middle	Non-life Science	Indiana	Rural
Ms. Anderson	High	Life Science	Colorado	Urban
Mr. Evans	High	Non-life Science	Kentucky	Urban
Ms. Sanford	High	Life Science	Montana	Suburban
Mr. Reeves	High	Life Science	Delaware	Rural

Teaching About COVID at a Kindergarten Level

Ms. Neville was a kindergarten teacher during the 2019–20 school year at an urban elementary school in New Mexico. In March of 2020, teachers and students were given a one-week notice that the school would be transitioning to online instruction due to the pandemic. Given that students were both curious and concerned about the situation, her school addressed COVID as a standalone lesson across grade levels. She explained:

> *Since that week [before the school building closed] was so crazy, we focused on COVID for that. I think since we didn't really know much about it, it was more focused on germs and illnesses and how you can get them. . . . The kids were very curious about it. I mean, they had been hearing about it at home and on the news, so they were interested in it.*

Ms. Neville described how she used a simple demonstration, videos, and discussions to increase student understanding of germs and how they are transmitted:

> *We did a germ activity where they all had glue on their hands and lotion. . . . And then one kid had glitter and they touched something. And then another student came over and touched it, so just showing how the germs transferred from hands to objects. And we watched a few videos just about germs, and then we mostly just had discussions about it.*

However, she indicated that she didn't go into great detail about the virus. Rather, she tried to make sure the information she provided was accessible to students at a kindergarten level. As she said:

> *I don't think for kindergarten it was necessarily like I needed such complicated facts or information about it, because it was more keep it at their level. . . . Activities that we did were activities that I had already done before about germs, like hand washing and stuff like that. So I didn't specifically seek out COVID activities. Our district did provide us with them, but I didn't use them just because they were a little too advanced for kindergarten.*

Ms. Neville also reflected on the fact that it would have been helpful to have additional support for teaching about COVID in ways that were both age appropriate and effective at easing student fears. In her words:

> *I know a lot of the kids were really worried and brought up things like, "What if our parents die or we die?" Just very, like, sensitive subjects that I didn't necessarily feel equipped to talk about. And then a lot of things about questioning or wondering where it came from, which I don't think I necessarily had the tools to talk about that.*

After their school building closed, Ms. Neville only briefly touched on COVID in her instruction. However, she did not devote any formal instructional time to the topic. As she explained:

I tried to stay away from formal lessons just to take their minds off things and just focus on school. . . . I didn't really distribute any information about COVID or stuff like that to them. It was more like informally just throughout the live meetings.

The Importance of Literacy and Mathematics

Ms. Smith taught 3rd grade during the 2019–20 academic year at a medium-sized, suburban elementary school in Illinois. Although COVID was spreading across the US, Ms. Smith decided not to address the topic in her classroom for fear of upsetting her students. In her words:

> *Third graders are only eight or nine years old and a little bit unsure about what exactly [COVID] is. We didn't want to raise the anxiety with the students, and I felt that that was more of the parent's job to kind of say what's going on.*

Eventually, Ms. Smith's school building closed due to COVID and her instruction moved online. As her school scrambled to put an instructional plan in place for the remainder of the year, literacy and mathematics took precedence over other subjects. As a result, there were no additional opportunities to address science topics, including COVID, with her students. As Ms. Smith explained:

> *So when we went totally virtual, the focus at that point was making sure that the students are getting the reading, writing, and math. I think that's another reason where we weren't really focusing on COVID. Unfortunately, the science and social studies . . . got pushed off to the side as far as what we would teach virtually.*

Teaching About COVID as a Current Event

Ms. Edmonds was a 5th grade science and social studies teacher at a small, rural school in Michigan during the latter half of the 2019–20 school year, a position she transitioned into after spending the first half of the year as a teacher in a 3rd grade classroom. Although COVID wasn't well aligned with the 5th grade content standards she was responsible for teaching, Ms. Edmonds devoted class time to discussing the virus because it was an important current event that was concerning to her students. As she said:

> *I felt it was important for my students to be educated about what was happening. They were very concerned, and so I decided to bring that in as part of our discussion, especially when we're talking about the current events. Whether I was teaching something in science or social studies, we did current events every day. . . . So I tried to apply it to what we were learning in both science and social studies as much as I could, but it kind of was more of just tied to our current events. More of a standalone topic.*

Before her school building closed, Ms. Edmonds drew heavily on Discovery Education curriculum materials and daily news reports as sources of information about the virus. These resources shaped her instruction around COVID. In her words:

> *So we use Discovery Education science textbooks, and they had some COVID-19 resources. And prior to the shutdown, I would bring in those resources to help teach my students about viruses and how to prevent the spread of viruses, and then what COVID-19 was and what we knew about COVID at the time. . . . We also used daily news reports that talked about COVID. It was in China and was moving into the United States and how that impacted people.*

After her school building closed, Ms. Edmonds continued to use digital resources to teach about the virus, with the goal of ensuring her students had access to accurate information that would help keep them safe and alleviate their fears. As she explained:

> *While we were trying not to make it too heavy on students that are home and worried, we did want them to still understand what's happening with the world and what's happening with this virus. So, we did bring in some digital learning pieces. Having students understand how what we knew about the virus was morphing and changing and how there's still some standard pieces to keep ourselves safe. And that's why we were in shutdown and social distancing and separating.*

Limited Resources for Teaching About COVID

During the 2019–20 school year, Ms. Logan was a 5th grade science and reading teacher at a small intermediate school serving grades 3–5 in rural Alabama. Before her school shut down, Ms. Logan devoted class time to talking about COVID in efforts to alleviate her students' fears. As she said:

> *[COVID] was just becoming public knowledge not long before our school shut down, so we didn't have a lot of time go into it. But the kids were scared. They were nervous about it, and so we just talked about what it was and compared it to other diseases. Just trying to ease their fears basically last year.*

However, Ms. Logan had limited resources for teaching about COVID, relying mainly on Google searches and daily news broadcasts. As she explained:

> *Mostly I just put in "COVID for kids" or "teaching COVID to kids" and Googled. At the time, that's all I could do. We watched the news. I would pull the news up because it was running 24-7 back then. And that was it.*

Ms. Logan reflected on her desire for access to age-appropriate materials and resources she could have used to teach about COVID:

> *[I wanted] something on a ten-year-old level, a fifth-grade level, that they could read and understand and learn about, but yet not fear. . . . You know, I wouldn't want them to get scared about this, but it is something that they need to know about other than what they hear around town or what they hear in their church or what they hear in their home. So something on a fifth-grade level with reading passages. Something that they could do to help them understand it better.*

Unfortunately, after her school building closed, Ms. Logan's science instruction did not continue. Because large numbers of students did not have access to computers for virtual instruction, schooling did not resume for the remainder of the academic year.

COVID and the Nature of Science

During the 2019–20 school year, Ms. Lee taught 8th grade integrated science at a public middle school located in a small city in West Virginia. Early in the school year, as part of her usual curriculum, her class learned about characteristics of viruses. Therefore, when COVID became a concern, Ms. Lee was able to draw on her students' prior knowledge of viruses when discussing this new disease. She also expanded upon her previous instruction by focusing on ways to prevent the spread of viruses. In her words:

> *We did some demonstrations, just very simple demonstrations, on how it has been shown that [COVID] is dependent on respiratory droplets, just how much does come out when you're talking. Then, especially if you're coughing or sneezing and you don't do anything to prevent it, like sneeze into your elbow, or then, of course, wearing a mask. But where I live, we were not under a mask mandate quite as early as the rest of the country, just simply because we were one of the last states to even have a case. But it was still discussed, and they still understood the ramifications and how viruses can spread, like cold viruses and flu viruses, and why it was important. And so the activities were mainly just about personal hygiene and how to prevent spreading any kind of germs.*

However, Ms. Lee noted the difficulty of teaching about COVID when information about the disease was constantly changing:

> *We had discussions about the information that was coming out. So I didn't speak specifically. And I told them I wasn't going to give them any definite information on COVID-19 because it changed daily. . . . I didn't want to provide them with information that I wasn't confident in. . . . And it was a good lesson in the nature of science, how science can change very rapidly. Because with new information and new discoveries, you get different ideas.*

As a result, Ms. Lee indicated that she tended to draw on only a few trusted sources when looking for information about COVID, including the CDC, John's Hopkins University, and the National Science Teaching Association:

> *I did refer to the CDC, Johns Hopkins, the National Science Teaching Association, because they have a lot of really good up-to-date information that was timely. So those are the main things. I mean, if I Googled something, I read it pretty thoroughly because you can never tell what you're going to get. . . . So that's pretty much the resources that I used, ones that I felt were reputable and that I trusted and have used in the past.*

When her school building closed in March of 2020, Ms. Lee continued to address COVID in her classroom instruction, with a particular focus on the impact of the virus on her students' daily lives:

> *Of course everything was so unorganized and just caught everyone by surprise that our [class] organization and meetings that we had were kind of sporadic. But when we did have them again, it's kind of like the main topic of the day. How the quarantine was affecting everybody and everything in our lives that there would be again, kind of like an update and, you know, what are the latest questions about it.*

However, consistent with her in-person instruction, Ms. Lee was cautious about the information she presented due to the rapidly changing body of knowledge around COVID:

> *So I didn't really structure a lesson because, again, I didn't feel comfortable with presenting information that I didn't know was 100 percent. Not that anything in science is ever 100 percent, but I didn't want to give misleading information. They did learn to understand how quickly the information can change, so if anything, one of the best things that they did understand was the nature of science.*

Building Student Knowledge While Attending to Student Health

Mr. Kennedy was a 7th and 8th grades science teacher at a small private middle school in California during the 2019–20 academic year. He reflected on how COVID became an increasingly important component of his classroom instruction as the pandemic unfolded, largely in response to student questions. In his words:

> *It was a normal year until it wasn't. I think the first time I mentioned COVID in class, it would have been in January when we first started to see news come out of WHO about the situation. And students asked me about it actually. Science news is something we regularly talk about in class. It's a part of the curriculum to keep up-to-date with events. And students asked me if I had heard about this virus in China and could we please talk about it. And so I gathered up materials, mostly general knowledge at that time about this is what a virus is, this is how they spread. . . . It was a very general conversation until the news started to get more serious. And it became a regular part of the class that we would talk about. Like the recommendations from the CDC, this is what we should all be doing. Don't panic, but let's watch the science carefully.*

Mr. Kennedy believed it was important to present his students with scientifically accurate information about the virus, but also recognized that students were likely to be concerned and potentially fearful. Therefore, he attempted to balance multiple priorities within his instruction. As he explained:

> *For the age group that I teach, it's really important, I think, to establish some context. I'm a believer that, like, science can be used to clarify—like the approach that I always try to take in classes is "Here's the evidence." We can talk about what to do with the evidence after that, but let's establish the facts first. And also trying to pay attention to our own social and emotional wellness, even as we're talking about something as dangerous as a pandemic. So I guess the approach was really to balance all of those different metrics of health to establish context, and to try to provide students with some scientific understanding of what they were hearing in the world around them.*

Mr. Kennedy also continued to encourage student questions about COVID, providing a discussion board as a platform for them to raise their questions. As he said:

> *We also had a discussion board. So I would encourage students if they just had a question, if maybe they had heard something they didn't fully understand, they could put the question on the discussion board and as a class community, we would address it. And I found that that was an especially important way to identify sources of misinformation that students had and to help get those out in the open so that we could again provide some context and evidence.*

When his school building closed, Mr. Kennedy continued to prioritize COVID in his online science instruction. Although the topic of viruses wasn't particularly well aligned with his curriculum, he believed it was important to continue to build student understanding of this important current event as it unfolded. In his words:

> *As I'm trying to teach them these other things that are more pertinent to the course, you know, I have to help them to stay informed about the world around them. So we spent really a lot of time talking about COVID science.*

Mr. Kennedy also continued to emphasize physical and emotional wellness, encouraging his students to reflect on ways to keep themselves and their families healthy. He explained:

> *Also, one of the activities that we did was building a plan for your family for how you can take care of not just your physical health, in the early days, encouraging them to practice good hygiene and things like that, but also how do you take care of your mental health, your emotional health, your social health, or community health. Trying to create an opportunity to have those conversations in my class has always been really important to me.*

Students Questions as Drivers of Science Instruction

During the 2019–20 school year, Ms. Richmond taught 7th grade life science and 8th grade physical science courses at a large, suburban elementary- and middle-grades school in Arizona. In early 2020, as COVID was becoming a mainstream concern, Ms. Richmond endeavored to help students evaluate the merits of widely circulating misinformation about COVID. She explained that helping students think more critically about what they were hearing and where that information originated helped calm their fears about the virus:

> *I realized that they were getting tons of misinformation, and I said, "Well, we've got to start addressing where do you go to get the proper information?". . . . They were suddenly just like, "It's spreading, and it's going all over the place," and they were panicking from misinformation. So that gave me a chance to really focus in on that, as like, "How do you know if the information is correct? Where are you getting it from? What's the source? How do you validate it? How do you verify it?" And so that was pretty important. They liked that because that really calmed them down. Because then they kept hearing rumors and they realized, "Wait a minute, that's just a rumor. Let's wait until we know something more definitive."*

Ms. Richmond also devoted instructional time to addressing student questions about the virus and equipping them with skills to find answers to their questions. As she explained:

> *I always took the time to answer their questions. . . . To not so much to respond to their questions, but to help them find the information that would lead to them getting answers to their questions. It was early and I felt at the time that, well, if things got better, then, you know, at least they'll have some information. But if things got worse, it would be great for them to know where to get as much information as they could. And that was my real direction initially. It's like, where do you get answers to your questions? What are the good questions to ask?*

Student questions came to play an increasingly important role in Ms. Richmond's science instruction, particularly in relation to how viruses spread. For example, Ms. Richmond described how student questions led to class discussions and experiments focused on hand washing:

> *So then eventually the questions turned to, "How does using soap kill it?" And that was great because they had had some chemistry, they had already had some life sciences, we had already talked about cells. And so I was able to talk about how soaps interact with membranes. . . . And then what I discovered is that they were taking it home and telling their parents, "This is why you need to wash your hands so often."*

Similarly, student questions led to class discussions about the merits of wearing masks to slow the spread of the virus:

> *The questions started talking about, "Why is it spreading and how do we stop it?" And that was way before the whole issue of the mask came in, but it was starting to. And we talked about how colds spread. We talked about other diseases, how it's related to other diseases like the flu and other viral infections and, you know, how do they spread? Of course, at the time we didn't know how bad it was going to get, but you know, they got a sense of like, "Well, there's something we can do to reduce the ability to get infected."*

Eventually, Ms. Richmond's school building closed due to the pandemic. She indicated that the transition from in-person to remote instruction caused significant disruptions to her instruction. Notably, she explained that she stopped addressing COVID, largely because students stopped asking questions:

> *Once the kids weren't around, they weren't asking questions. . . . And I kept asking them to send questions so that we could at least interact in a way with the questions and stuff. But I think the students got a little bit shy, because it was just so different to suddenly not be able to be in a conversation. I'm not really sure what happened there, but it was tough.*

Online Instruction as a Barrier to COVID Instruction

During the 2019–20 school year, Ms. Morris taught 8th grade science at a rural middle school in Indiana. As COVID began to spread throughout the US, her school quickly moved to online instruction. Ms. Morris recalled how difficult it was to adapt to an online mode of teaching:

> *Prior to last year, we'd never had e-learning. . . . So I really felt like I was starting in the deep end of the pool, and it was a sink or swim kind of time. I didn't have time to really figure it out, I just started doing it. . . . It was more of let's just get by in the spring, let's just do the best that we can with what we have to work with.*

She noted the added challenge of trying to facilitate online instruction when her students didn't have access to reliable internet. In her words:

> *We were running into problems of some students didn't have internet, and then the internet was down in some locations. So it was not reliable initially to be able to say, "Okay, I'm getting [online] with everybody."*

Due in large part to these obstacles, Ms. Morris did not address the topic of COVID in her science instruction, choosing instead to devote class time to covering the required standards. As she said:

> *I didn't teach on the topic of COVID. I have standards I have to cover, and we get only so much time. And then when the pandemic hit and I did not meet with my students, really I couldn't meet with all my students, so when I did get them, I had to stick with my standards. And so, no, I never did talk about COVID. It was like, gosh, I don't have enough time to open that can of worms.*

Addressing COVID as an Extension of the Life Science Curriculum

Ms. Anderson taught high school biology and chemistry at a small high school located in a large city in Colorado. Because the topic of viruses was included in her content standards, it was not difficult for her to integrate COVID into her biology instruction before her school building closed. As she explained:

> *The pandemic started right when we were talking about mitosis. And so, part of that section is discussing viruses and bacteria. And so it actually was a very easy gateway to get to speak about this particular virus and what was known at the time.*

There was limited information available about COVID at that time, so Ms. Anderson focused her instruction on viruses in general, comparing what was known about this new virus to other viruses that have been around for much longer. In her words:

> *Since this was a novel virus, since it was new, there wasn't a lot of information. So I presented it more in the general family of other viruses that were similar to it and what that indicated.*

Ms. Anderson also used instructional time to address common misconceptions her students had about COVID. As she said:

> *I actually did bring in information as to why this particular virus was more concerning than influenza, because that was a pretty common misconception, and one that exists still to this day. And so I was hoping to present information to them that allowed them to see that this was a concerning virus and why we should take it seriously.*

When her school building closed in March of 2020, Ms. Anderson continued to devote a significant portion of her instruction to COVID, focusing particularly on what was known about how to prevent the spread of the virus in efforts to keep her students safe. She explained:

> *My school, for a multitude of reasons but predominantly because of the size, it's a very close-knit group of individuals. And being told that they were not supposed to be spending time with each other was really, really, really challenging. I mean, it was challenging for all teenagers, right? But, I would say the smaller the group, the bigger the challenge it was to keep them away from each other. And so we actually would discuss why that was important and why they needed to follow it and why we needed to wear masks. I remember there was one day that we spent about half of our class period discussing how and why masks work and involving the droplets and what that looked like. . . . There were days where it was really important. Like, it was clear that they needed to talk about it and they needed to ask me questions. And so those days, if we needed to dedicate the whole class period to it, I dedicated the whole class period to it.*

COVID and the NGSS

Mr. Evans taught physics, chemistry, and advanced chemistry at a large, urban high school in Kentucky during the 2019–2020 school year. As COVID became more widespread, students in his classes began asking questions about the virus. Therefore, before his school closed, Mr. Evans devoted instructional time to addressing their questions. As he said:

> *There were so many questions about it. My students did have so many questions. I felt like it was important to at least have more like a Q&A kind of a discussion before we closed down. . . . I wanted to get their ideas and kind of try and figure out what they were understanding and how they were kind of feeling about it.*

However, given the limited, conflicting, and quickly changing information about COVID, Mr. Evans spent a great deal of time seeking out reputable sources of information. As he said:

> *At that time, I was just kind of a little bit crazy obsessive about trying to figure out what was going on with it because the students had had so many questions. So anything that I could read about it and try to verify information, and pull multiple sources where possible, because there was a lot of conflicting stuff at that time. . . . I don't know when along the process it was, but Dr. Fauci kind of was coming through, and he kind of emerged as someone I was like, "Okay, that guy seems to know what he's talking about and uses scientific language and evidence when he talks." I started paying more attention to what he was saying, but at first, I didn't know who to trust or what to try to believe.*

Although COVID wasn't well aligned to his content standards, Mr. Evans also used the virus as a way to teach his students about science practices and the nature of science. He explained:

> *We don't have any specific COVID or disease-oriented standards for our disciplinary core ideas, but for the [Next Generation Science Standards] stuff, a lot of it is integrating the practices and the cross-cutting concepts. And so really, you're talking about scientific practices. So we were talking a lot about social distancing and then models along with that. Just the process of science itself. Like why is there so much confusion and misunderstanding around the virus at that time. So a lot of it was related back to really core questions about the nature of science, which is in our standards. It was a very unique application of that I would say.*

When his school eventually closed, Mr. Evans' instruction moved online and became largely asynchronous. However, he still provided opportunities for students to learn about COVID via choice-board assignments. In his words:

> *The method that I chose to share information and do their assignments was called an agency board or choice board. . . . Like there were 10 assignments on it, and they got to choose five of them in the course of one week. . . . And so one of the boards that I did, the*

> *very first board I did, was just about COVID stuff. And so I would pull resources from online. There was a model that I think the Washington Post or somebody had posted, and there was an article about it, but it was like the spread of COVID with social distancing and without social distancing. And you can kind of see the growth of that over time. So I was asking them questions about modeling in science. And then there were some [assignments] just about the spread of disease in general and kind of relating that to globalization. . . . So a lot of it was sharing resources and just having them reflect on that information.*

However, over time, Mr. Evans noticed that students became less interested in engaging with the topic, likely due to the overwhelming amount of information that they frequently encountered. He said:

> *I felt like . . . as it kind of went on, they were feeling a little bit inundated with information and with discussions about COVID. A lot of them just didn't want to talk about it anymore at all. Kind of got to that point where it just wasn't useful anymore to them.*

Using Emerging Research to Teach About COVID

Ms. Sanford taught honors and AP biology during the 2019–20 school year at a suburban high school in Montana. Her state was one of the last in the US to experience major spread of COVID. Therefore, she only briefly touched on the topic before her school building closed, tying it to her instruction on natural selection:

> *As we were talking about the natural selection unit, we were looking at the evolution of the virus and looking at some research coming out of Washington about how the virus changed over time and some of the tracing they were doing of who was getting the virus based on the . . . RNA sequence of the virus.*

However, once the school building closed, Ms. Sanford substantially expanded her instruction related to COVID. She taught about multiple facets of the pandemic during a week-long instructional unit that she adapted from an AP Biology Facebook group she was a member of. In her words:

> *We did kind of a coronavirus week in AP Bio. There was actually another teacher who . . . had started making a PowerPoint that included all sorts of topics about coronavirus. Everything from structurally what is the virus, to the specific coronavirus, to how you get it, to what treatments were being worked on and vaccines.*

Ms. Sanford noted that her instruction relied heavily on research articles, statistics, and data sets that were being released and updated on a regular basis:

> *I took [the information from the AP Biology Facebook group] and modified it for an AP class so that they were looking through a bunch of the different things. I would snip parts of the research articles and give it out. And the teacher out of Washington who had made this initially, she had done a lot of that too and then just kept updating it as studies were put out. So they were looking at some of the primary research in an easy-to-swallow chunk with links to the actual journal articles that things were coming out of. . . . Even talking about some preprint articles, because there was a lot that was coming out, and some of the statistics they'd heard in the news versus what was in the original research articles on all those topics.*

Ms. Sanford also provided opportunities for her students to apply what they were learning from the emerging research they examined. For example, she asked her students to seek out information from popular media sources and use scientific evidence from research to refute false claims. As she explained:

> *The last thing as a part of this unit was they had to go spot fake news. So they had to go and find popular media, and it could have been social media, it could have been*

newspaper, whatever, and find the fake news, explain why it was fake news, and then cite evidence from actual scientific articles . . . in terms of why it was fake news.

In addition, Ms. Sanford had her students create informational videos about COVID and share them with members of their families. In her words:

They had to make a video, and they had to get on and explain something about the coronavirus from what they learned to their parents. So, they were teaching their family members.

Although Ms. Sanford was able to access many COVID resources and lesson ideas from the AP Biology Facebook group, she noted that teachers would have benefitted greatly if they had access to comprehensive repositories of information that were applicable to the grade levels they teach. As she said:

That one teacher [on Facebook] who had done all the work to put so much information in that one PowerPoint was so helpful. And so once I found that, I didn't really search a lot of other places because that was being updated every two days. And so that information was there, and if I had a question on a topic, I'd look for things myself. But having a hub for educators, somewhere that has current research articles [would have been helpful.] We just don't have time to do that. . . . For coronavirus, I'm guessing that the majority of biology teachers are at least somehow teaching it in spurts, and the information is changing so quickly that it would be nice to have a spot to go that information is there without searching through and finding the information that's most relevant when you have to pare it down to what a high school student can understand.

Focusing on Scientific Data to Alleviate Student Fears

During the 2019–20 school year, Mr. Reeves taught 9th grade physical science and 11th–12th grades International Baccalaureate biology at a small rural high school in Delaware. Because the topic of viruses was aligned with his standards, he taught COVID-related content in each of his classes. In his words:

> *In the biology course, we were actually studying cells, so it gave me an opportunity to emphasize why science doesn't regard a virus as a true living entity. And then we got into quite a bit of detail about how viruses work and how they use the cellular apparatus of another organism in order to replicate themselves. . . . With the 11th and 12th graders, I did a little bit more in-depth look at what the COVID virus looked like, what you would typically see. What we still see is the graphic that we see on the news about COVID, so I took that model and had them try to understand what the parts of that model represented. And understanding viruses and as just really little mechanisms for using your cells to make more copies of themselves. Because that was what we were actually studying, was the replication of DNA and translation using RNA to translate the code in the DNA.*

However, many of Mr. Reeve's students lived or worked in settings where COVID transmission was particularly concerning:

> *It was early, even before we closed, that the information started to come to light that this was a very communicable disease. There was immediately concern among people who worked in situations where they were in close proximity to other people, as well as people who lived in situations with close proximity to other people. And a lot of my students live in very densely populated places and in multi-generational homes.*

In efforts to alleviate student fears, Mr. Reeves devoted a substantial portion of class time to answering their questions, with an emphasis on the importance of accessing accurate and reliable scientific information. As he said:

> *I mostly answered questions, and tried to help them understand the science. I tried to give kids opportunities to ask questions and also shared with them places where they could find information and answers. Most of the questions were based on if I was afraid of the virus, and I tried to share that, you know, as a scientist, I don't allow fear to drive my life. I try to really access good information because fear doesn't really serve us very well. So I did those kinds of lessons and tried to gear them towards the questions that the students had because if you're answering their questions, then there's going to be some learning going on.*

Mr. Reeves also provided students with opportunities to access and interact with COVID-related data. In his words:

So I accessed the COVID data on the State of Delaware website and showed them how to access it as well, with the idea that we might part ways. Again, trying to empower them with information. For them to learn how to access information and interpret information clearly is a part of what I do. And so I used COVID data to push that part of my teaching a little bit more than I would have pre-COVID.

After their school building closed, Mr. Reeves continued to address COVID in his online instruction in response to student questions:

It became obvious to us from their questions that they had very, very little understanding and were very fearful. So I did one lesson that was pretty involved with building understanding between bacteria, which are living things, but also microbes and viruses, which are non-living and at the root of this pandemic. And it was pretty successful. It was probably about a week of interrelated lessons.

However, he recalled the delicate balance between providing information that would increase student knowledge without contributing to their anxiety. In his words:

It was a fine line. What I didn't want to do was scare my students and make them—you know, I really consciously tried not to stress them out. I didn't want them to be more fearful. And of course, some of these kids were getting COVID, and some of their parents were getting COVID, and some of their grandparents were dying from COVID, and it was stressful. So I really tried to strike a good balance. . . . And then what I asked them to do, which was more like looking at data and trying to build some understanding of how to look at data and interpret it. . . . I went online and found good data, good representations of data, and even some animations of how data was changing over time, that kind of thing. Again, to make it responsive to some of the questions that I was getting from them, like, "Why can't we come back to school?" and "When's this ever going to end?"

Despite the challenges, Mr. Reeves reflected on the important role he and other teachers could play in disseminating accurate scientific information related to COVID within their schools and communities:

And I think that educators like myself could have promoted good understanding, clear understanding, and it would spread like the virus spreads. It would spread from person to person within communities. And high school-aged students can play a role in helping their parents understand the science, because they're a little younger. They're little adults. They're smart. They're very, very bright. And they're very, very capable.

SUMMARY

This report details findings from a research study about teachers' decisions and instruction related to COVID. Study data indicate that teachers accessed a variety of media sources to find information about COVID, with large percentages relying on health information websites such as the CDC and NIH. However, health information websites were more likely to be accessed by teachers who taught about COVID than by those who did not.

Large proportions of life and non-life science teachers at each grade band devoted class time to COVID. Life science teachers tended to address COVID as part of their curriculum, while non-life science teachers addressed it as a standalone topic. Encouragingly, when looking at equity factors, student access to COVID-related instruction was generally equitably distributed.

The vast majority of teachers at each grade band indicated that students asked questions about COVID before they addressed the topic. Students asked questions about many different aspects of COVID, including risk of infection, what the virus/disease is, and how to prevent transmission. Yet, large majorities of life and non-life science teachers at each grade band indicated they would have addressed COVID even if students had not asked about it. Additionally, teachers in Democratic-leaning counties were more likely than teachers in Republican-learning counties to indicate they would have addressed COVID regardless of whether students asked questions.

While school buildings were open, teachers frequently utilized class discussions (driven by student questions) as a means of teaching about COVID. However, after school buildings closed, teachers increasingly relied on readings and videos. Active learning strategies, such as hands-on/laboratory investigations, were infrequently used to address COVID.

Across grade bands, the most commonly addressed topics while school buildings were open included how the virus is transmitted and what coronavirus/COVID-19 is. In contrast, after school buildings closed, teachers increasingly focused on topics related to public health, such as the impacts of social distancing and factors that place people at risk for contracting the virus. Interestingly, teachers in high-poverty schools were more likely than teachers in low-poverty schools to address COVID transmission, COVID treatment/diagnosis, and advanced COVID topics. Large percentages of teachers at each grade band relied heavily on units or lessons they created to teach about COVID.

Teachers identified several reasons why they chose to teach about COVID. At the elementary level, many teachers took up the topic as a way to address student fear and anxiety. Middle and high school teachers generally addressed COVID because it was a relevant and current event. Conversely, elementary teachers who did not address COVID cited the age of their students, lack of stable knowledge about COVID, and the desire to avoid causing fear and anxiety. Middle and

high school teachers who did not teach about COVID overwhelmingly noted lack of alignment to their standards or curriculum.

Survey items aligned with the Theory of Planned Behavior provided additional information about factors that influenced teachers' decision whether to teach about COVID. Teacher attitudes toward teaching about COVID, perceptions of control over teaching about COVID, and feelings of self-efficacy had a substantial influence on whether they addressed COVID in their instruction. However, there were no substantial differences in teacher decision making when examining these data by equity factors.

APPENDIX

APPENDIX A

TEACHING SCIENCE DURING A PANDEMIC TEACHER QUESTIONNAIRE

Your Teaching Assignment

1) During the spring of 2020, did you teach **multiple subjects to a <u>single class</u> of students** all/most of the day? *Q1*
    a. Yes (typical of elementary teachers who teach in a **self-contained** classroom)
    b. No (typical of teachers who teach in **teaming** or **departmentalized** situations)

2) Did your school building close (even temporarily) due to coronavirus/COVID-19? *Q2*
    a. Yes
    b. No

The next several questions ask about your science instruction ***[[while your school building was open***. ***Later in the survey, you will see questions about your science instruction while your school building was closed.]]*** *Q3*

3) In a typical week, how many different classes (sections) of science did you teach? (If you taught the **same science course to multiple classes of students**, count each class separately. If you do pull-in with a special population of students, please include them as part of a class, and not as a separate class.)

1○	2○	3○	4○	5○	6○	7○	8○	9○	10○

Your Science Instruction While Your School Building Was Open

4) During the spring of 2020, did you address coronavirus/COVID-19 in any of your instruction (e.g., class discussion, formal lesson, student presentation, current event coverage) *[[while your school building was open]]*? Q4
    a. Yes
    b. No

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5) During the spring of 2020, did you address coronavirus/COVID-19 in any of your science instruction (e.g., class discussion, formal lesson, student presentation, current event coverage) ***[[while your school building was open]]***? Q5
    a. Yes
    b. No

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6) Did you devote any class time to coronavirus/COVID-19 in **more than one** of your science classes ***[[while your school building was open]]***? Q6
   a. Yes
   b. No

[[Please answer the questions on the following pages for the one class where you addressed coronavirus/COVID-19 <u>the most</u> with your students.]]

7) What grade levels are included in the class you are answering about? *Select all that apply*.

□	K	*q7_k*
□	1	*q7_1*
□	2	*q7_2*
□	3	*q7_3*
□	4	*q7_4*
□	5	*q7_5*
□	6	*q7_6*
□	7	*q7_7*
□	8	*q7_8*
□	9	*q7_9*
□	10	*q7_10*
□	11	*q7_11*
□	12	*q7_12*

8) Which of the following best describes the content focus of the one class you are answering about? Q8
   a. (1) Earth science (e.g., geology, astronomy, meteorology, oceanography)
   b. (2) Life science (e.g., biology, ecology, anatomy and physiology)
   c. (3) Physical science (e.g., chemistry, physics)
   d. (4) Environmental science
   e. (5) General science
   f. (6) Integrated science
   g. (7) Other (please specify):_____

9) In this class, on about how many days did you devote any class time to coronavirus/COVID-19 ***[[while your school building was open]]***? Q9
   a. (1) 1
   b. (2) 2
   c. (3) 3
   d. (4) 4
   e. (5) 5
   f. (6) 6
   g. (7) 7
   h. (8) 8
   i. (9) 9
   j. (10) 10
   k. (11) >10

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10) Did you use coronavirus/COVID-19 to address topics you are responsible for teaching in this class (e.g., spread, treatment, and prevention of disease; characteristics of viruses) ***[[while your school building was open]]***? Q10
   a. Yes
   b. No
11) Did you address coronavirus/COVID-19 as a stand-alone topic, unrelated to the rest of your science curriculum (e.g., a current event topic outside of the specified curriculum of this class) ***[[while your school building was open]]***? Q11
   a. Yes
   b. No
12) Did your students ask questions about coronavirus/COVID-19 before you began addressing it in this class ***[[while your school building was open]]***? Q12
   a. Yes
   b. No

---

13) Would you have addressed coronavirus/COVID-19 in this class if your students had not asked questions about it? Q13
   a. Yes
   b. No

---

14) Which of the following took place when coronavirus/COVID-19 was addressed in this class ***[[while your school building was open]]***? *Select all that apply.*

□	a) I lectured or gave an in-class presentation about coronavirus/COVID-19.	*q14a*
□	b) I recorded a video of myself explaining a concept for students to watch outside of class.	*q14b*
□	c) I led a whole class discussion about coronavirus/COVID-19.	*q14c*
□	d) I answered questions about coronavirus/COVID-19 asked by students.	*q14d*
□	e) Small groups discussed coronavirus/COVID-19.	*q14e*
□	*f)* Students read about coronavirus/COVID-19.	*q14f*
□	g) Students did a hands-on activity or laboratory investigation about coronavirus/COVID-19.	*q14g*
	h) Students used a simulation or model to explore coronavirus/COVID-19.	
□	i) Students did a worksheet or answered written questions about coronavirus/COVID-19.	*q14h*
□	j) A student (or students) gave a presentation about coronavirus/COVID-19.	*q14i*
□	k) A guest speaker talked about coronavirus/COVID-19.	*q14j*
□	l) Students watched a video about coronavirus/COVID-19.	*q14k*
□	m) Students searched the internet for information or current events related to coronavirus/COVID-19.	*q14l*
□	Other: _____*q14m_o*_____	*q14m*

15) In addressing coronavirus/COVID-19 in this class, which of the following topics were covered ***[[while your school building was open]]***? *Select all that apply.*

□	What coronavirus/COVID-19 is (e.g., the difference between the virus and the disease)	*q15a*
□	How coronavirus is transmitted among humans	*q15b*
□	Ways to prevent coronavirus transmission from one individual to another (e.g., washing hands, covering mouth when you cough, staying away from people with symptoms)	*q15c*
	Impacts of social distancing	
□	Factors that place people at risk for contracting coronavirus	*q15d*
□	Symptoms of COVID-19	*q15e*
□	How COVID-19 is diagnosed	*q15f*
□	How COVID-19 is treated	*q15g*
□	Survival rates of those infected with coronavirus	*q15h*
□	Where coronavirus originated (i.e., what part of the world)	*q15i*
□	Likelihood that coronavirus/COVID-19 would spread throughout the United States	*q15j*
□	Common misconceptions about coronavirus/COVID-19 (e.g., coronavirus doesn't affect young people, coronavirus is spread only by people with symptoms)	*q15k*
□	Other: _____*q15l_o*_____	*q15l*

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16) About how much time **total** did you spend discussing and teaching about coronavirus/COVID-19 in this class ***[[while your school building was open]]***? Please combine across all sessions of this class in which you discussed and taught about coronavirus/COVID-19. Q16

a. (1) Less than 30 minutes
b. (2) 30–60 minutes
c. (3) 61–90 minutes
d. (4) 91–120 minutes
e. (5) 121–150 minutes
f. (6) 151–180 minutes
g. (7) 181–210 minutes
h. (8) 211–240 minutes
i. (9) 241–270 minutes
j. (10) 271 – 300 minutes
k. (11) More than 5 hours

Your Science Instruction While Your School Building Was Closed

17) After your school building closed, did instruction for this class continue? Q17
   a. Yes [SKIP TO Q23]
   b. No

18) After your school building closed, did instruction continue? Q18
   a. Yes
   b. No

---

19) After your school building closed, did you address coronavirus/COVID-19 in any of your ***[[science]]*** instruction (e.g., class discussion, formal lesson, student presentation, current event coverage)? Q19
   a. Yes
   b. No

Please answer the following questions for the one class where you addressed coronavirus/COVID-19 the most with your students, **after your school building closed.**

20) What grade levels are included in the class you are answering about? *Select all that apply.*

□	K	*Q21_k*
□	1	*Q21_1*
□	2	*Q21_2*
□	3	*Q21_3*
□	4	*Q21_4*
□	5	*Q21_5*
□	6	*Q21_6*
□	7	*Q21_7*
□	8	*Q21_8*
□	9	*Q21_9*
□	10	*Q21_10*
□	11	*Q21_11*
□	12	*Q21_12*

21) Which of the following best describes the content focus of the class you are answering about? Q22
    a. (1) Earth science (e.g., geology, astronomy, meteorology, oceanography)
    b. (2) Life science (e.g., biology, ecology, anatomy and physiology)
    c. (3) Physical science (e.g., chemistry, physics)
    d. (4) Environmental science
    e. (5) General science
    f. (6) Integrated science
    g. (7) Other (please specify):_____
22) In this class, on about how many days did you devote any class time to coronavirus/COVID-19 **after your school building closed?** Q23
    a. (1) 1
    b. (2) 2
    c. (3) 3
    d. (4) 4
    e. (5) 5
    f. (6) 6
    g. (7) 7
    h. (8) 8
    i. (9) 9
    j. (10) 10
    k. (11) >10

---

23) **After your school building closed**, did you address coronavirus/COVID-19 in this class (e.g., class discussion, formal lesson, student presentation, current event coverage)? Q24
    a. Yes
    b. No

---

24) **After your school building closed**, did you address coronavirus/COVID-19 in any of your **other** science classes (e.g., class discussion, formal lesson, student presentation, current event coverage)? Q25
    a. Yes
    b. No

Please answer the following questions for the one class where you addressed coronavirus/COVID-19 the most with your students, **after your school building closed.**

25) What grade levels are included in the class you are answering about? *Select all that apply.*

□	K	*Q21_k*
□	1	*Q21_1*
□	2	*Q21_2*
□	3	*Q21_3*
□	4	*Q21_4*
□	5	*Q21_5*
□	6	*Q21_6*
□	7	*Q21_7*
□	8	*Q21_8*
□	9	*Q21_9*
□	10	*Q21_10*
□	11	*Q21_11*
□	12	*Q21_12*

26) Which of the following best describes the content focus of the class you are answering about? Q22

a. (1) Earth science (e.g., geology, astronomy, meteorology, oceanography)
b. (2) Life science (e.g., biology, ecology, anatomy and physiology)
c. (3) Physical science (e.g., chemistry, physics)
d. (4) Environmental science
e. (5) General science
f. (6) Integrated science
g. (7) Other (please specify):_____

27) In this class, on about how many days did you devote any class time to coronavirus/COVID-19 **after your school building closed?** Q23

a. (1) 1
b. (2) 2
c. (3) 3
d. (4) 4
e. (5) 5
f. (6) 6
g. (7) 7
h. (8) 8
i. (9) 9
j. (10) 10
k. (11) >10

28) **After your school building closed,** did you use coronavirus/COVID-19 to address topics you are responsible for teaching in this class (e.g., characteristics of viruses; spread, treatment, and prevention of disease)? Q25
    a. Yes
    b. No

29) **After your school building closed,** did you address coronavirus/COVID-19 as a stand-alone topic, unrelated to the rest of your science curriculum (e.g., a current event topic outside of the specified curriculum of this class)? Q26
    a. Yes
    b. No

30) **After your school building closed,** did your students ask questions about coronavirus/COVID-19 before you began addressing it in this class? Q27
    a. Yes
    b. No

---

31) **After your school building closed,** would you have addressed coronavirus/COVID-19 in this class if your students had not asked questions about it? Q28
    a. Yes
    b. No

---

32) **After your school building closed,** which of the following took place when coronavirus/COVID-19 was addressed in this class? *Select all that apply.*

□	I lectured or gave a presentation about coronavirus/COVID-19.	*q28a*
□	I recorded a video of myself addressing coronavirus/COVID-19for students to watch.	*q28b*
□	I led a whole class discussion about coronavirus/COVID-19.	*q28c*
□	I answered questions about coronavirus/COVID-19 asked by students.	*q28d*
□	Small groups discussed coronavirus/COVID-19.	*q28e*
□	Students did small group projects related to coronavirus/COVID-19.	*q28f*
□	Students read about coronavirus/COVID-19.	*q28g*
□	Students did a hands-on activity or laboratory investigation about coronavirus/COVID-19.	*q28h*
□	Students used a simulation or model to explore coronavirus/COVID-19.	*q28i*
□	Students did a worksheet or answered written questions about coronavirus/COVID-19.	*q28j*
□	A student (or students) gave a presentation about coronavirus/COVID-19.	*q28k*
□	A guest speaker talked about coronavirus/COVID-19.	*q28l*
□	Students watched a video about coronavirus/COVID-19.	*q28m*
□	Students searched the internet for information or current events related to coronavirus/COVID-19.	*q28n*
□	Other: _____*q28o_o*_____	*q28o*
□	Other: _____*q28o_o*_____	
□	Other: _____*q28o_o*_____	

33) In addressing coronavirus/COVID-19 in this class **while your school building was closed**, which of the following topics were covered? *Select all that apply.*

□	What coronavirus/COVID-19 is (e.g., the difference between the virus and the disease)	*Q29a*
□	How coronavirus is transmitted among humans	*Q29b*
□	Ways to prevent coronavirus transmission from one individual to another (e.g., washing hands, covering mouth when you cough, staying away from people with symptoms)	*Q29c*
	Impacts of social distancing	
□	Factors that place people at risk for contracting coronavirus	*Q29d*
□	Symptoms of COVID-19	*Q29e*
□	How COVID-19 is diagnosed	*Q29f*
□	How COVID-19 is treated	*Q29g*
□	Survival rates of those infected with coronavirus	*Q29h*
□	Where coronavirus originated (i.e., what part of the world)	*Q29i*
□	Likelihood that coronavirus/COVID-19 would spread throughout the United States	*Q29j*
□	Common misconceptions about coronavirus/COVID-19 (e.g., coronavirus doesn't affect young people, coronavirus is spread only by people with symptoms)	*Q29k*
□	Other: _____ *Q29l_o*_____	*Q29l*

Overall Science Instruction in This Class

34) This question is about your science instruction **overall, not about your instruction related to coronavirus/COVID-19.** How often did you do each of the following in your science instruction in this class **before** and **while** your building was closed? *Select one in the before column and one in the while column.*

Never	**Rarely (less than once a month)**	**Sometimes (Once or twice a month)**	**Often (Once or twice a week)**	**Very often (Every day or almost every day)**	
				Before Closed	**While Closed**
a. Explained science ideas to the whole class					
b. Engaged the whole class in discussions					
c. Had students work in small groups					
d. Had students do hands-on/laboratory activities					
e. Had students read from a textbook, module, or other material in class, either aloud or to themselves					
f. Engaged the class in project-based learning (PBL) activities					
g. Had students write their reflections (e.g., in their journals)					
h. Focused on literacy skills (e.g., informational reading or writing strategies)					
i. Met with the whole class by videoconference					
j. Met with small groups of students by videoconference					
k. Communicated with individual students by videoconference					
l. Communicated with individual students on the telephone					
m. Communicated with the parents/guardians of individual students on the telephone					
n. Communicated with individual students through text messages, email, or an online messaging program (e.g. Class Dojo)					
o. Communicated with the parents/guardians of individual students through text messages, email, or an online messaging program (e.g. Class Dojo)					
p. Sent assignments home by mail					
q. Sent assignments home by email					
r. Printed paper copies of work packets, which were picked up at the school.					
s. Printed paper copies of work packets, which were delivered to students' homes.					
t. Used a learning-management system (e.g., Canvas, Google Classroom, Schoology) for sharing assignments					
u. Used a class webpage for sharing assignments					
v. Used Google Drive to share assignments					

35) Overall, compared to their engagement level prior to the school building being closed, my students' level of engagement with this class after the closure was: *Q36*
   a. Much lower
   b. Somewhat lower
   c. The same
   d. Somewhat higher
   e. Much higher

Coronavirus/COVID-19 Instruction in This Class

The following questions apply to your coronavirus/COVID-19 instruction **regardless of whether the school was open or closed**.

36) ***[[Regardless of whether it happened before or after your school building closed, in| In]]*** your instruction related to coronavirus/COVID-19 in this class, did you use any of the following? *Select all that apply.*

□	Commercially published materials (printed or electronic)	*q37a*
□	Commercially published kits/modules (printed or electronic)	*q37b*
□	State, county, or district-developed units or lessons	*q37c*
□	Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPop, ShareMyLesson, Teachers Pay Teachers)	*q37d*
□	Lessons or resources from websites that are free (e.g., Khan Academy)	*q37e*
□	Units or lessons you created (either by yourself or with others)	*q37f*
□	Units or lessons you collected from any other source (e.g., conferences, journals, colleagues, university or museum partners)	*q37g*
	None of the above	*Q37h*

---

37) Did you use any of the following materials in your instruction related to coronavirus/COVID-19 in this class? *Select all that apply.*

□	COVID-19! How Can I Protect Myself and Others? from the Smithsonian Science Education Center	*q35a*
□	Materials from the Responding to an Emerging Epidemic through Science Education (REESE) project	*q35b*
□	Responding to a Mystery Illness from Amgen Biotech Experience	*q35c*
□	Understanding Ebola Virus Disease from BSCS	*q35d*
□	None of the above	*q35e*

38) Please list up to five (5) questions your students asked about coronavirus/COVID-19 in this class**.**

a. _____ q35a _____
b. _____ q35b _____
c. _____ q35c _____
d. _____ q35d _____
e. _____q35e_____

The next several items are about factors that influenced your decision to teach about coronavirus/COVID-19***[[, whether it was before or after your school closed]]***. Please continue to answer for the same class you've been answering for up to now.

39) For me, teaching about coronavirus/COVID-19 is:

a.	Undesirable	1	2	3	4	5	6	7	Desirable
b.	The wrong thing to do	1	2	3	4	5	6	7	The right thing to do
c.	Harmful	1	2	3	4	5	6	7	Beneficial
d.	Unimportant	1	2	3	4	5	6	7	Important
e.	Uninteresting	1	2	3	4	5	6	7	Interesting
f.	A waste of my time	1	2	3	4	5	6	7	A good use of my time

---

40) Please rate the extent to which you disagree/agree with each of the following statements. *Select one on each row.*

	Strongly Disagree						**Strongly Agree**
a. I am confident in my ability to successfully teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
b. It was difficult for me to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
c. It was up to me whether or not to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
d. The decision about whether or not to teach about coronavirus/COVID-19 was beyond my control.	1	2	3	4	5	6	7
e. I felt pressure from others to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
f. It was expected that I teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
g. I had sufficient time to plan/prepare for teaching about coronavirus/COVID-19.	1	2	3	4	5	6	7
h. I had adequate access to supports/resources/materials for teaching about coronavirus/COVID-19.	1	2	3	4	5	6	7
i. Students learning from home was conducive to teaching about coronavirus/COVID-19.	1	2	3	4	5	6	7
j. The topic of coronavirus/COVID-19 is well aligned to the content standards I am required to teach.	1	2	3	4	5	6	7

---

41) Does the class you are answering for have a pacing guide?

a. Yes
b. No

42) The topic of coronavirus/COVID-19 fits within my pacing guide.

Strongly Disagree	1 2 3 4 5 6 7	Strongly Agree

43) Ensuring that my instruction adheres closely to my pacing guide is:

Extremely Unimportant	1 2 3 4 5 6 7	Extremely Important

---

44) Please provide your opinion about each of the following statements. *Select one on each row.*

	Extremely Unlikely						**Extremely Likely**
a. Teaching about coronavirus/COVID-19 helped ease my students' fear/panic/anxiety about the pandemic.	1	2	3	4	5	6	7
b. Teaching about coronavirus/COVID-19 helped my students take actions to stop its spread.	1	2	3	4	5	6	7
c. Other science teachers in my school taught about coronavirus/COVID-19.	1	2	3	4	5	6	7

---

45) Please provide your opinion about each of the following statements. *Select one on each row.*

	Should not						**Should**
a. Most people who are important to me thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
b. My principal thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
c. My district administrator(s) thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
d. The parents/guardians of my students thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
e. My students thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7

---

46) Please rate the extent to which each of the following statements is important to you.
Select one on each row.

	Not at all						**Very Much**
a. Teaching the same topics as other science teachers in my school is important to me.	1	2	3	4	5	6	7
b. My principal's opinion about what I teach is important to me.	1	2	3	4	5	6	7
c. My district administrators' opinions about what I teach are important to me.	1	2	3	4	5	6	7
d. Parents'/guardians' opinions about what I teach are important to me.	1	2	3	4	5	6	7
e. My students' opinions about what I teach are important to me.	1	2	3	4	5	6	7

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47) Does your school have a science curriculum specialist?

a. Yes
b. No

48) My school science specialist thought I _____ teach about coronavirus/COVID-19.

Should not	1 2 3 4 5 6 7	Should

49) My school science specialist's opinion about what I teach is important to me.

Not at all	1 2 3 4 5 6 7	Very much

---

50) Does your district have a science curriculum specialist?

a. Yes
b. No

51) My district curriculum specialist thought I _____ teach about coronavirus/COVID-19.

Should	1 2 3 4 5 6 7	Should not

52) My district curriculum specialist's opinion about what I teach is important to me.

Not at all	1 2 3 4 5 6 7	Very much

---

53) Please rate the extent to which each of the following statements is important to you. *Select one on each row.*

	Extremely Unimportant						**Extremely Important**
a. Ensuring that my instruction adheres closely to the content standards I am required to teach is:	1	2	3	4	5	6	7
b. Easing my students' fear/panic/anxiety about coronavirus/COVID-19 is:	1	2	3	4	5	6	7
c. Helping my students understand actions they can take to stop the spread of coronavirus/COVID-19 is:	1	2	3	4	5	6	7

---

54) Please provide your opinion about each of the following statements. *Select one on each row.*

	Less likely						**More likely**
a. Having sufficient time makes me _____ to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
b. Having adequate teaching supports/resources/materials makes me _____to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
c. When students were learning at home, I was _____to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7

Overall Instruction in This Class

The next several items are about factors that influenced your decision **not** to teach about coronavirus/COVID-19.

55) For me, teaching about coronavirus/COVID-19 would be:

a	Undesirable	1	2	3	4	5	6	7	Desirable
b.	The wrong thing to do	1	2	3	4	5	6	7	The right thing to do
c.	Harmful	1	2	3	4	5	6	7	Beneficial
d.	Unimportant	1	2	3	4	5	6	7	Important
e.	Uninteresting	1	2	3	4	5	6	7	Interesting
f.	A waste of my time	1	2	3	4	5	6	7	A good use of my time

---

56) Please rate the extent to which you disagree/agree with each of the following statements. *Select one on each row.*

	Strongly Disagree						**Strongly Agree**
a. I am confident in my ability to successfully teach about coronavirus/COVID-19 if I wanted to.	1	2	3	4	5	6	7
b. It would have been difficult for me to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
c. It was up to me whether or not to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
d. The decision about whether or not to teach about coronavirus/COVID-19 was beyond my control.	1	2	3	4	5	6	7
e. I felt pressure from others to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
f. It was expected that I teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
g. I had sufficient time to plan/prepare for teaching about coronavirus/COVID-19 if I wanted to.	1	2	3	4	5	6	7
h. I had adequate access to supports/resources/materials for teaching about coronavirus/COVID-19 if I wanted to.	1	2	3	4	5	6	7
i. Students learning from home would be conducive to teaching about coronavirus/COVID-19.	1	2	3	4	5	6	7
j. The topic of coronavirus/COVID-19 is well aligned to the content standards I am required to teach.	1	2	3	4	5	6	7

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57) Do you use a pacing guide in any of your science classes?

a. Yes
b. No

58) Coronavirus/COVID-19 fits within the pacing guide for the life science topics I teach.

Strongly Disagree	1 2 3 4 5 6 7	Strongly Agree

59) Ensuring that my instruction adheres closely to my pacing guide is:

Extremely Unimportant	1 2 3 4 5 6 7	Extremely Important

60) Please provide your opinion about each of the following statements. *Select one on each row.*

	Extremely Unlikely						**Extremely Likely**
a. Teaching about coronavirus/COVID-19 would have helped ease my students' fear/panic/anxiety about the pandemic.	1	2	3	4	5	6	7
b. Teaching about coronavirus/COVID-19 would have helped my students take actions to stop its spread.	1	2	3	4	5	6	7
c. Other science teachers in my school taught about coronavirus/COVID-19.	1	2	3	4	5	6	7

---

61) Please provide your opinion about each of the following statements. *Select one on each row.*

	Should not						**Should**
a. Most people who are important to me thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
b. My principal thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
c. My district administrator(s) thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
d. The parents/guardians of my students thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
e. My students thought I _____ teach about coronavirus/COVID-19.	1	2	3	4	5	6	7

---

62) Please rate the extent to which each of the following statements is important to you.
Select one on each row.

	Not at all						**Very Much**
a. Teaching the same topics as other science teachers in my school is important to me.	1	2	3	4	5	6	7
b. My principal's opinion about what I teach is important to me.	1	2	3	4	5	6	7
c. My district administrators' opinions about what I teach are important to me.	1	2	3	4	5	6	7
d. Parents'/guardians' opinions about what I teach are important to me.	1	2	3	4	5	6	7
e. My students' opinions about what I teach are important to me.	1	2	3	4	5	6	7

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63) Does your school have a science curriculum specialist?

a. Yes
b. No

64) My school science specialist thought I _____ teach about coronavirus/COVID-19.

Should not	1 2 3 4 5 6 7	Should

65) My school science specialist's opinion about what I teach is important to me.

Not at all	1 2 3 4 5 6 7	Very much

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66) Does your district have a science curriculum specialist?

a. Yes
b. No

67) My district curriculum specialist thought I _____ teach about coronavirus/COVID-19.

Should	1 2 3 4 5 6 7	Should not

68) My district curriculum specialist's opinion about what I teach is important to me.

Not at all	1 2 3 4 5 6 7	Very much

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69) Please rate the extent to which each of the following statements is important to you. *Select one on each row.*

	Extremely Unimportant						**Extremely Important**
a. Ensuring that my instruction adheres closely to the content standards I am required to teach is:	1	2	3	4	5	6	7
b. Easing my students' fear/panic/anxiety about coronavirus/COVID-19 is:	1	2	3	4	5	6	7
c. Helping my students understand actions they can take to stop the spread of coronavirus/COVID-19 is:	1	2	3	4	5	6	7

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70) Please provide your opinion about each of the following statements. *Select one on each row.*

	Less likely						**More likely**
a. Having sufficient time makes me _____ to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
b. Having adequate teaching supports/resources/materials makes me _____to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7
c. When students were learning at home, I was _____to teach about coronavirus/COVID-19.	1	2	3	4	5	6	7

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71) What was the single most important factor that made you decide to address coronavirus/COVID-19 in this class?

72) What was the single most important factor that made you decide **not** to address coronavirus/COVID-19 in this class?

Your Sources of Coronavirus/COVID-19 Information

73) To what extent has each of the following been a **source of information** for you about coronavirus/COVID-19***[[, whether for instruction or for your personal use]]***? *Select one on each row.*

	Not at All	Minimal	Moderate	To a Great Extent
a. Local news station (e.g., NBC4), via radio, TV, or Internet	( )	( )	( )	( )
b. National broadcast TV news program (e.g., NBC Nightly News, CBS Nightly News)	( )	( )	( )	( )
c. 24 hour TV news (e.g., CNN, MSNBC, FOX, BBC)	( )	( )	( )	( )
d. Radio talk show	( )	( )	( )	( )
e. Online-only sources (e.g., Huffington Post, Yahoo News, AOL)	( )	( )	( )	( )
f. Newspapers, whether print or online (e.g., NY Times, Boston Globe)	( )	( )	( )	( )
g. Popular science magazines (e.g., Scientific American, Discover)	( )	( )	( )	( )
h. Other magazines, whether print or online (e.g., Time, New Yorker)	( )	( )	( )	( )
i. Centers for Disease Control and Prevention (CDC) website	( )	( )	( )	( )
j. Johns Hopkins Coronavirus Resource Center website	( )	( )	( )	( )
k. National Institutes of Health (NIH) website	( )	( )	( )	( )
l. World Health Organization (WHO) website	( )	( )	( )	( )

m. Websites from other health organizations (besides CDC, Johns Hopkins, NIH, and WHO)	( )	( )	( )	( )
n. Websites from teacher professional organizations (e.g., National Science Teachers Association, National Association of Biology Teachers)	( )	( )	( )	( )
o. Social media (e.g., Facebook, Instagram, LinkedIn, Twitter)	( )	( )	( )	( )
p. Resources provided by your school district	( )	( )	( )	( )
q. Conversations with health professionals (e.g., nurses, doctors)	( )	( )	( )	( )
r. Conversations with other teachers	( )	( )	( )	( )
s. Conversations with others (i.e., not health professionals or teachers)	( )	( )	( )	( )

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74) Please rate the **usefulness** of the sources of information about coronavirus/COVID-19 you explored for **planning your instruction**. *Select one on each row.*

	Not at All Useful	Minimally Useful	Moderately Useful	Extremely Useful
a. Local news station (e.g., NBC4), via radio, TV, or Internet	( )	( )	( )	( )
b. National broadcast TV news program (e.g., NBC Nightly News, CBS Nightly News)	( )	( )	( )	( )
c. 24 hour TV news (e.g., CNN, MSNBC, FOX, BBC)	( )	( )	( )	( )
d. Radio talk show	( )	( )	( )	( )

e. Online-only sources (e.g., Huffington Post, Yahoo News, AOL)	( )	( )	( )	( )
f. Newspapers, whether print or online (e.g., NY Times, Boston Globe)	( )	( )	( )	( )
g. Popular science magazines (e.g., Scientific American, Discover)	( )	( )	( )	( )
h. Other magazines, whether print or online (e.g., Time, New Yorker)	( )	( )	( )	( )
i. Centers for Disease Control and Prevention (CDC) website	( )	( )	( )	( )
j. Johns Hopkins Coronavirus Resource Center website	( )	( )	( )	( )
k. National Institutes of Health (NIH) website	( )	( )	( )	( )
l. World Health Organization (WHO) website	( )	( )	( )	( )
m. Websites from other health organizations (besides CDC, Johns Hopkins, NIH, and WHO)	( )	( )	( )	( )
n. Websites from teacher professional organizations (e.g., National Science Teachers Association, National Association of Biology Teachers)	( )	( )	( )	( )
o. Social media (e.g., Facebook, Instagram, LinkedIn, Twitter)	( )	( )	( )	( )
p. Resources provided by your	( )	( )	( )	( )

school district				
q. Conversations with health professionals (e.g., nurses, doctors)	( )	( )	( )	( )
r. Conversations with other teachers	( )	( )	( )	( )
s. Conversations with others (i.e., not health professionals or teachers)	( )	( )	( )	( )

Teacher Background

75) Did you complete any of the following types of biology/life science courses at the undergraduate or graduate level? *Select one on each row.*

	Yes	No
a. General/introductory biology/life science courses (e.g., Biology I, Introduction to Biology)	( )	( )
b. Biology/life science courses beyond the general/introductory level	( )	( )

76) If you would like to be entered into the drawing for 1 of 50 $100 prizes, please enter your home mailing address below (in case we need to mail you a check). We will not share your address with any third party nor will we use it for any purpose outside of this study.
Address Line 1: _____

Address Line 2: _____

City: _____ State: _____ Zip: _____

77) We will select 40 questionnaire respondents for a 45-minute follow-up telephone interview. Each interviewee will receive $40. Would you be willing to participate in an interview if selected?
   a. Yes
   b. No

78) What is the best telephone number to reach you at year round? (Your phone number will not be shared with any third party and will not be used for any purpose outside of this study.)

APPENDIX B

SAMPLE DEMOGRAPHICS

Table B-1
Elementary Grades Teacher Sample Demographics

	Study Sample (N = 272)		National	
Race/Ethnicity				
American Indian or Alaska Native	1	(0.6)	1	(0.6)
Asian	1	(0.7)	2	(0.6)
Black or African American	7	(1.6)	8	(1.2)
Hispanic/Latino	6	(1.4)	9	(1.6)
Native Hawaiian or Other Pacific Islander	1	(0.6)	1	(0.4)
White	90	(1.8)	88	(1.5)
Sex				
Female	94	(1.5)	94	(0.7)
Male	6	(1.5)	6	(0.7)
Type of School				
Public	94	(1.4)	93	(1.1)
Private	6	(1.4)	7	(1.1)
Region				
Midwest	25	(6.2)	22	(1.5)
Northeast	19	(6.2)	16	(1.4)
South	35	(6.2)	37	(1.6)
West	21	(6.2)	25	(1.6)
Community Type				
Urban	28	(4.2)	26	(1.2)
Rural	21	(4.2)	19	(1.3)
Suburban	51	(4.2)	55	(1.8)
Grades Taught				
K	21	(4.2)	Unavailable	
1	21	(2.5)	Unavailable	
2	26	(2.7)	Unavailable	
3	29	(2.8)	Unavailable	
4	32	(2.8)	Unavailable	
5	45	(3.0)	Unavailable	
6 Self-Contained	11	(1.9)	Unavailable	

Table B-2
Elementary School Sample Demographics

	Study Sample (N = 272)		National	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Student Race/Ethnicity				
American Indian or Alaska Native	2.33	12.02	3.45	15.49
Asian	4.80	9.37	4.15	12.74
Black or African American	17.62	24.98	16.99	24.97
Hispanic/Latino	19.53	24.80	19.47	29.23
Native Hawaiian or Pacific Islander	1.19	6.22	0.76	3.70
White	51.56	31.39	51.34	36.93
Two or more races	4.36	3.64	4.87	9.87
Percent of Students Eligible Free or Reduced-Price Lunch	53.08	27.90	53.96	32.93

Table B-3
Middle Grades Teacher Sample Demographics

	Study Sample (N = 560)		National	
Race/Ethnicity				
American Indian or Alaska Native	3	(0.7)	2	(0.6)
Asian	4	(0.8)	2	(0.5)
Black or African American	5	(0.9)	8	(1.5)
Hispanic/Latino	3	(0.8)	7	(1.2)
Native Hawaiian or Other Pacific Islander	1	(0.3)	0	(0.2)
White	92	(1.1)	91	(1.5)
Sex				
Female	84	(1.5)	71	(1.8)
Male	16	(1.5)	28	(1.8)
Type of School				
Public	89	(1.3)	87	(1.9)
Private	11	(1.3)	13	(1.9)
Region				
Midwest	23	(4.2)	23	(1.8)
Northeast	18	(4.2)	17	(1.7)
South	38	(4.2)	40	(2.2)
West	21	(4.2)	20	(2.2)
Community Type				
Urban	30	(3.0)	26	(2.2)
Rural	21	(3.0)	26	(2.1)
Suburban	49	(3.0)	48	(2.3)
Subjects Taught				
Life science	28	(1.9)	27	(1.8)
General science	49	(2.1)	49	(2.4)
Earth science	19	(1.7)	24	(2.0)
Physical science	29	(1.9)	25	(2.2)
Grades Taught				
6	34	(2.0)	Unavailable	
7	52	(2.1)	Unavailable	
8	52	(2.1)	Unavailable	

Table B-4
Middle School Sample Demographics

	Study Sample (N = 560)		National	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Student Race/Ethnicity				
American Indian or Alaska Native	1.38	6.46	1.34	8.15
Asian	4.73	7.05	3.36	8.24
Black or African American	14.15	20.52	15.81	24.48
Hispanic/Latino	18.76	22.97	22.8	30.21
Native Hawaiian or Pacific Islander	1.62	6.37	0.48	2.89
White	55.86	29.52	52.42	34.89
Two or more races	4.57	4.66	4.31	10.85
Percent of Students Eligible Free or Reduced-Price Lunch	45.70	25.49	50.28	30.53

Table B-5
High School Teacher Sample Demographics

	Study Sample (N = 599)		National	
Race/Ethnicity				
American Indian or Alaska Native	1	(0.3)	2	(0.5)
Asian	4	(0.8)	5	(0.9)
Black or African American	3	(0.7)	5	(0.9)
Hispanic/Latino	5	(0.9)	6	(0.8)
Native Hawaiian or Other Pacific Islander	1	(0.3)	0	(0.1)
White	93	(1.1)	91	(1.2)
Sex				
Female	77	(1.8)	57	(1.9)
Male	22	(1.8)	43	(1.9)
Non-binary/other	1	(1.8)	0	(0.0)
Type of School				
Public	84	(1.5)	85	(1.7)
Private	16	(1.5)	15	(1.7)
Region				
Midwest	24	(4.3)	24	(1.9)
Northeast	21	(4.3)	19	(1.5)
South	32	(4.3)	36	(1.5)
West	23	(4.3)	20	(1.6)
Community Type				
Urban	31	(2.9)	28	(1.7)
Rural	20	(2.9)	24	(1.4)
Suburban	49	(2.9)	47	(1.6)
Subjects Taught				
Life science	52	(2.0)	53	(1.3)
Earth/space science	14	(1.4)	11	(1.2)
Environmental science	16	(1.5)	15	(1.5)
Chemistry	32	(1.9)	31	(1.1)
Physics	17	(1.5)	22	(1.2)
Multi-discipline science	27	(1.8)	27	(1.5)
Grades Taught				
9	57	(2.0)	Unavailable	
10	75	(1.8)	Unavailable	
11	81	(1.6)	Unavailable	
12	76	(1.7)	Unavailable	

Table B-6
High School Sample Demographics

	Study Sample (N = 599)		National	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Student Race/Ethnicity				
American Indian or Alaska Native	0.98	4.48	1.57	9.33
Asian	6.24	10.43	5.87	12.93
Black or African American	13.04	19.04	13.05	25.58
Hispanic/Latino	15.62	21.31	18.01	29.40
Native Hawaiian or Pacific Islander	1.97	5.37	1.01	13.03
White	59.60	28.12	58.89	34.38
Two or more races	3.54	3.25	3.43	10.92
Percent of Students Eligible Free or Reduced-Price Lunch	40.98	24.10	41.08	30.44

APPENDIX C

DESCRIPTION OF REPORTING VARIABLES

Grade Range

Teachers were classified by grade range (elementary, middle, and high) according to the information they provided about their teaching schedule. Elementary was defined as grades K–5 plus 6th grade self-contained; middle was defined as 6th grade non-self-contained and grades 7–8; high was defined as grades 9–12.

Percentage of Students in School Eligible for Free/Reduced-Price Lunch

Each teacher was classified into 1 of 4 categories based on the proportion of students in their school eligible for free/reduced-price lunch (FRL). The categories were defined as quartiles within groups of schools serving the same grades—e.g., schools with grades K–5, schools with grades 6–8 (see Table C-1).

Table C-1
Cut Points for Percentage of Students in the School Eligible for FRL

	Percent Of Teachers	Percent FRL Used as Cut Point		
		Quartile 1/Quartile 2	Quartile 2/Quartile 3	Quartile 3/Quartile 4
K–5 Schools	19	32.95	50.68	74.81
6–8 Schools	39	25.58	43.66	63.00
9–12 Schools	42	22.96	37.00	55.20

Percentage of Students from Race/Ethnicity Groups Historically Underrepresented in STEM in Class

Each teacher was classified into 1 of 4 categories based on the proportion of students in their school identified as being from underrepresented minority (URM) groups in STEM (i.e., American Indian or Alaskan Native, Black or African American, Hispanic or Latino, Native Hawaiian or Other Pacific Islander, multi-racial). As this proportion is similar in schools regardless of grades served, the categories were defined as quartiles across all classes (see Table C-2).

Table C-2
Cut Points for Percentage of Students in the Class From Underrepresented Minority Groups

	Percent URM Used as Cut Point
Quartile 1/Quartile 2	15.00
Quartile 2/Quartile 3	33.12
Quartile 3/Quartile 4	62.39

Type of Community

Each teacher was classified as belonging to 1 of 3 types of communities based on the location of their school:

- Urban: Central city;
- Suburban: Area surrounding a central city, but still located within the counties constituting a Metropolitan Statistical Area (MSA); or
- Rural: Area outside any MSA.

Political Leaning of County

Each teacher was classified into 1 of 2 groups based on which 2020 presidential candidate received the majority of votes in the county their school is located in.

Overview of Composites

To facilitate the reporting of large amounts of survey data, and because individual questionnaire items are potentially unreliable, HRI used factor analysis to identify survey questions that could be combined into "composites." Each composite represents an important construct related to COVID in science education.

Each composite is calculated by summing the responses to the items associated with that composite and then dividing by the total points possible. In order for the composites to be on a 100-point scale, the lowest response option on each scale was set to 0, and the others were adjusted accordingly; so, for example, an item with a scale ranging from 1 to 4 was re-coded to have a scale of 0 to 3. By doing this, someone who marks the lowest point on every item in a composite receives a composite score of 0 rather than some positive number. It also assures that 50 is the true mid-point. The denominator for each composite is determined by computing the maximum possible sum of responses for a series of items and dividing by 100; e.g., a 9-item composite where each item is on a scale of 0–3 would have a denominator of 0.27. Composite values were not computed for participants who responded to fewer than two-thirds of the items that form the composite.

The composites were derived through a multi-stage process. As a first step, to test whether the items intended to target the same underlying construct indeed showed similar response patterns, an exploratory factor analysis was conducted on a subset of the data. (The complete dataset was split randomly into two subsets to allow for independent exploratory and confirmatory factor

analyses.) Using Mplus version 8.1, several different factor solutions were produced, and scree plots, eigenvalues, and factor patterns were examined. Based on item fit and conceptual coherence, preliminary composite definitions were created. Next, the preliminary composite definitions were applied to a different subset of the data and a confirmatory factor analysis was performed, again using Mplus. Mplus provides one fit index to evaluate the model: the standardized root mean square residual (SRMR). The psychometric literature provides multiple criteria for judging acceptable model fit using this index, ranging from 0.05 to 0.10.[9] The obtained values from final models are presented in the tables that follow, allowing the reader to apply their preferred criteria for evaluating fit. Lastly, to further aid in the assessment of the composites, Cronbach's coefficient alpha, a common measure of reliability, was calculated and is presented in the tables. An alpha of 0.6–0.8 is evidence of moderate reliability, and a value over 0.8 is considered evidence of strong reliability.

Definitions of Teacher Composites

Composite definitions for the science, mathematics, and computer science teacher questionnaire are presented below along with the item numbers from the respective questionnaires. Composites that are identical for the two subjects are presented in the same table; composites unique to a subject are presented in separate tables.

Sources of Information About COVID

These composites estimate the extent to which teachers used various sources of information about coronavirus/COVID-19, whether for instruction or for personal use.

Table C-3
Local/National Television News Stations

	Item
Local news station (e.g., NBC4), via radio, TV, or Internet	Q73a
National broadcast TV news program (e.g., NBC Nightly News, CBS Nightly News)	Q73b
24-hour TV news (e.g., CNN, MSNBC, FOX, BBC)	Q73c
Number of Items in Composite	**3**
Reliability – Cronbach's Coefficient Alpha	**0.69**
Confirmatory Factor Analysis Fit Index – SRMR	**0.08**

[9] Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55.

Table C-4
Online News/Social Media

	Item
Online-only sources (e.g., Huffington Post, Yahoo News, AOL)	Q73e
Social media (e.g., Facebook, Instagram, LinkedIn, Twitter)	Q73o
Number of Items in Composite	**2**
Reliability – Cronbach's Coefficient Alpha	**0.46**
Confirmatory Factor Analysis Fit Index – SRMR	**0.08**

Table C-5
Written News Sources

	Item
Newspapers, whether print or online (e.g., NY Times, Boston Globe)	Q73f
Popular science magazines (e.g., Scientific American, Discover)	Q73g
Other magazines, whether print or online (e.g., Time, New Yorker)	Q73h
Number of Items in Composite	**3**
Reliability – Cronbach's Coefficient Alpha	**0.64**
Confirmatory Factor Analysis Fit Index – SRMR	**0.08**

Table C-6
Health/Science Organization Websites

	Item
Centers for Disease Control and Prevention (CDC) website	Q73i
Johns Hopkins Coronavirus Resource Center website	Q73j
National Institutes of Health (NIH) website	Q73k
World Health Organization (WHO) website	Q73l
Websites from other health organizations (besides CDC, Johns Hopkins, NIH, and WHO)	Q73m
Number of Items in Composite	**5**
Reliability – Cronbach's Coefficient Alpha	**0.81**
Confirmatory Factor Analysis Fit Index – SRMR	**0.08**

Table C-7
Personal Conversations

	Item
Conversations with health professionals (e.g., nurses, doctors)	Q73q
Conversations with other teachers	Q73r
Conversations with others (i.e., not health professionals or teachers)	Q73s
Number of Items in Composite	**3**
Reliability – Cronbach's Coefficient Alpha	**0.59**
Confirmatory Factor Analysis Fit Index – SRMR	**0.08**

Teaching About COVID

These composites estimate the extent to which teachers used instructional activities to address COVID and the extent to which they covered certain COVID topics.

Table C-8
Group/Whole Class Discussions

	Before	After
I lectured or gave an in-class presentation about coronavirus/COVID-19.	Q14a	Q32a
I led a whole class discussion about coronavirus/COVID-19.	Q14c	Q32c
I answered questions about coronavirus/COVID-19 asked by students.	Q14d	Q32d
Number of Items in Composite	**3**	
Reliability – Cronbach's Coefficient Alpha	**0.51**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.05**	

Table C-9
Active Learning Strategies

	Before	After
Small groups discussed coronavirus/COVID-19.	Q14e	Q32e
Students did a hands-on activity or laboratory investigation about coronavirus/COVID-19.	Q14g	Q32h
A student (or students) gave a presentation about coronavirus/COVID-19.	Q14j	Q32k
Students searched the internet for information or current events related to coronavirus/COVID-19.	Q14m	Q32n
Number of Items in Composite	**4**	
Reliability – Cronbach's Coefficient Alpha	**0.46**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.05**	

Table C-10
Passive Learning Strategies

	Before	After
Students read about coronavirus/COVID-19.	Q14f	Q32g
Students used a simulation or model to explore coronavirus/COVID-19.	Q14h	Q32i
Students did a worksheet or answered written questions about coronavirus/COVID-19.	Q14i	Q32j
Students watched a video about coronavirus/COVID-19.	Q14l	Q32m
Number of Items in Composite	**4**	
Reliability – Cronbach's Coefficient Alpha	**0.60**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.05**	

Table C-11
COVID Transmission

	Before	After
What coronavirus/COVID-19 is (e.g., the difference between the virus and the disease)	Q15a	Q33a
How coronavirus is transmitted among humans	Q15b	Q33b
Ways to prevent coronavirus transmission from one individual to another (e.g., washing hands, covering mouth when you cough, staying away from people with symptoms)	Q15c	Q33c
Number of Items in Composite	**3**	
Reliability – Cronbach's Coefficient Alpha	**0.61**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.04**	

Table C-12
COVID Treatment/Diagnosis

	Before	After
How COVID-19 is diagnosed	Q15g	Q33g
How COVID-19 is treated	Q15h	Q33h
Number of Items in Composite	**2**	
Reliability – Cronbach's Coefficient Alpha	**0.83**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.04**	

Table C-13
Further/Advanced COVID Topics

	Before	After
Where coronavirus originated (i.e., what part of the world)	Q15j	Q33j
Likelihood that coronavirus/COVID-19 would spread throughout the United States	Q15k	Q33k
Common misconceptions about coronavirus/COVID-19 (e.g., coronavirus doesn't affect young people, coronavirus is spread only by people with symptoms)	Q15l	Q33l
Number of Items in Composite	**3**	
Reliability – Cronbach's Coefficient Alpha	**0.68**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.04**	

Teacher Decision Making

These composites estimate the extent to which various factors influenced whether teachers addressed COVID in their instruction.

Table C-14
Attitude Toward Teaching About COVID

	Taught about COVID	Did not teach about COVID
Teaching about COVID is undesirable/desirable.	Q39a	Q55a
Teaching about COVID the wrong thing to do/right thing to do.	Q39b	Q55b
Teaching about COVID is harmful/beneficial.	Q39c	Q55c
Teaching about COVID is unimportant/important.	Q39d	Q55d
Teaching about COVID is uninteresting/interesting.	Q39e	Q55e
Teaching about COVID a waste of my time/a good use of my time.	Q39f	Q55f
Number of Items in Composite	**6**	
Reliability – Cronbach's Coefficient Alpha	**0.94**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.06**	

Table C-15
Subjective Norms

	Taught about COVID	Did not teach about COVID
I felt pressure from others to teach about coronavirus/COVID-19.	Q40e	Q56e
It was expected that I teach about coronavirus/COVID-19.	Q40f	Q56f
Number of Items in Composite	**2**	
Reliability – Cronbach's Coefficient Alpha	**0.62**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.06**	

Table C-16
Self-Efficacy

	Taught about COVID	Did not teach about COVID
I am confident in my ability to successfully teach about coronavirus/COVID-19.	Q40a	Q56a
It was difficult for me to teach about coronavirus/COVID-19.	Q40b	Q56b
Number of Items in Composite	**2**	
Reliability – Cronbach's Coefficient Alpha	**0.60**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.06**	

Table C-17
Control

	Taught about COVID	Did not teach about COVID
It was up to me whether or not to teach about coronavirus/COVID-19.	Q40c	Q56c
The decision about whether or not to teach about coronavirus/COVID-19 was beyond my control.	Q40d	Q56d
Number of Items in Composite	**2**	
Reliability – Cronbach's Coefficient Alpha	**0.82**	
Confirmatory Factor Analysis Fit Index – SRMR	**0.06**	