

Teachers' Time Use and Affect Before and After COVID-19 School Closures

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Abstract

Several large-scale survey efforts have attempted to understand teachers' experiences in the early months of the pandemic. Our study complements this literature by providing direct evidence of teachers' work prior to and after the onset of COVID-19. We leverage unique longitudinal time use and affect data on nearly 250 teachers from two districts across the 2019-2020 school year. Specifically, we provide a full accounting of teachers' instructional activities, their reports of their positive affect while engaged in these activities, and the extent to which teachers' work experiences changed post-COVID. Our results suggest a large reduction in teachers' daily instructional minutes, which were replaced with increased planning, paperwork, and interactions with colleagues and parents. Teachers' overall negative affect did not change post-COVID, but they did report lower average levels of positive affect. Perhaps most interesting, teachers reported their highest levels of positive affect while teaching, and this association actually strengthened post-COVID.

Introduction

In the spring of 2020, the COVID-19 pandemic led to a shutdown of schools buildings across the United States and a subsequent unplanned nationwide transition to distance learning. For teachers, these school closures resulted in a transformation of many facets of their work, requiring them to take on new and often shifting roles, including learning new technologies and juggling work and home responsibilities (see Hamilton et al., 2020 and Kraft et al., 2021 for more details). In-person teaching in schools has long been characterized by its predictable daily structure,¹ but as has been evidenced in several large-scale surveys, distance learning required changes in teachers' daily time use (Educators for Excellence, 2020 Hamilton et al., 2020; Kraft, Simon, & Lyon, 2021). And, early studies suggest the pandemic may have had an adverse effect on teachers' overall well-being, with increases in stress, anxiety, and burnout (Diliberti & Hamilton, 2020; Reich et al., 2020; Will, 2020;).

It is clear from this existing research that the pandemic introduced a massive exogenous shock to the work lives of teachers, and we have emerging evidence about how teachers navigate rapid, unplanned changes to their working conditions. At the same time, these studies share a fundamental limitation. Because they rely exclusively on evidence collected *after* schools closed, their ability to illuminate how teachers' experiences changed during the pandemic is limited. We believe that researchers, policymakers and the public could benefit from evidence of teachers' work experiences — including their daily time use and affect — collected both *before* and *after* the school closures. Such evidence has the potential to provide more accurate insight into how teachers' work has changed during this period.

Our paper contributes to this emerging literature by providing, to the best of our knowledge, the first direct evidence of teachers' work before and after schools closed in response

to COVID-19. We leverage unique longitudinal data on teachers' daily work activities and affect using the Day Reconstruction Method (DRM), which we collected across the 2019–2020 school year. The DRM asks respondents to provide an exhaustive accounting of their work activities during a school day and report their feelings during each work activity on that day. We draw on data from 287 teachers in two urban school districts. Beginning in fall 2019, participants completed DRMs on up to three timepoints prior to school closures and one additional timepoint in May 2020, after schools had closed. Given the scope of our longitudinal data on teachers' practice and affect, we are able to describe in detail the changes in teachers' daily work in the initial months of the pandemic.

Our findings point to a dramatic restructuring of teachers' workdays following pandemic-related school closures. In the spring of 2020, teachers spent considerably less time providing instruction. Whereas instruction accounted for approximately 52% of teachers' time at work prior to school closures, afterward, it accounted for only 18%. Following school closures, teachers also spent significantly more time on planning, grading and assessment. In addition, there was a significant increase in how much time teachers interacted with administrators, fellow teachers, and parents. Taken together, these findings suggest a re-organization of how, and with whom, teachers spent their workdays after their school buildings were closed.

We saw an equally important shift in teachers' feelings during work. There was an overall decline in teachers' positive affect while working, while negative affect remained largely unchanged. But these overall patterns mask changes in teachers' affect during specific work activities. Regardless of time period, we find that teachers felt most positively during instruction, compared to all other work activities. Our data indicate that, after COVID-related school closures, positive affect during instruction actually *increased*. We conjecture that this result

might indicate that time spent with students during instruction was the highlight of many teachers' workdays post transition to distance teaching.

Because our findings are based on detailed, longitudinal data on teachers' work activities and affect, we believe this study makes a critical and complementary contribution to the literature, describing in detail the changes in teachers' daily work in the initial months of the pandemic. Researchers have only begun to understand how changes to the teaching profession induced by the pandemic impact teachers. It seems reasonable to assume that, at least in the near term, remote teaching will continue to be a part of school operations. If this is the case, we believe schools and districts could benefit from robust evidence of what teachers' work was like after in-person instruction was cancelled and how the broader disruptions associated with the pandemic impacted teachers' work-related affect.

The remainder of the article is organized as follows. We begin by situating the study in research on teacher time use and affect respectively. Then, we summarize the evidence base that has emerged over the past year on how teachers have responded to the COVID-related transition to distance learning. We introduce the DRM as a tool uniquely suited for capturing the dynamic interplay between time use and affect, particularly in the time of such rapid transformation of teachers' work. We describe our sample of 287 teachers before presenting our findings. Throughout the manuscript, we refer to data collected *pre-COVID* and *post-COVID* (after schools had shifted to distance learning in spring 2020). We are careful to not attribute changes in teachers' time use and affect to the change to distance learning, given the inseparable nature of school closings and broader shifts attributable to the pandemic.

Teacher Time Use

One of our windows into how teachers' work changed in the wake of the pandemic is evidence about how allocation of time across major work activities changed. Detailed evidence on how U.S. teachers distribute their working time across work activities is relatively scarce. One of the few sources of such evidence is the Teaching and Learning International Study (TALIS), an international survey about teachers, teaching, and learning environments sponsored by the Organization for Economic Cooperation and Development (OECD). TALIS is administered to nationally representative samples of teachers in participating countries. The 2013 TALIS survey administered to U.S. teachers in Grades 7–9 asked teachers to report, for their most recent complete calendar week, the number of hours spent on specific instructional activities.

In follow-up questions, teachers reported the number of hours per week they spent on nine specific activities. The table below shows the average number of hours US teachers reported for each activity along with the corresponding average across all 34 participating countries.

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Table 1

TALIS Estimates of Time Use, By Activity

Activity	US			OECD Average	
	Avg hours	Pct of calculated hrs	US Rank out of OECD countries	Avg hours	Pct of calculated hrs
Teaching	26.76	44%	1	19.31	42%
Planning or preparation of lessons	7.25	12%	18	7.07	15%
Team work and dialogue with colleagues	2.95	5%	17	2.86	6%
Marking/ correcting of student work	4.87	8%	13	4.88	10%
Student counseling	2.36	4%	13	2.19	5%
Participation in school management	1.58	3%	15	1.57	3%
General administrative work	3.29	5%	10	2.91	6%
Communication/cooperation with parents	1.62	3%	15	1.58	3%
Engaging in extracurricular activities	3.60	6%	3	2.11	5%
All other tasks	6.95	11%	1	2.03	4%
Reported working hours	44.78		6	38.26	
Calculated working hours	61.24			46.52	

Source: TALIS 2013 results, https://nces.ed.gov/surveys/talis/talis2013/talis2013results_2_3.asp.

US teachers reported working 45 hours per week on average. When the average number of hours reported for each activity were added up, this calculated total exceeded the reported total by approximately 16 hours per week, possibly indicating that some activities fall into multiple categories. Compared to other work activities, US teachers spent the most time, by far, on teaching—an average of 27 hours per week. US teachers also reported spending more time on teaching than teachers in any other country. Indeed, the average number of hours teaching for all OECD countries combined 7.5 hours less per week than the US average. US teachers also reported spending substantial time each week on planning, grading student work, and extracurricular activities.

The results displayed in Table 1 are consistent with the intuitive notion that teaching is complex, multifaceted work that requires teachers to divide their time and attention across a multitude of responsibilities. Moreover, it is intuitive that teaching itself is the activity that

teachers report most frequently. We conjecture that the distribution of teacher time across activities displayed in Table 1 is largely reflective of instruction that is provided *in-person in school buildings*. This conjecture is grounded in research on the incidence of distance and blended learning, but statistics on these modes of instruction prior to the pandemic are limited. Molnar et al (2019) found that as of 2017–18, enrollments in full-time virtual and blended schools was growing, with enrollments of 297,712 students and 132,960 students respectively. Collectively, these approximately 430,000 students represent only 0.72% of the 59.5 million K-12 students in the U.S. in 2017 (McFarland et al, 2017). The TALIS results can thus be viewed as benchmarks from a time period when nearly all K–12 instruction in the U.S. was provided in person in school buildings. We know that nearly all instruction in our two study districts was provided in person prior to the pandemic. In light of all this, we anticipate that our pre-pandemic evidence might resemble the patterns observed in Table 1. Any departure from this pattern observed in post-pandemic evidence could indicate the restructuring of teachers’ work that took place after widespread school shutdowns.

Teachers’ Affective Responses to their Work

A second window into how teachers’ work changed in the wake of the pandemic is evidence about how teachers felt while working. Teachers’ affective responses to their work has been shown to have important consequences for teachers and students. Morgan et al. (2010) found that teachers’ feelings while working was associated with general satisfaction with their work. The authors found that the absence of positive experiences, rather than the occurrence of negative experiences, undermined teachers’ commitment and efficacy. They also observed that teachers’ day-to-day experiences had a greater impact on their affect than experiences that were more distal to the classroom, such as policy messages from entities outside the school building.

In a previous study using the experience sampling method, Jones and Youngs (2012) documented that teachers' in the moment affective responses to instructional activities were associated with their year-end levels of burnout and retention plans.

Teachers' affect has also been shown to have a strong influence on students' achievement, motivation, and emotional states. Teachers' affect is believed to exercise such influence when their opinions about students are communicated through nonverbal cues (for example, nodding or smiling) and behaviors that, in turn, help define the socioemotional classroom climate for students (McLeod, 1995). There is considerable evidence that affect shared through teacher/student relationships has a significant impact on young children's adaptation to school. For example, Pianta et al. (1995) found that children with warm, close, communicative relationships with kindergarten teachers were better adjusted and had more positive child-teacher relationships in second grade than those with angry, dependent child-teacher relationships in kindergarten. Similar benefits to older students have also been reported. For example, Reddy, et al. (2003) found that students who felt they received increased support from teachers during the middle school years showed decreases in depressive symptoms and increases in self-esteem between grades six and eight. More recent research has examined the association between teachers' anxiety and depressive symptoms, their instructional quality, and students' well-being and academic achievement (McLean & Connor, 2015, 2018; McLean et al., 2018).

An additional line of research has examined how teachers' affect for their students, as expressed in their expectations about students' capabilities (often referred to in the literature as "expectancy"), influences students. Teachers' low expectations have been found to have a deleterious effect on students' expectations for themselves (Brophy, 1985). Teachers' feelings about their own efficacy have also been found to be associated, both positively and negatively,

with student achievement (Ashton & Webb, 1986), student efficacy (Anderson et al., 1988), and student motivation (Midgley et al., 1989)).

Finally, research in and out of education has documented the dynamic nature of individuals' affect, implying that affect—along with motivations and cognitive processes—fluctuate constantly as individuals interact with their environment (Frijda, 1993; Hektner et al., 2007; Lazarus, 1991). Likewise, we expect that teachers' affective experiences during work (for example, their mood or level of energy) will vary from activity to activity. Indeed, previous studies have demonstrated that teachers' affect varies as they perform different roles and responsibilities, including interactions with students and parents, serving as department chairs, and responding to reform efforts (Hargreaves, 2001; Jones & Youngs, 2012; Lasky, 2000; Little, 1996). With shifts in teachers' activities after the widespread move to distance learning (as well as changes in affective experiences attributable to the pandemic itself), we thus expect to see shifts in how teachers feel while working from pre-pandemic to post-pandemic time periods.

Research on Teacher Time Use and Affect During COVID-19

A number of studies have been published that attempt to document teachers' time use and affect during the initial months of COVID. Rather than present an exhaustive accounting of these studies, we briefly present what we see as the relevant findings for our current investigation. We also provide some information on the methods that researchers have used to understand teachers' experiences during this time.

Teacher Time Use During COVID-19

To our knowledge, there are no studies that have comprehensively looked at how teachers structured their time during COVID-19, but some existing studies provide useful information. One recurring finding is that teachers report working *more* hours since schools closed in spring

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2020. In a survey fielded by *Horace Mann* (2020), 77% of educators surveyed reported spending *more* time working than they were a year ago. A national *USA Today* poll of over 500 teachers found that most reported working more than usual (Page, 2020). A survey of over 10,000 teachers in Arizona conducted by *Expect More Arizona* (2020) found that over half of teachers (55%) reported an increase in their weekly work hours during distance learning, with 30% reporting a significant increase. About 25% of teachers reported a decrease of their weekly work hours during this time. It is worth noting here that these surveys typically used a single survey item (or a small set of items) to get estimates of changes in time use, reinforcing the need for a more detailed accounting how teachers spent their time.

With regard to individual instructional activities, *Educators For Excellence* (2020) asked a nationally representative sample of 600 teachers to estimate how much time they were spending on different facets of teaching compared to the period before distance learning. About 70% of teachers reported spending more time reaching out to students, and 74% reported spending more time than before reaching out to parents. Over half of teachers reported spending somewhat less time (34%) or much less time (19%) than before on instruction. In terms of grading and providing student feedback, roughly one third of teachers reported spending more time and about the same proportion reported spending less time on this activity.

Teacher Affect During COVID-19

Surveys and interviews with teachers in the initial months of the pandemic raise concerns about the impact of COVID on teacher affect. Across repeated surveys with educators in spring 2020, *EdWeek* (2020) found widespread declines in teacher morale in the early months of the pandemic. Bintliff and colleagues (2020) conducted a mixed-methods study examining some of the underlying causes of decreased well-being for teachers working in under-resourced schools

in southern California. The majority of these teachers reported a deep sense of worry and concern for students, including absenteeism, as well as basic needs and wellbeing.

On a professional level, these negative affective experiences likely influence teachers' attention, performance and decision-making. *Educators for Excellence* (2020) found that an overwhelming majority of teachers thought “staying focused on teaching and learning in the midst of a pandemic” was a somewhat serious (46%) or very serious (41%) challenge. And, analyzing interviews with 40 teachers across the country, Reich and colleagues (2020) found the loss of professional identity, uncertainty, and burnout to be central concerns for teachers in the transition to remote learning. Frustrations with the limitations of remote learning “challenged teachers’ sense of professional identity and competence; as they struggled to do online learning well, they expressed guilt, frustration, and loss about their own inadequacies in these new formats.” Similarly, Kraft et al. (2021) found that the rapid switch to “emergency remote teaching resulted in a sudden, massive drop in teachers’ sense of success.” The authors find that supportive working conditions played a protective role, with teachers reporting less of a decline in their sense of success in schools with stronger conditions than teachers in schools with worse working conditions.

In sum, it appears that the pandemic has led to changes in teachers’ daily time use — including reduced time spent in instruction — as well as largely negative consequences for teacher affect. Many of the studies conducted to date draw on surveys administered at a single timepoint, though some — like the *Edweek* surveys — have been conducted routinely with the same set of teachers. Further, few of these studies have asked teachers to provide a detailed account of either their time use or their affective experiences, and none (to the best of our knowledge) have relevant comparison data from prior to the pandemic. Therefore, the current

study adds to this literature by leveraging comprehensive accounts of teachers' activities and affect over time, including both prior to and post-COVID. Specifically, this study addresses three questions:

1. How has teachers' time use changed during the initial period of the pandemic, in terms of overall number of hours worked and teachers' allocation of time, across an exhaustive set of instructional activities?
2. How has teachers' affect while working, including their positive affect and negative affect, changed during the initial period of the pandemic?
3. How has the relationship between specific teaching activities and affective responses changed during the initial period of the pandemic?

Method

Sample and Data

Data for this study come from two large, urban school districts that serve large numbers of students of color and historically underserved populations. To help understand these districts and contextualize our results we provide descriptive statistics for the characteristics of students in these districts. Data for these descriptive statistics come from the Stanford Education Data Archive 4.0 (SEDA 4.0) (Fahle et al, 2021). SEDA 4.0 provides demographic and achievement statistics for every district in the U.S. We extracted the following variables from the SEDA 4.0 archive for all districts in the country: percent Hispanic students, percent African American students, percent white students, percent receiving free or reduced lunch, total district enrollment, average socioeconomic status score (sesall), and average achievement score (cs_mn_all). We then calculated quartile cutpoints for the distribution of all US districts on all six variables, and determined the quartile into which the two participating districts fell for each

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variable. The data are summarized in Table 2. As Table 2 illustrates, the total enrollment of both districts is in the top quartile in the nation, the percentage of Hispanic and African American students in both districts are in the upper two quartiles in the nation, and both district’s averages on the SEDA 4.0 socioeconomic status index are in the lowest quartile of the national distribution. The average achievement level of both districts falls into the second quartile on the national distribution indicating lower than average achievement.

Table 2: District Characteristics

	Pct Hispanic	Pct African American	Pct White	Pct Free/red. lunch	Total Enrollment	SES index	Average Achievement
U.S. 25th percentile	2.5%	0.4%	55.5%	34.2%	189	-0.157	-0.260
U.S. 50th percentile	6.6%	1.3%	83.1%	49.9%	523	0.382	-0.004
U.S. 75th percentile	19.0%	5.2%	94.1%	66.3%	1,404	0.880	0.253
District 1 quartile	4	4	1	4	4	1	2
District 2 quartile	3	4	2	2	4	1	2

A total of 245 teachers participated in the study. Data were collected in three waves, two of which were prior to the widespread move to distance learning and one of which was after. The first wave was in October and November 2019, the second wave was in February and March 2020, and the third wave was in May 2020. Table 3 displays the number of teachers participating in each wave.

Instrument

Data for this study were collected using a Day Reconstruction Method instrument. The DRM measures the activities in which teachers engage, how they feel during each activity, and who teachers were with during the activity. This information is captured in two steps in a web form that is completed at the end of the workday. First, teachers list the *episodes* of work activity in which they engaged throughout the day. The DRM allows the participant to document the

length of each work episode capturing the start and end times of each. Listing out the episodes that make up the day has the effect of “reviving” memories about the specifics of each episode (Kahneman et al., 2004). In a second step, teachers answer a brief, structured questionnaire in which they record details about each episode. We asked teachers to complete DRM instruments twice in each of waves 1 and 2, and one DRM instrument in wave 3. Table 3 shows the number of instruments that were completed per wave. Given our data collection regime, DRM data have the following structure: episodes nested within days, nested within teachers.

Table 3: DRM Administration, by Waves

	N teachers	N completed DRM instruments
Wave 1: October and November 2019	157	279
Wave 2: February and March 2020	163	196
Wave 3: May 2020	104	104
Total	245	579

The DRM was originally designed by behavioral economists to measure individuals’ wellbeing by capturing evidence of episodes of activity and affect throughout the day (Kahneman et al., 2004). Because it represents intact moments of people’s lives, DRM data is believed to have strong ecological validity and is less prone to recall errors that diminish the validity of self-reports.

Some evidence exists regarding the validity of the original DRM instrument. Kahneman et al. (2004) compared diurnal cycles of affect and tiredness measured on two samples. One sample was measured with a DRM instrument, while the other was measured with an experience sampling method (ESM) instrument. Despite strong demographic differences between the two samples, Kahneman et al. (2004) found that “diurnal cycles of affect and tiredness produced by both methods are remarkably similar.” A second study compared contemporaneously-collected

ESM and DRM ratings of happiness, tiredness, stress, and anger/frustration from a sample of 94 working women (Dockray et al., 2010). When ratings from the same hour of the day were compared researchers found that the two instruments produced similar profiles of affect intensity. Between-person correlations ranged from 0.58 to 0.90, and the strength of the associations were unrelated to age, educational attainment, or depression level.

Measures

To examine how teachers' work changed after schools closed in response to COVID-19, we used DRM data to measure three constructs: teacher work activity, positive affect and negative affect. DRM items were developed and refined through cognitive interviews with 22 elementary, middle, and high school teachers. Feedback from the interviews was incorporated into a revised DRM instrument that was pilot tested with 23 teachers in the study districts. The major focus of the cognitive interviews was to learn whether activity categories made sense to teachers and to discern teachers' comfort and willingness to report how they felt while teaching. Each of the three constructs is described below.

Work Activity

Teachers reported their *work activity* in response to the following question: *The first step of this survey is to create a list of work activities you did today. For each activity, choose a start and end time and a category from the drop-down that best describes it. You can also add a second activity if it occurred at the same time.* The drop-down list included the following 10 activity categories: planning, paperwork, instruction, non-instructional activities with students, grading or working with assessment data, interacting with colleagues, interacting with administrators, professional development, interacting with parent(s), personal activities.

One of the main purposes of the DRM was to capture time budgets of how teachers allocate their time across broad domains of work. These 10 activity items are intended to cover those broad domains. Feedback received in cognitive interviews and pilot data indicated that these activities covered a substantial portion of teachers’ work activities.

Positive and Negative Affect

Teachers’ affect while working was measured with a modified version of the widely-used Positive and Negative Affect Schedule (PANAS) (Watson et al., 1988). The PANAS is designed to provide valid and reliable measurement of two primary dimensions of mood: positive and negative affect. Watson et al. (1988) found that their 10-item PANAS scales were internally consistent and correlated strongly with lengthier measures. Important for this study, Watson et al. (1988) found that the scales captured fluctuations in mood over time when administered with instructions like “right now” or “today.”

Positive and negative affect scales in the DRM include 13 items measuring positive affect and 11 items measuring negative affect. The question that asked teachers the degree to which they experienced these 24 emotions during an activity was as following: *How did you feel while you were [providing instruction, planning etc.]?* The response choices for these items were: not at all, a little, some, a lot, and very much.

Table 4: PANAS Survey Items

Positive	Negative
Active	Afraid
Alert	Ashamed
Attentive	Distressed
Competent	Frustrated
Content	Guilty
Determined	Hostile
Enthusiastic	Irritable
Excited	Jittery
Inspired	Nervous
Interested	Scared
Proud	Stressed
Strong	Upset
Successful	
Valued	

Analysis Plan

To answer the first two research questions examining teachers' time use, affect and their relationship before and after COVID, we drew on a series of summary statistics and multilevel models. For each of our outcomes, we began by examining the variability across episodes, days and teachers along with an assessment of any differences before and after the shift to remote learning. We first fit a three-level model that decomposes the variance in each outcome across episodes, days and teachers. Our analytic model was

$$\begin{aligned}
 Y_{ijk} &= \pi_{0jk} + \varepsilon_{ijk} & \varepsilon_{ijk} &\sim N(0, \sigma_Y^2) \\
 \pi_{0jk} &= \beta_{00k} + r_{0jk} & r_{0jk} &\sim N(0, \tau_\pi^2) \\
 \beta_{00k} &= \gamma_{000} + u_{00k} & u_{00k} &\sim N(0, \tau_\beta^2)
 \end{aligned} \tag{1}$$

At level one (episode-level), we use Y_{ijk} as the outcome (for example, episode length, positive affect, negative affect) for episode i on day j for teacher k , π_{0jk} as the day-specific average with ε_{ijk} as the deviation specific to an episode. At level two (day-level), we then model the day-specific averages as a function of the teacher-specific average (β_{00k}) and the day-specific deviation from that average (r_{0jk}). In turn, level three further specifies the variability in the outcome as a function of the overall average length of an episode (γ_{000}) and the teacher-specific deviation from this average (u_{00k}). To assess the differences before and after COVID as well as differences in affect across activity types, we subsequently introduced fixed effects at the appropriate level to indicate the type of activity and whether it occurred before COVID.

For analyses that examined the composition of all time and activities in a day, we drew on a model that was similar to that of equation (1) but was reduced to a two-level model. Specifically, we estimated the parameters of a two-level model that nested days within teachers.

Like the three-level analysis, we also introduced a fixed effect at the day-level to assess the impact of COVID on the daily composition of teachers' activities and time use.

To summarize differences in affect across activity types, we extended the multilevel models outlined in equation (1) to include a fixed effect for activity type. Subsequently, we further extended these models to probe the potential moderating effect of COVID on the relationships between activity and affect by adding in an interaction term between activity type and the pre- and post-COVID indicator. In this series of multilevel models, we first draw on the coefficients connected to activity type to summarize the extent to which specific activity types are associated with higher or lower affect relative to other activity types. We then draw on the interaction coefficients to describe how the shift to remote learning moderated the relationships between affect and activity type.²

Results

Research Question 1

We begin by describing teachers' reported work time, its distribution across activities and how time distributions changed in the transition from in-person learning to remote learning. Across all reported activities, the average length of an episode was 59.3 minutes with approximately 73% of the variation in that length owing to persistent differences among teachers, 13% owing to variation within teachers across days and the remaining 14% owing to variation among episodes within days (e.g., activity type or focus). Comparisons of pre- and post-COVID observation days suggested that approximately 20% of the observed day-level variation was explained by post-COVID differences, with post-COVID episodes lasting about 24 minutes longer than their pre-COVID counterparts (see Table 5).

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We next examined the complete set of activities teachers reported for each day to understand the composition of a day and the extent to which the shift to remote learning was associated with a restructuring of teachers' work days. When accumulating time use across episodes to summarize daily instruction, the results suggested that the total amount of time a teacher spent on teaching duties in a given day changed considerably from day to day. Of the total time spent each day on teaching duties across all reported days approximately 39% was attributable to persistent differences among teachers and 61% was attributable to day-to-day variation within teachers. When contrasting observations reported before COVID with those reported after COVID, we found that the total daily time spent on teaching activities dropped from about 409 to 326 minutes. That is, the results indicate that while the average length of an individual episode grew by 24 minutes, the total time spent across all episodes within a day dropped by 83 minutes (see Table 5).

Table 5: Variance decomposition of time spent on activities and total daily time spent on all teaching activities as well as the impact of shifting to remote instruction

	Average activity length		Total daily time	
	Unconditional	Conditional	Unconditional	Conditional
Variance Components				
Teacher-level variance	3900.6	3904.6	8308	8121
Day-level variance	687.5	547.7	13221	12281
Activity-level variance	722.6	726.6	NA	NA
Fixed Effects				
Intercept	59.3*(4.2)	53.9*(4.3)	391.5*(7.7)	408.5*(8)
COVID coefficient	NA	24.2*(3.6)	NA	-83*(13.5)
(SE)				

Although the overall amount of time devoted to teaching activities in a day dropped after COVID, changes in the time allocated to specific activity types were uneven. Table 6 provides a summary of teachers' time use by activity before and after COVID. Two of the most notable shifts occurred in instructional time and planning time. Instructional time dropped from an

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average of 214 minutes per day before COVID to an average of just 61 minutes after COVID. In contrast, the time teachers spent planning rose from a pre-COVID level of 69 minutes to a post-COVID level of 107 minutes. Other notable shifts in time use occurred in non-instructional time with students (decrease from 53 to 24 minutes) and grading/assessment (increase from 8 to 43 minutes).

Table 6: Time use by activity before and after COVID

Activity	Pre-COVID	Post-COVID
Planning	68.69	106.84
Instruction	214	61.42
Non-instruction with students	52.65	23.58
Grading/assessment	7.96	42.97
Meeting with teachers	31.75	32.5
Meeting with administrators	5.04	13.96
Professional development	4.43	4.01
Interacting with parents	6.79	20.24
Other	20.17	21.13

Research Question 2

We next examined the extent to which COVID was associated with changes in teacher affect while working. Across all reported episodes, the average reported level of positive affect was about 3 (on a 1 to 5 scale) with approximately 48% of the observed variation owing to persistent differences among teachers, 11% to variation within teachers across days and the remaining 41% to variation among episodes within days (Table 7). That is, the variance decomposition of positive affect suggested that while there was considerable variation in positive affect across episodes and across teachers, much less variation owed to disparities across days. Results further suggested that COVID had a dampening influence on teachers' positive affect as post-COVID positive affect decreased by about 0.14 standard deviations.

Relative to positive affect, reports of negative affect across activities were substantially less common and variable both before and after COVID. The variance decomposition of reported negative affect suggested that the average level of negative affect was just 1.24 (on a 1 to 5 scale) with a total variation of 0.14 such that of that variation 29% owed to teachers, 16% owed to days, and 55% owed to activities. In contrast to the changes in positive affect associated with COVID, the shift to remote learning did not notably increase or decrease teachers' levels of negative affect.

Table 7: Variance decomposition of affect across all teaching activities and the impact of COVID

	Positive affect		Negative affect	
	Unconditional	Conditional	Unconditional	Conditional
Teacher-level variance	0.38	0.38	0.04	0.04
Day-level variance	0.09	0.09	0.02	0.02
Activity-level variance	0.33	0.33	0.08	0.08
Intercept (SE)	3.06*(0.04)	3.09*(0.05)	1.24*(0.02)	1.23*(0.02)
COVID coefficient (SE)	NA	-0.13*(0.06)	NA	0.03(0.03)

Research Question 3

Last, we use two related queries to probe teacher affect within specific activities to understand how the relationships between teaching activities and affective responses changed post-COVID. First, we examined the degree to which affect was higher or lower for certain activity types relative to other activities. Second, we investigated the extent to which the relationship between teaching activities and affective responses was moderated by COVID. The results are summarized in Table 8.

Regarding our first query, our analyses indicated that affect varied considerably by activity type both in terms of magnitude and direction (Table 8). Positive affect tended to be highest during instructional activities — positive affect, on average, was more than one third of a

standard deviation higher during instruction relative to all other activity types. Positive affect tended to be lowest when teachers were engaged in activities such as professional development and grading/assessment. There were far fewer disparities with negative affect across activity areas as reports of elevated negative affect tended to be infrequent. The one notable exception was when teachers were meeting with administrators — on average, negative affect rose by 0.18 or nearly a half of a standard deviation during these types of meetings.

Our second query revealed that although COVID was associated with lower positive affect and higher negative affect, the shift moderated the relationship between affect and several specific teaching activities (Table 8). The most prominent finding in this query was that COVID moderated the relationship between activities and affect for instructional activities directly involving students. For example, the relationship between positive affect and non-instructional activities with students saw a reversal in its sign and a qualitative change in its magnitude. Pre-COVID reports of non-instructional activities with students tended to be associated with lower positive affect (i.e., 0.13 unit or 0.15 standard deviation decrease). However, post-COVID reports of non-instructional activities with students were associated with a positive and substantial shift in positive affect (i.e., 0.53 unit or 0.59 standard deviation increase). Likewise, post-COVID reports demonstrated a stronger relationship between positive affect and instruction. Pre-COVID, positive affect was associated with a 0.34 unit increase while post-COVID it was associated with a 0.52 unit (0.58 standard deviation) increase.

Negative affect demonstrated similar moderating effects (Table 8). For example, there was a decrease in negative affect when teachers were involved in instructional activities with students. Pre-COVID, the negative affect associated with instruction was not meaningfully different than that for other teaching activities. However, post-COVID there was a notable

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reduction in negative affect for instruction — relative to other activity types, post-COVID instruction was associated with a 0.09 unit (0.24 standard deviation) decrease in negative affect. In contrast, the shift to remote learning was also associated with increased negative affect when teachers were planning. Pre-COVID planning was associated with negligibly lower negative affect relative to other activity type. Post-COVID planning, however, was associated with a higher negative affect (0.08 units or 0.21 standard deviations).

Table 8: Relationship between activity and positive affect and the extent to which that relationship was moderated by COVID

Activity	Positive affect	Negative affect
Planning	-0.26*(0.04)	-0.01(0.02)
COVID	-0.08(0.06)	-0.00(0.03)
Planning-by-COVID	-0.03(0.08)	0.09*(0.04)
Instruction	0.34*(0.03)	-0.01(0.02)
COVID	-0.05(0.06)	0.04(0.03)
Instruction-by-COVID	0.18*(0.08)	-0.08*(0.04)
Non-instruction with students	-0.13*(0.05)	-0.01(0.02)
COVID	-0.13*(0.06)	0.03(0.03)
Non-instruction with students-by-COVID	0.66*(0.13)	-0.04(0.07)
Grading/assessment	-0.43*(0.13)	0.02(0.07)
COVID	-0.10(0.06)	0.02(0.03)
Grading/assessment-by-COVID	0.12(0.17)	0.04(0.08)
Meeting with teachers	-0.06(0.05)	0.01(0.03)
COVID	-0.13*(0.06)	0.03(0.03)
Meeting with teachers-by-COVID	0.06(0.11)	-0.01(0.03)
Meeting with administrators	-0.27*(0.13)	0.18*(0.06)
COVID	-0.13*(0.06)	0.01(0.03)
Meeting with administrators-by-COVID	0.25(0.21)	-0.15(0.10)
Professional development	-0.44*(0.17)	0.07(0.08)
COVID	-0.13*(0.06)	0.03(0.03)
Professional development-by-COVID	0.01(0.29)	-0.23(0.14)
Interacting with parents	0.13(0.15)	-0.10(0.07)
COVID	-0.11*(0.06)	0.03(0.03)
Interacting with parents-by-COVID	-0.24(0.19)	0.12(0.09)
Other	-0.38*(0.08)	0.03(0.04)
COVID	-0.13*(0.06)	0.03(0.03)
Other-by-COVID	0.12(0.16)	-0.10(0.08)

Discussion

In the initial months of the pandemic, several large-scale research efforts were undertaken to try to understand the sudden changes to teachers' work brought about by COVID-19 (Hamilton et al., 2020; Kraft et al., 2021). We argue that our study makes several unique contributions to this emerging literature. First, our instrument, the DRM, affords us the opportunity to explore in greater detail the nuances of teachers' daily experiences. The teachers in our sample provide an exhaustive accounting of all of their work activities, in contrast to more common approaches that ask teachers about overall patterns in their time use. Additionally, we are able to track variation in teachers' affect, including how their positive and negative affect vary across activities. This too is in contrast to existing studies of teachers in the wake of the pandemic, which have typically asked teachers to reflect more generally on their affective experience. Finally, we have true pre/post data; we provide the first empirical evidence of teachers' daily time use and affective responses to work activities in the months leading up to and in the months immediately following COVID-induced school closures. Given these unique design features, our study has resulted in findings that extend — and at times challenge — the field's emerging understanding of how teachers navigated this unique time period.

Regarding teacher time use, it is clear that the pandemic introduced major shifts in teachers' overall work hours and their time engaged in specific activities. The most notable finding related to specific activities was the changing role of instruction pre- and post-COVID. Prior to COVID, instruction consumed teachers' workdays; they reported spending approximately 214 minutes per day on instruction (or 52% of their total work time), an estimate very much in line with 2013 TALIS findings (44%) of work time. But in the initial transition to distance learning, teachers greatly reduced the amount of time they spent providing instruction.

This finding is not surprising given what we know about teachers' time use other surveys of teachers during this same time (e.g., Educators for Excellence, 2020; Morning Consult, 2021). With teachers and students navigating new technologies, and with teachers having to transition their curriculum to the distance learning context, most districts across the U.S. were forced to reduce the amount of synchronous instructional time between teachers and students. Our results suggest that teachers filled the reduced instructional time with activities that would support the new challenges placed on them. In comparison to their time use prior to COVID, teachers spent significantly more time planning, grading, meeting with other teachers and their administrators, and interacting with parents. Our findings about time engaged in specific activities align with some other results from surveys and interviews conducted with teachers in spring 2020. In the Educators for Excellence survey (2020), for example, over half the teachers in their sample reported spending less time on instruction after the transition to distance learning. Morning Consult (2021) similarly found that COVID-19 had disrupted the majority of teachers' daily instructional routines. There are relatively few studies that have catalogued — with any level of specificity — the amount of time teachers have devoted to other activities (such as interacting with other teachers, administrators, or parents) during this time.

Our more surprising time use result is the reduction in overall hours worked in the initial months of school closures — from 409 minutes before COVID to 326 after. In many of the other survey studies we could find from spring 2020 (*Expect More Arizona*, 2020; *Horace Mann*, 2020; *Page*, 2020), teachers reported *increases* in their overall hours worked, such as the survey by *Horace Mann* (2020) where 77% of teachers reported working more time than a year ago. It could be the case that we are systematically underreporting teachers' work activities, but the fact that we can anchor post-COVID responses in how teachers used the instrument prior to COVID

decreases this possibility. But, even if teachers did work fewer hours overall in Spring 2020 than has been reported, it does not undermine the overall toll that teaching during a pandemic may have taken on educators. Like Americans in many other professions, teachers were asked to complete their work responsibilities alongside family obligations and the looming threat of a global pandemic. This reality further reinforces the need to pair assessments of teachers' work activities with their emotional experiences of their work.

Our teacher affect results also add important information to our understanding of teachers' immediate reactions in the wake of the pandemic. First, at a purely descriptive level, our DRM instrument appears to pick up on important within-person variation that has been commonly overlooked in existing studies of teachers' responses to their work during COVID. Our variance decompositions show that positive and negative affect varied substantially both within and across teachers. Most of the within-teacher variation seems attributable to within-day differences across activities (e.g., providing instruction vs. planning vs. interacting with colleagues). It is still relatively rare for studies to collect multiple assessments of affect; this is especially true of research in the wake of the pandemic, where most all data collection efforts have relied on one-time surveys. Our findings urge us to be cautious in interpreting study data where teacher report on their *typical* time use or their *overall* responses to their work. Instead, there appears to be meaningful information at the level of teachers' activities that is missed when we aggregate up to overall assessments of affect. Therefore, we encourage researchers to provide a more careful accounting of what goes on in and across teachers' days and we see the DRM as a valuable tool for reflecting the fact that teachers' affect appears to vary considerably depending on what teachers are doing.

Why do our affect-by-activity findings matter? If we only take teachers' overall assessments of positive and negative affect prior to and post-COVID, our data tell a story similar to the one we have seen elsewhere in the literature. Positive affect decreased significantly post-COVID while negative affect remained stable. Teachers reported fewer positive experiences in the wake of the pandemic, which is in line with studies suggest decreases in teacher morale (Edweek, 2020a), their sense of success (Kraft et al., 2021), a loss of professional identity and increases in burnout (Diliberti & Kaufman, 2020; Reich et al., 2020).

But this overall description makes important variation that reveals important insight into how teachers respond to their work. Across all administrations of DRM data, both before and after COVID, teachers reported significantly higher positive affect and lower negative affect while directly teaching students. Consistent throughout teachers' daily experiences are the positive emotions associated with the core work of teaching. These results correspond to Lortie's (1975) *psychic rewards* of teaching; students drive teachers more than any other aspect of their work. Further supporting this essential notion of teaching is what happened after the transition to remote learning — while teachers reported lower (or unchanged) levels of positive affect in many other activities, the association between instruction and positive affect actually increased post-COVID. It is not a stretch to suggest that the consistent reports of positive affect while teaching were likely attributable to teachers' personal connections with students and their care for students' well-being. In the midst of dramatic changes to their work and the fears and uncertainty that accompanied the pandemic, teachers seemed buoyed by their interactions with students. This finding, more than any other in this study, complements our existing picture of the work lives of teachers during this historic time and provides lessons for how we might structure teachers' work moving forward.

Limitations

The current study has a number of limitations with regard to its design. There are some advantages that come with collecting data from 245 teachers in the same two districts, but the sampling strategy raises questions about the generalizability of our findings to other contexts. We collected data in Rhode Island and Connecticut, two states that have provided clear leadership at the state level guiding school plans in the transition to distance learning. Further, in both districts, positive relationships between the teacher unions and district leadership facilitated data collection but they also likely reveal district dynamics where districts respected teachers' needs during this transition.

Further, while our data collection scheme improves upon many other studies that were conducted during the initial months of the pandemic, we were still only able to collect data at one time point from teachers post-COVID. Our data provide a snapshot of teachers' experiences during the month of May 2020, but as we have seen in several news reports, the expectations placed on teachers changed at several timepoints in spring 2020 and continuing into fall 2020, when many school districts re-opened to at least some of their students. Ideally, we would have longitudinal data that allowed us to put our post-COVID timepoint into better context. Still, the availability of data prior to COVID provides us with the opportunity to understand teachers' responses to COVID in ways that most other studies have not. It is also worth noting that fewer teachers overall provided DRM reports after COVID than did before the pandemic. We may systematically be missing reports from teachers whose experiences in the wake of the pandemic varied from their colleagues who did complete DRM surveys. However, we used models that allowed for missing data assuming missing at random (MAR), which is the standard assumption. That is, because the missing data occurs at the day level, its comparable to students (days) nested

in teachers where we do not sample all the students in a class. The estimator uses all available unbalanced data to estimate relationships and variance components. The assumption here is that the cause of the missingness is not directly related to the outcomes (time use, affect) on those particular days that are missing once we have controlled for covariates (COVID, activity type). Still, we acknowledge that the teachers in our sample may differ from the broader population of teachers in ways that we cannot account for in our data.

Conclusion

It is difficult to know what to make of studies detailing teachers' early experiences in the wake of COVID-19. We provide a rich, detailed accounting of the impact of this exogenous shock on teachers' time use and affective experiences, and our results may be valuable strictly as careful descriptive work during this historical time. There is also a case to be made that similar rapid shifts to distance learning are likely to occur in the future, and so we need to understand how best to support teachers during such transitions. Our findings suggest that teachers are likely to make use of additional planning and grading time to ensure they can support students during synchronous instruction.

We would argue, however, that the study holds implications for how we should think about teachers' work as we return to fully in-person learning. While we would certainly not advocate that teachers reduce their daily teaching loads from 214 minutes per day to 61, there may be reasons to consider reducing the daily instructional demands placed on teachers. Among OECD countries, the U.S. is second only to Chile in the number of hours teachers spend directly engaged in instruction, nearly 7.5 hours per week over the OECD average (OECD, 2013). In the wake of the pandemic, some have called for additional flexibility during the school day to provide teachers with additional opportunities to plan and to collaborate with their colleagues

(Rotherham, 2021). While it is true that the sudden transition to remote teaching required teachers to take on further planning than they otherwise may have, the increased flexibility in teachers' daily schedules did allow teachers to spend significantly more time planning for their instruction. They also were more likely to interact with school-based colleagues and administrators. Given the positive role that relationships with colleagues appears to play in teachers' sense of success and job satisfaction, as Kraft and colleagues have shown both prior to the pandemic and after (Johnson et al., 2012; Kraft et al., 2021), it is worth asking whether we might structure teachers' work in ways that allow them increased access to their peers.

Beyond the pandemic, arguably the greatest contribution of our study is the evidence of the centrality of teacher-student relations in how teachers experience their work. Across the 2019–2020 school year, teachers in our sample were at their most positive when they were doing the core work of teaching, and this relationship only strengthened in the transition to distance learning. These results remind us that we need to facilitate working conditions that allow teachers to focus their efforts on their students, and that teachers' experiences at work will largely be driven by what goes on in their classrooms. We are reminded of the pivotal role played by teachers' pursuit of a “sense of success” in their teaching, and how critical teacher-student interactions are for teachers' plans to remain in the profession (Johnson & Birkeland, 2003). Particularly during this time, when much of the commentary around teachers and the pandemic has been on the possibility of large-scale attrition from the workforce, we should be mindful of the protective role that classroom interactions with students can play in teachers' experiences of their work. And we should ensure that teachers have the supports they need to derive the benefits that come from the core work of teaching itself.

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Endnotes

¹ It is common for teachers to spend approximately 240–300 minutes per day teaching, with daily time dedicated to planning and paperwork (e.g., Smith, 1998).

² We additionally examined whether overall patterns in time use and affect — as well as the moderating effect of COVID — varied across teachers' instructional level (elementary vs middle vs high school) and across categories of teachers (e.g., special education vs general education, core vs non-core). However, we exclude these results from our analysis because the analyses yielded virtually no significant differences.

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