Teaching Writing During the COVID-19 Pandemic in the 2021-2022 School Year

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Abstract

This study examined if in-class, online, and hybrid (in-class and on-line) instruction provided to middle and high school students in the U.S. differed during the third school year of the COVID-19 pandemic. It also provided a description of how writing was taught to secondary students. Thirty-eight middle and high school teachers (32 female, 6 male), who mostly taught languages arts (84%), were asked to complete a survey each day during the 2020/2021 school year for a single class that best represented how they taught writing. The survey included questions about mode of instruction (in-class at school, online, and hybrid), whether writing or writing instruction was provided that day, and if so, whether 11 specific writing activities occurred. Teachers completed 2,676 surveys, and their responses indicated there was only one statistically detectable difference between in-class, online, and hybrid lessons in terms of the proportion of lessons that included each of the targeted writing activities or the time devoted to them. The only difference involved creating digital written products, which occurred more often in hybrid lessons than at school in-class lessons., but not more often in online lessons One significant finding across all reported lessons was that teachers devoted little time to teaching writing. Writing and writing instruction did not occur in close to one-third of all lessons; teachers typically included only one writing activity in a lesson; and an average of just 19 minutes a lesson was devoted to the targeted writing activities.

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In the last month of 2019, the SARS-CoV-2 virus was identified by medical researchers. This contagious and lethal virus spread quickly across the globe affecting virtually all aspects of daily life, including the education of school-aged students (Reimers, 2022). To slow the spread of this virus, countries around the world moved at school in-person learning to remotely delivered instruction (e.g., online) or some hybrid of remote and in-class instruction (Di Pietro et al., 2020; Hodges et al., 2020). In most countries, this move to emergency remote instruction began in March or April of 2020, and it impacted over 1.7 billion school-aged and university students worldwide (UNESCO, 2020). As the pandemic persisted and evolved, so did the use of emergency remote instruction. Some countries returned to in-class instruction, other countries continued remote instruction into the following school year, other countries reinstituted remote instruction after in-class instruction resumed, and still other countries shifted multiple times between in-class, online, and hybrid instruction as the need arose (Azner, 2021; OECD, 2021).

In the United States, where the current study took place, some individual schools and districts began to close and offer instruction online in late February of 2020 (Decker et al., 2021). On March 12 of that year, Ohio became the first state to suspend in-class instruction, and within a single day 16 additional states followed suit. Between then and the end of the school year, all 50 states had closed schools and moved to emergency remote instruction (Montana and Wyoming allowed schools to reopen before the end of the school year). During the 2020-2021 school year, 34 Ssates left decisions on school closures due to COVID-19 to individual districts and schools; 13 states required in-class instruction; two states required regional school closures, closures for certain grades or allowed hybrid instruction only; and one state required in-class

instruction for certain grades (https://www.edweek.org/leadership/the-coronavirus-spring-the-historic-closing-of-u-s-schools-a-timeline/2020/07). During the 2021-2022 academic year, the time during which the present study took place, school closures became less common, but still occurred in individual districts and schools in the United States (https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2021-2022_academic-year). For example, during the week ending September 17, 2021, 96% of school districts in the United States received in-person in-class instruction, but 4% of them offered either online or hybrid instruction (https://www.cdc.gov/mmwr/volumes/70/wr/mm7039e2.htm).

While the move from in-class to online and hybrid instruction provided a way to ensure students continued their education during the COVID-19 pandemic (Di Pietro et al., 2020), concerns about the application of these modes of teaching on students' learning were voiced by educational experts (e.g., Daniel, 2020). As schools moved from in-class to online learning at the start of the pandemic, evidence began to accumulate that this shift to emergency remote instruction resulted in a loss of learning time (e.g., Huber et al., 2020; OECD, 2021), and the instruction students received was qualitatively poorer when it was delivered online (e.g., Blikstad-Balas et al., 2021; Di Pietro et al., 2020). For example, students had lesson person-to-person interactions with their teachers and peers while learning.

Two recent meta-analyses provided further evidence on the impact of school closures on students' learning. Hammerstein et al. (2021) reported a median drop of -0.10 standard deviations for mathematics and -0.09 for reading before and after remote instruction was implemented in the Spring of 2020. Likewise, König and Frey (2022) indicated a drop of -0.18 standard deviation across a variety of academic outcomes (mostly mathematics and reading)

when examining the effects of remote instruction implemented during the Spring of 2020 and about a year later. They also noted that the move to emergency remote instruction had a smaller negative impact on students' learning when it occurred later than earlier. It is possible, therefore, the effects of suspending in-class instruction and providing online or hybrid instruction became less pronounced over time. As teachers became more experienced at switching from in-class to online or hybrid instruction, it is possible that such adjustments had less impact on how they taught. This issue was addressed in the current investigation by examining if how writing was taught in year three of the pandemic differed when it was offered in-class, on-line, or hybrid.

Study Purposes

Differences in In-Class, Online, and Hybrid Instruction

One purpose of the present study was to determine if middle and high school teachers in the United States taught writing differently when they provided in-class, online, and hybrid instruction. The data for this investigation was collected during the 2021-2022 school year. By this point, the COVID-19 pandemic and concomitant school closures and shifts in modes of instruction had occurred across three school years. By this point in time, teachers had considerable opportunities to adjust to the demands of such transitions.

Surprisingly little is known about the effects of the COVID-19 pandemic on teaching writing. The studies that are available focus on the elementary grades. Goodrich et al. (2022) conducted two surveys that included questions about the effects of COVID-19 and emergency remote instruction and the teaching of writing in the United States. Of the 428 elementary grade teachers who responded to the first survey administered in the Spring of 2020 (following school closures), only 36% indicated they provided remote instruction for writing daily, with just 13% reporting they provided daily direct instruction for writing. Seventy-six percent of the teachers

indicated, however, they assigned independent writing weekly. With a different and separate survey administered in the Fall of 2020, after teachers had some experience providing online and hybrid instruction, 20% of the 340 elementary grade teachers indicated they screened their students for writing difficulties at the start of the school year, whereas 50% reported they provided supplemental writing instruction to lower performing students.

In a survey study in Australia with 310 primary grade teachers (Metga et al., 2021), 73% of participants indicated COVID-19 related school closures in 2020 impacted the teaching of writing. They indicated they had less time for teaching writing, writing was more difficult to assess, differentiating writing instruction was not always possible, and they provided explicit writing instruction less frequently. On the positive side, they reported receiving more support from peers for planning writing instruction and sharing resources.

In a survey study conducted in Macao with 307 primary grade teachers, Hsiang et al. (in press) examined how the writing of Chinese characters were taught during the school closure that occurred between February to May. Most teachers reported teaching a lesson on Chinese characters only once every three to four weeks, but they indicated they spent 32 minutes a week teaching students how to write characters and provided students with 21 minutes a week to practice them. They also applied a variety of instructional procedures when teaching the writing of Chinese characters during emergency remote instruction.

All of the studies conducted to date examined writing instruction during the earlier phases of the COVID-19 pandemic, mainly when teachers experienced their first shift to online or hybrid instruction. As noted earlier, this investigation examined how teachers taught writing during the third school year into the pandemic. At this point, teachers had considerable time to adjust to the demands of shifting from in-class to online or hybrid instruction. These previous

studies also used a single survey to gauge teachers' writing practices. While such surveys can provide useful information about the teaching of writing, they require that teachers calculate a summary of what they did over a period of time, increasing the likelihood that their remembrance may not be fully accurate. In contrast, the present study asked teachers to complete an online survey each day indicating mode of instruction (in-class, on-line, and hybrid), if writing was taught, and what aspects of writing were taught and for how long. This is the first study of writing practices to our knowledge applying such an approach. It is also important to note that the three previous surveys provided no direct comparison of online and hybrid writing instruction compared to teachers' in-class instruction. The current investigation made such comparisons.

Middle and High School Writing Instruction

The second purpose of this study was to provide a description of how writing is taught to secondary students. Studies conducted during the last 15 years suggest that most middle school and high school teachers devote little attention to teaching writing. For instance, in a study by Applebee and Langer (2011), 260 middle and high school teachers of English, social studies, science, and math reported they typically used a variety of research-based practices to teach writing, but little time was devoted to writing or writing instruction and the use of digital tools as a form of writing was applied infrequently. Observations of teachers' classrooms revealed that only 7.7% of classroom time was spent writing, and writing in a typical class was dominated by tasks that required writing without composing (e.g., writing short answers to questions, fill-in-the -blank tasks). Similar findings were reported by Graham et al. (2014) and Kiuhara et al. (2009) with middle and high school language arts and content area teachers, respectively. Further, in studies where middle and high school language arts and content area teachers were asked about

their use of writing as a tool to support learning (Drew et al., 2017; Gillespie et al., 2014; Ray et al., 2016), most teachers indicated they used a variety of writing activities for this purpose, but again the most common activities involved writing without composing (e.g., note-taking, short written responses). Across all of these studies, teachers rarely asked students to write longer pieces of text (beyond a paragraph or two) or compose text with digital tools.

In the current study, middle and high school teachers were asked to indicate daily whether their students engaged in writing short and longer text as well as whether they used digital tools when they wrote in the classroom. Because the Common Core State Standards benchmarks (2010), adopted by 46 states, emphasized the importance of middle and high school students writing extended text, we thought it important to revisit how frequently students wrote texts that varied in output and how often they created digital written products. One upside to the COVID-19 pandemic in the United States was that computers became more common in schools (Rauf, 2020). This also led us to ask teachers if they were teaching students how to type.

Teachers were further asked to indicate daily if they were teaching spelling, grammar, and sentence construction. These foundational writing skills are essential to transcribing and translating a writer's ideas into text (Graham, 2018). They also indicated daily if students were engaged in planning, revising, and proofreading text. These writing processes are central in conceptualizing, reconceptualizing, and polishing what is written (Hayes, 1996).

Research Question and Predictions

The present study addressed the following research questions:

1. Was there a difference in how often middle and high school teachers engaged students in specific writing activities when teaching occurred in-class, online, or hybrid? (RQ1)
2. What writing activities were applied most frequently? (RQ2)?

3. Were there teacher differences in the application of writing activities? (RQ3)

RQ1 examined the impact of shifts in mode of instruction due to COVID-19 during the third school year of the pandemic. If teachers reported they engaged in these writing practices less often or spent less time on them when providing online or hybrid instruction than when they taught their whole class in-person, this would support the proposition that changes in mode of instruction caused by COVID-19 were detrimental to the teaching of writing. In these analyses, we examined three possible outcomes. One involved the proportion of lessons during which a writing activity was reportedly applied. The other two outcomes involved time: (a) average time across all reported class periods a writing activity was applied and (b) average time spent teaching a writing activity in lessons where it reportedly occurred.

There are multiple reasons why shifting between in-class, online, and hybrid modes of instruction may influence middle and high school teachers' application of writing activities in their classrooms. For example, teachers may experience higher levels of stress when they have to apply less familiar modes of instruction, and teacher stress can negatively impact teaching (e.g., Oberle & Schonert-Reichl, 2016). Consequently, teachers may still face challenges when using online and hybrid tools to teach (Schleicher, 2020), even years into the pandemic. Teachers may also be less motivated to provide their best instruction when teaching online or by hybrid means because their students may be less motivated to learn due to decreased interactions with the teacher and their peers (Di Pietro et al., 2020). Additionally, some complex skills like writing may be easier to learn when teachers have direct and in-person access to all students during instruction (Skar et al., in press).

Despite these potentially negative consequences, we predicted there would be few differences between how frequently and for how long middle and high school teachers employed

the writing activities assessed daily when teaching in-class, online, and by hybrid means. By the 2021-2022 school year, middle and high school teachers had gained experience making adjustments to the different modes of instruction, potentially reducing stress and increasing their ability to switch easily and successfully from one mode of teaching to the other. Teachers were also not required to switch from in-class to online or hybrid instruction as frequently or for as long in 2021-2022 as during the two previous years. This likely reduced teacher and student stress, and provided students with frequent opportunities throughout the school year to interact with their teachers and classroom peers. Further, the meta-analysis by König and Frey (2022) suggested that learning loss at the start of the COVID-19 pandemic was larger than learning loss measured one year into the pandemic. The lessening of the COVID-19 impact on students' writing was illustrated with two studies from Norway. In the first investigation, Skar et al. (2022) reported that the move to online instruction in 2020 for first grade students had a negative effect on their writing. However, in a follow-up study conducted a year later when students were in second grade (Skar et al., in press), the impact of the COVID-19 pandemic on these students' writing had disappeared. This suggests that as the pandemic continued over time, its impact lessened. If this was the case for students, we think it was also likely to be the case for teachers.

RQ2 examined if teachers reportedly applied different writing activities more than others. This provided information on how writing was taught to secondary students by examining if secondary teachers privileged some writing activities more than others. We anticipated that secondary teachers would be more likely to privilege writing activities that involved creating shorter text than longer text, as previous survey studies with middle and high school teachers reported that teachers were more likely to assign short writing tasks rather than longer ones (Drew et al., 2017; Gillespie et al., 2014; Graham et al., 2014; Kiuhara et al. 2009; Ray et al.,

2016). We also expected that secondary teachers would privilege teaching translation skills such as sentence construction and grammar over teaching transcription skills such as typing and spelling. It is commonly assumed that students master transcription skills in the elementary grades (Graham, 1990). Further, we anticipated that teachers would privilege student planning over proofreading and revising. Previous research has demonstrated that planning before writing enhanced the quality of students' writing (Graham & Perin, 2007), but the impact of revision was less certain (Fitzgerald, 1987).

RQ3 focused on a commonly assumed, but rarely tested, aspect of writing instruction: namely, teachers differ in how they teach writing. To test this proposition, we focused on whether there were teacher differences in the percentage of (a) lessons where one or more writing activities were applied and (b) possible writing activities that could be applied across lessons. This latter measure assumed that the surveyed writing activities could all be applied in every lesson. Rasch models were used to determine if each of these two measures could distinguish between separate groups of teachers. We predicted that these analyses would result in separate groups of teachers who differed in how frequently they applied writing activities in every lesson and how frequently they applied multiple writing activities across all lessons.

Methods

Participants

Selection Process

The teachers who participated in this investigation were part of a larger study involving 109 middle and high school teachers from 15 states in the United States (i.e., Alabama, Arkansas, Connecticut, Delaware, Florida, Illinois, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Oklahoma, Texas, Washington, and Wyoming) as well as the District of

Columbia. A majority of the teachers were from three states: New York (29%), Alabama (13%), and Arkansas (9%). In the larger study, teachers completed a short online survey each day they taught a selected class. The survey asked teachers if they applied specific instructional procedures for teaching writing in their class. It was designed to determine how middle and high school teachers taught writing across a significant portion of the school year.

Multiple methods were used to recruit teachers for the larger investigation. Through the use of social media and email, we shared a description of the project with teachers. This included soliciting participation of teachers associated with the National Writing Project, Teach for America, SRSD Online, and Achievement First. About 12% of the teachers who agreed to participate in the larger study started completing the online survey in September or October of 2021 (n = 13), with 67% of teachers starting in November or December of 2021 (n = 73) and the remaining 21% completing their first survey in January or February of 2022 (n = 23). They were asked to continue completing the survey until the end of their school year.

The teachers in the larger investigation were mostly female (84%), and 75% of them were White, 12% Black, 4% Hispanic, 4% Asian, 4% Multiracial, and 2% Native American. They were mostly language arts or English teachers (82%), but 14% taught social studies, 2% science, and 2% mathematics. As a group they averaged 11.63 years of teaching experience (SD = 8.39), and 52.3% of them taught middle school and 47.7% high school. These teachers mostly taught in Title 1 schools (74%), and they were almost equally likely to work in a public school (46.8%) or a charter school (53.2%). Approximately one-third of the teachers (30.3%) were from schools with National Writing Project members. Two-thirds of the teachers (61%) reported students in their class were expected to complete a high-stakes writing test. Collectively, they taught the selected class they reported on 4.58 times a week (SD = 0.90). Average size of the

selected class was 33.28 students (*SD* = 25.13), and 5.36 (*SD* = 7.96) of these students received special education services and another 2.35 (*SD* = 4.80) were learning English as a second language.

To participate in the current study, teachers had to report spending at least five days providing online or hybrid instruction to students from the point they completed their first online survey to April 15, 2022. We selected this date in April of 2022 because we thought it unlikely there would be additional school closures due to COVID-19 at that point. This was generally the case as 87% of the teachers (*n* = 95) taught all remaining classes during the school year in-person, and another 6% of them (*n* = 6) taught all but one or two of the remaining classes in-person. Online or hybrid instruction was not the typical mode of instruction for any of the teachers in the larger study. When this mode of instruction was applied, it was due to the suspension of in-class instruction because of the COVID-19 pandemic.

Participating Teachers

Thirty-eight of the 109 teachers met the criterion described above (i.e., five or more days of teaching online or hybrid due to suspension of in-class instruction due to COVID-19), and served as the participants in the current investigation. These 38 teachers hailed from seven states (Alabama, Arkansas, Illinois, New Jersey, New York, Oklahoma, and Texas). A majority of the teachers were from New York (48%) and Arkansas (26%). For these 38 teachers, 72% of their classes were taught in-person (*SD* = 27%), 20% on-line (*SD* = 26%), and 8% hybrid (*SD* = 18%). Five of these teachers did considerably more on-line instruction that the other 33 teachers, whereas three teachers did considerably more hybrid teaching than their peers.

The participating 38 teachers were mostly female (84%), and 76% of them were White, 8% Black, 5% Asian, 5% Native American, 3% Hispanic, and 3% Multi-racial. They were

mostly language arts or English teachers (84%), but 13% of them taught social studies and 3% mathematics. As a group they averaged 9.86 years of teaching experience (*SD* = 7.03), and 42.0% of them taught middle school and 58.0% high school. These teachers mostly taught in Title 1 schools (79%), with 40% of them working in public schools and the remaining 60% in Charter schools. Slightly more than one-third of these teachers (36.8%) taught in schools with National Writing Project members. Two-thirds of the teachers (66%) reported students in their class were expected to complete a high-stakes writing test during the school year. Collectively, they taught the class they reported on 4.58 times a week (*SD* = 0.89). Average size of the target classroom was 30.63 students (*SD* = 21.52), and 5.14 (*SD* = 5.72) of these students received special education services and another 1.71 (*SD* = 2.59) were learning English as a second language. When we compared these 38 teachers to the 71 teachers who did not meet the eligibility criterion on the variables above, there were no statistically significant differences between the two groups of teachers (all *p*'s > 0.107). Thus, the smaller group of teachers in the current study were representative of teachers in the larger investigation.

When queried about their preparation to teach writing, 13% of the teachers in the current study indicated they had taken no course on teaching writing as an undergraduate or graduate student, 16% noted they had taken one course, 34% two courses, 26% three to five courses, and 11% six or more courses. Somewhat similarly, when asked about their career as a teacher, 3% of them indicated they had taken no workshops, training sessions, seminars, or courses on teaching writing. About one-fifth of them (18%) indicated they had completed one or two of these activities; 34% noted they had engaged in three to five of these activities; 26% reported completing six to 10 of these activities; and 18% responded they had completed 10 or more of

these activities. Thirty percent of the teachers indicated these preparation activities had little influence on how they taught writing.

As a group, the 38 teachers were positive about teaching writing and their efficacy to do so (these measures are described in the section entitled Surveys). On a measure of attitudes toward teaching writing (Brindle et al., 2016), their mean score of 4.92 (*SD* = 0.79) indicated they moderately agreed they liked to teach this subject. On a measure of efficacy to teach writing (Graham et al., 2001), their mean score of 4.67 (*SD* = 0.80) suggested they were confident about their capabilities to teach this skill. All of these teachers indicated that language arts and English teachers should be responsible for teaching writing, and 95% believed this was also the responsibility of social studies teachers. The teachers were evenly split on whether math teachers had a responsibility to teach writing. Finally, 61% of the 38 teachers indicated they created their own writing program, with another 3% reporting they and other teachers created writing instruction for their students. Almost one-fourth of the teachers (24%) indicated their writing program was school or district based, with just 13% reporting they used a commercial writing program.

Surveys

Intake Survey about Teachers

Once teachers agreed to participate in the study, they were asked to complete a survey that collected information about their school (public or charter school, external exam required for course taught), personal characteristics (gender and race), preparation (number of courses taken as an undergraduate/graduate student; number of professional experience [workshops, trainings, seminars, courses] completed while teaching; impact of these professional experiences on how they taught writing), experience (years spent teaching), and beliefs about who is responsible for

teaching writing (language arts teachers, social studies teachers, science teachers, math teachers, and arts teachers). We were able to determine if teachers taught at a Title 1 school, the state where they taught, and if they taught at a school with National Writing Project teachers through the information they provided.

They were also asked specific questions about the class they selected to report on daily. This included the name of the course, how often it met each week, how long each class lasted (in minutes), number of students in the class, number of students with special needs, and number of students who were learning English as a second language. Teachers were further asked who designed the writing instruction in this class (i.e., teacher, teacher and peers, school/district, commercial material developer).

As part of this initial survey, teachers completed two assessments. One examined their attitudes toward teaching writing. This measure was developed by Brindle et al. (2016) and included four items: I enjoy teaching writing; teaching writing gives me personal satisfaction; teaching writing makes me feel good; and teaching writing is its own reward. Each item was accompanied by a six-point Likert type scale where teachers indicated if they strongly disagreed (score of 1.0) to strongly agreed (score of 6.0) with the corresponding statement. We conducted a factor analysis involving the four attitude items using data from the 109 teachers who participated in the larger investigation. This yielded a single factor solution, with an eigenvalue of 3.038, accounting for 75.94% of the variance. All four items loaded at 0.79 or greater on the identified factor, The Cronbach coefficient for the 109 teachers was 0.89. For the 38 teachers in the current study, it was 0.90.

The second measure, which assessed efficacy for teaching writing, was taken from Graham et al. (2001). It included the following seven items: (1) When a student's writing

performance improves, it is usually because I found better ways of teaching that student; (2) If a student did not remember what I taught in a previous writing lesson, I would know how to increase their retention in the next lesson; (3) If I try really hard, I can help students with the most difficult writing problems; (4) When a student is having difficulty with a writing assignment, I would have no trouble adjusting it to their level; (5) If a student masters a new writing concept quickly, this is because I knew the necessary steps in teaching this concept; (6) When a student does better than usual in writing, it is because I exerted a little extra effort; (7) and If one of my students could not do a writing assignment, I would be able to accurately assess whether the assignment was the correct level of difficulty. Each item included the six-point Likert-type scale described above. A factor analysis conducted with the 109 teachers in the larger investigation yielded a one factor solution, with an eigenvalue of 3.124, accounting for 45.92% of the variance. All four items loaded at 0.48 or greater on the identified factor, The Cronbach coefficient for the 109 teachers was 0.80. For the 38 teachers in the current study, it was 0.78.

The data collected on this intake survey provided information about the participating teachers and the context in which they operated. The only information from this survey that was used in the analysis of teachers' daily reports on writing instruction was grade-level: middle school (grades 5 to 8) or high school (grades 9 to 12). This allowed us to determine if middle and high school teachers responded differently on the daily writing instruction survey (see below).

Survey about Writing Instruction

The online survey that teachers were asked to complete each day they taught first asked them to indicate if the lesson was taught in-person, online (virtually), or in a hybrid format (online and in-person at school). They were also asked to indicate if writing was taught during this lesson. If it was taught, they were asked to indicate which of the following aspects of writing

they worked on during the lesson (selecting all that applied): (1) teaching spelling, (2) teaching typing, (3) teaching grammar (e.g., identifying parts of speech, adding punctuation and capitalization, correcting fragments and run-ons, conjugating verbs, Greek and Latin roots), (4) teaching sentences (e.g., writing topic sentences/theses, writing a hypothesis, incorporating transitions, incorporating evidence, combining sentences, using conjunctions, using literary devices), (5) planning text (e.g., brainstorming, note-taking, research, citing sources, outlining, free-writing), (6) revising text (i.e., making changes to content, re-organizing ideas), (7) proofreading text (e.g., correcting errors in spelling, grammar, punctuation, etc.), (8) writing short response(s) or paragraph(s) that are not part of a longer product (e.g., explaining the process for solving a math problem, describing a scientific concept, composing an ELA or history short response, journaling/reflection), (9) writing part or all of a 3-5 paragraph or equivalent length product (e.g., lab report, essay, story, letter, personal narrative, speech, skit, poem), (10) writing part or all of a longer piece of writing (more than 5 paragraphs), and (11) creating a digital written product (e.g., a product that doesn't have a paper and pencil equivalent, such as an email, PowerPoint, or website).

For each aspect of writing identified as taught during the class period, teachers were further asked to specify the amount of time devoted to activity using a six-point Likert-type scale. The six points included the following time-frames: (1) 0 to 10 minutes, (2) 11 to 20 minutes, (3) 21 to 30 minutes, (4) 31 to 40 minutes, (5) 41 to 50 minutes, (6) 51 to 60 minutes. For the purposes of this study, we used the midpoint of each time-frame to indicate the amount of time devoted to the specified writing activity (e.g., 0 to 10 minutes coded as 5 minutes; 11 to 20 minutes coded as 15 minutes).

These 11 aspects were selected for the following reasons. Research shows that teaching spelling and sentence skills to secondary students has beneficial writing effects (Graham & Perin, 2007; Graham & Santangelo, 2014). Likewise, engaging secondary students in the processes of planning, revising, and proofreading improves students' writing (Graham & Perin, 2007; Rogers & Graham, 2012). Writing shorter and longer pieces of text can improve secondary students' understanding of information presented in both class and textual material (Graham & Hebert, 2011; Graham et al., 2020). While evidence on the effectiveness of teaching grammar to secondary students are mixed (see Graham & Perin, 2007; Rogers et al., 2008), it is important that students learn to write text with few grammatical miscues because such errors can have a negative impact on how their text is evaluated by others (Graham et al., 2011). We included teaching typing and creating digital written products because research has demonstrated that secondary students' writing improves when they consistently use word processing and other digital tools to write (e.g., Morphy & Graham, 2012).

Procedures

When a teacher responded that they might be interested in participating in the study (see Selection Process above), the purpose of the project was explained. This included explaining that the teacher would complete an intake survey providing information about their school, themselves, a specific classroom, and their beliefs about writing. They were also told that they would be asked to complete an online survey each day they taught, providing information on how they taught writing to a specific class. They were informed that the survey should take between three to five minutes to complete (based on the piloting of the survey). For participating in the study, they were informed they would be paid $450 per semester. Finally, teachers were told that all information collected would be deidentified and confidentiality would be maintained

so that their responses could not be directly linked to their name. They were encouraged to ask questions, and they were told they could drop out of the study at any point if they so desired.

Each teacher who consented to participate in the study selected one class that they would report on daily. This had to be a class where writing was taught (although this did not need to occur every day), and the class had to be as representative as possible of how they typically taught writing. The intake survey was then administered, and the teacher was taught how to complete the daily survey. Teachers were encouraged to contact the researchers to ask questions at any point during the study. If we saw that a teacher had stopped answering the daily online survey, he or she was contacted to determine if there was a problem or if they needed help.

Results

The 38 teachers in this study completed 2,676 survey responses on their daily writing instruction between September and April 15. For these 38 teachers, the minimum and maximum number of surveys completed was 25 and 115, respectively. The mean and standard deviations for surveys completed was 70.4 and 20.8, respectively.

Did Middle and High School In-class, Online, and Hybrid Writing Instruction Differ (RQ1)?

Measures. Table 1 presents means and standard deviations for 10 of the 11 writing activities (e.g., writing short responses) included on the daily survey. Participating middle and high school teachers rarely taught spelling (four teachers taught spelling 13 times in total in 2,676 completed surveys), so this teaching behavior was eliminated from all subsequent analyses. For the 10 remaining writing activities, Table 1 specifies the proportion of in-class, online, and hybrid lessons during which the activity occurred, the average amount of time devoted to it across all lessons, and the average amount of time devoted to it in lessons where the

activity occurred. Table 1 also provides this same information for middle school teachers, high school teachers, and all teachers combined.

Analytic procedures. Since teachers recorded if a specific writing activity occurred or did not occur on multiple days and how much time was devoted to it, the data may be viewed as repeated measures data, which can be handled using multilevel regression models (MLMs). Both logistic and linear MLMs were used to analyze the data.

To determine if the proportion of lessons during which a specific writing skill occurred was related to mode of instruction (in-class, online, and hybrid) and grade-level (middle school [grades 6 to 8] and high school [grades 9 to 12]) a logistic MLM was conducted for each writing activity (10 in all). To illustrate this approach, the logistic MLM analysis for the writing activity "proofreading" was done in the following way. Suppose a given teacher reported their activity for a full week, and this teacher had students proofread on Monday and Tuesday, but not on Wednesday through Friday. On any day proofreading occurred it was recorded as a "1"; if it did not occur, it was recorded as "0". So the data for proofreading for the five days was 1, 1, 0, 0, 0. The data for all 38 teachers for proofreading then served as the binary dependent variable in the logistic MLM, and type of lesson and grade-level served as the covariates. The regression coefficients of the MLM for proofreading indicated whether this writing activity was more (or less) likely to be taught in in-class, online, and hybrid lessons and by middle and high school teachers.

Separate linear MLMs were used to determine whether lesson type (in-class, online, and hybrid) or grade-level (middle and high school) was associated with the amount of time devoted to each writing activity. The MLMs examined two different outcomes: (Method 1) average time devoted to a writing activity across all lessons, and (Method 2) average time devoted to a writing

activity when it occurred. We again use proofreading to illustrate these analyses. For Method 1, suppose a given teacher taught proofreading on only Monday and Tuesday as imagined above, and they devoted 15 and 25 minutes to this skill on these days, respectively. The teacher's data for that week would be 15, 25, 0, 0, 0), with "0" recorded for days during which proofreading did not occur. In the linear MLM for proofreading, the corresponding data for time all teachers served as the numerical dependent variable, and type of lesson and grade-level served as the covariates. Method 2 employed a similar approach, but for the hypothetical teacher the data for that week would simply be (15 and 25). Only data for the days during which proofreading occurred was used in this analysis. Collectively, Method 1 and 2 resulted in 20 linear MLMs (two for each skill).

All logistic and linear analyses were conducted in the R software programming environment (R Core Team, 2020). The MLMs were fitted using the lme4 package (Bates et. al 2015).

Findings. Statistically detectable differences by mode of instruction (in-class, online, and hybrid) were observed for only one writing activity: creating a digital writing product (see Table 1). The logistic MLM for this writing activity showed that teachers were less likely to cover this skill during in-person lessons than during hybrid lessons. Specifically, the estimated regression coefficient for in-person lessons was $\hat{\beta}_{in-person} = -1.04$ (p-value = 0.02), indicating that the odds that creating a digital written product was smaller by a factor of $e^{-1.34}$ during in-class lessons than during hybrid lessons. Since odds may be difficult to interpret, we provide an example of how this can be applied with middle school teachers. Middle school teachers in this study covered this skill about 1.0% of the time during in-person lessons, but 2.7% of the time during hybrid lessons.

Similarly, statistically detectable differences in grade-level (middle vs high school) were observed for only one writing activity: teaching grammar (see Table 1). The logistic MLM for this writing activity showed that middle school teachers were more likely to teach grammar than high school. Specifically, the estimated regression coefficient for middle school was $\hat{\beta}_{middle} = 1.34$ (p-value = 0.02), indicating that the odds that a teacher covered grammar was larger by a factor of $e^{1.34}$ for middle school teachers compared to high school teachers. If we applied these odds to in-class lessons as an example, middle school teachers covered grammar in 6.5% of the time during such lessons, whereas high school teachers covered grammar in 1.8% of these lessons.

None of the linear MLMs resulted in statistically significant effects for either lesson type (in-class, online, hybrid) or grade-level. Consequently, there were no statistically detectable differences for any of the writing activities in terms of average time devoted to a writing activity across all lessons or average time devoted to a writing activity when it occurred.

What Writing Activities Were Applied Most Frequently (RQ2)?

Measures. As reported in the previous section, the only statistically detectable differences in how frequently each writing activity occurred involved creating a digital writing product, which occurred less frequently during in-class than in hybrid lessons, and grammar, which was taught more frequently by middle school than high school teachers. Further, type of lesson and grade level was not statistically related to how much time teachers devoted to any of the 10 writing activities across all lessons or during the lessons in which a particular writing activity occurred. Consequently, we did not treat type of lesson or grade-level as covariates when examining if some writing activities were applied more frequently than others.

Analytic procedures. To determine if there were statistically detectable differences in how frequently the 38 teachers taught the surveyed writing activities, we applied the Marascuillo procedure (Marascuilo & McSweene, 1967). This procedure allowed us to simultaneously tests the differences of all pairs of proportions of days the 10 writing skills occurred across all teachers. For the 10 writing skills, there are $\frac{k(k-1)}{2} = \frac{10(10-1)}{2} = 45$ pairwise comparisons. The Marascuillo procedure calculates the absolute difference between pairs of proportions. This difference is compared with a critical range value. If the absolute difference is greater than the critical value, then the difference between the pairs is statistically detectable.

Findings. The last column in Table 1 presents the means and standard deviations for each writing activity for all 38 teachers collectively. The most commonly occurring writing activity across all teachers collectively was writing short responses (21.9% of lessons; 4.62 min/lesson; 21.10 min when taught) followed in order by planning text (16.3% of lessons; 4.21 min/lesson; 25.75 min when taught), writing 3 to 5 paragraph texts (11% of lessons; 3.72 min/lesson; 33.82 min when taught), teaching sentences (9.2% of lessons; 4.12 min/lesson; 22.92 min when taught), teaching grammar (8.8% of lessons; 1.90 min/lesson; 21.51 min when taught), revising text (5.4% of lessons; 1.21 min/lesson; 22.35 min when taught), proofreading text (4.5% of lessons; 0.70 min/lesson; 15.37 min when taught), creating digital writing products (3.4% of lessons; 1.16 min/lesson; 33.64 min when taught), writing longer pieces of text (1.6% of lessons; 0.63 min/lesson; 40.26 min when taught), and teaching typing (0.5% of lessons; 0.13 min/lesson; 26.23 min when taught).

Table 2 presents the outcomes for the 45 comparisons between the proportion of lessons during which the 10 writing activities occurred. The obtained absolute value exceeded the critical value in 38 of the 45 comparisons, indicating there was a statistically detectable difference

between the two writing activities in each of these instances (the activity that was taught more frequently in each comparison is bolded). To illustrate, the grammar ($p_{Grammar}$) and planning ($p_{Planning}$) comparison produced an absolute value of 0.075 which was larger than the critical value of 0.037, indicating that planning statistically occurred in proportionally more lessons (16.3% of lessons) than grammar (8.8% of lessons).

Writing short responses occurred more frequently in lessons than all other writing activities, whereas planning text was more common in lessons than all other writing activities except writing short responses. Writing 3 to 5 paragraph texts occurred in a greater proportion of lessons than revising text, proofreading text, creating digital text, writing longer text, and teaching typing, but occurred less frequently than writing short responses and planning text. Teaching sentences occurred in proportionally more lessons than revising text, proofreading text, creating digital text, writing longer text, and teaching typing, but occurred less frequently than writing short responses and planning text. Teaching grammar occurred in proportionally fewer lessons than short written responses and planning text, but was less common than revising text, proofreading text, creating digital text, writing longer text, and teaching typing. Proportionally, revising text occurred more frequently writing longer text and teaching typing, but less frequently than writing short responses, planning text, writing 3 to 5 paragraph texts, teaching grammar, and teaching sentences. Proofreading text was proportionally more common than writing longer text and teaching typing, but was less common than writing short responses, planning text, writing 3 to 5 paragraph texts, teaching sentences, teaching grammar, and revising text. Creating digital text was only proportionally more common than writing longer text and teaching typing, but less common than writing short responses, planning text, writing 3 to 5

paragraph texts, teaching sentences, and teaching grammar. Writing longer text and teaching typing occurred proportionally less frequently than all other writing activities.

Were There Teacher Differences in the Application of Writing Activities? (RQ3)

Measures. To determine if the 38 teachers differed in their use of the target writing activities, two indices were calculated for each teacher. The first measure, percent of lessons with one or more writing activities, was calculated by dividing the number of lessons during which one or more writing activities occurred by the total number of lessons reported and multiplying by 100%.

The second measure, percent of possible writing activities applied, assessed how many writing activities a teacher applied in relation to how many could possibly be applied. To illustrate, a lesson could potentially include all 10 writing activities. If a teacher reported on 70 lessons, the teacher could possibly apply 700 writing activities. A teacher's score for percent of possible writing activities applied was calculated by dividing total number of writing activities the teacher applied across all lessons (e.g., 70) by all possible writing activities (e.g., 700) and multiplying the outcome by 100% (i.e., 10%).

Analysis. Data were fitted to Rasch-models (Rasch, 1980), using the software *Facets* (Linacre, 2018b). The original Rasch model stated that the odds of success is related to two parameters: the ability of the student, and the difficulty of the item. The Rasch model is commonly expressed as:

$$ln\frac{P_{ni1}}{P_{ni0}} = \beta_n - \delta_i,$$

where *ln* is the natural logarithm, P_{ni1} is probability for person *n* to succeed on item *i* (with P_{ni0} being its inverse). β_n is the estimated ability of person *n* (expressed in log-odds units; "logit scores"), and δ_i is the estimated difficulty of item *i* (expressed as "logit scores"). In our

context, it would be more precise to talk about a teacher's "willingness," "inclination", or "opportunity" to include writing activities (in general) and the "difficulty" of given writing activities. While the family of Rasch models are often used in educational testing settings or as a tool for test validation, the use of these procedures in the present context provides some interesting features that are pertinent to examining teachers' differential use of the writing activities in this investigation. First, estimates for subjects (i.e., teachers) and items (i.e., writing activities) are expressed on an interval logit scale, meaning that differences between subjects and items are easier to interpret. Second, and most important to this study, the Rasch mdelling provides a single estimate of the reliability of separation or, in other words, the extent to which the measurement reliably can separate subjects (teachers) and items (writing activities) into statistically distinct strata (i.e., levels that are separated by a minimum of three standard errors [(Schumacker & Smith, 2007)]). The number of strata (*H*) is estimated by:

$$H = \frac{4G+1}{3}, \text{ where } G = \sqrt{\frac{R}{1-R}},$$

and *R* is the Rasch reliability. Rasch reliability for subjects is analogous to Cronbach's alpha (Linacre, 2018a). The strata value has a straightforward interpretation in that it indicates how many groups of similar teachers and groups of similar writing activities there are (Schumacker & Smith, 2007).

Findings. Table 3 presents the results of the Rasch model. This includes for each teacher the number of lesson surveys completed, percent of lessons with one or more writing activities, the logit and standard error for this measure, the total writing activities a teacher applied across all reported lessons, the percent of possible writing activities applied, and the logit and standard error for this measure.

On average, the 38 teachers included one or more of the 10 writing activities in 68% of the reported lessons (see Table 3). The teacher who most frequently applied one or more of the writing activities in lessons was number 23 (98% of the time in 83 reported lessons), whereas teacher 18 was least likely to report using one or more of the writing activities (22% of the time in 96 reported lessons). The Rasch reliability of separation of teachers (*R*) was .88, and the strata (*H*) was 3.87, indicating that it was possible to statistically distinguish between almost four groups of teachers in terms of percent of lessons reported with one or more writing activities, from teachers seemingly unwilling, or not inclined to include one or more writing activities in reported lessons to teachers which opted for including one or more writing activities in reported lessons to a great extent. A linear model analysis revealed that the differences between teachers could not be attributed to group variables such as Title 1 School status (b = 0.40, p = .347), Charter or Public School type (b = -0.18, p = .724), participation in the National Writing Project (b = .19, p = .717), or whether the school was a Middle School or High School (b = -0.12, p = .716). The differences thus seemed to be individual.

We also observed differences between teachers in the percent of possible writing activities applied.[1] On average, 9% of the possible writing activities that could be applied in reported lessons were applied by the 38 teachers (see Table 3). In other words, teachers applied less than one of the target writing activities across all reported lessons. Teacher 20 reported the highest percentage for this measure: 24%, which represented the application of 88 writing activities across 370 possible opportunities to apply them in 37 lessons. The lowest percentage of possible writing activities applied (3%) was reported by teacher 18, who applied 26 writing

[1] In this analysis, we also included an "item-facet," that is a facet consisting of the ten writing activities. Because activities are subject to another analysis in this investigation, we do not report on the Rasch output here.

activities across 960 possible opportunities to apply them in 96 lessons. The Rasch reliability of separation of teachers (*R*) for this measure was .89, and the strata (*H*) was 4.17, indicating that it was possible to statistically distinguish between four groups of teachers in terms of percent of possible opportunities to apply writing activities across lessons, ranging from teachers evidencing little proclivity to apply multiple writing activities in a lesson to teachers applying two to three writing activities per lesson. A linear model analysis revealed that the differences between teachers could not be attributed to group variables such as Title 1 School status (b = 0.19, p = .395), Charter or Public School type (b = 0.22, p = .402), participation in the National Writing Project (b = -0.17, p = .544), or whether the school was a Middle School or High School (b = 0.07, p = .668). The differences thus seemed to be individual.

Discussion

Teaching Writing in the United States During the Third School Year of COVID-19

The present study examined if middle and high school teachers taught writing differently when they provided in-class, online, and hybrid instruction during the third school year (2020-2021) of the COVID-19 pandemic. At this point in the United States, the move from in-class to online or hybrid instruction because of COVID-19 became less common than during the previous school years, as such switches in mode of instruction occurred for shorter periods of time and involved a much smaller number of school districts. All of the participating teachers in this investigation were asked to complete a daily survey indicating whether they applied 11 specific writing activities during a select class and how that class was taught (in-class at school, online, or through a hybrid version involving both in-class and on-line teaching). To be included in this study, teachers had to provide at least five school days of online or hybrid instruction from September, 2021 to the middle of August, 2022. To our knowledge, this is the only study that has

examined the relationship between mode of instruction and the teaching of writing during the third school year of the pandemic.

We predicted there would be no statistically detectable differences in how the 38 middle and high school teachers taught writing when providing in-class, online, and hybrid instruction during the third school year of the COVID-19 pandemic. While such differences were reported during the first and second school year of the pandemic in the United States and elsewhere (Blikstad-Balas et al., 2021; Goodrich et al., 2022; Metga et al., 2021), we reasoned that such effects were less likely to occur by the third year. By this point, teachers had gained considerable experience in switching between the different modes of instruction. Further, moves from in-class to online or hybrid teaching at this time were less frequent and shorter than they had been in prior years.

Consistent with our prediction, there were no statistically detectable differences when teachers taught in-class, online, or a hybrid mode in the proportion of lessons during which each of the targeted writing activities were applied or the average amount of time devoted to each activity across all reported lessons and in lessons where the activity occurred. The only exception involved students creating digital writing projects. This writing activity was statistically more likely to happen when teaching was delivered in a hybrid fashion than in-class at school. It is possible teachers emphasized creating a digital writing project more frequently in hybrid classes because some of their students were already participating in-class through digital means. They may have believed this would make it easier to monitor and assist students with digital writing because some students were already engaged digitally. However, this explanation seems unlikely since there were no statistically detectable differences between online and in-class at school teaching for this writing activity. It is important, therefore, that future studies examining the

application of digital writing under different modes of instruction interview teachers to determine what, how, and why they apply such procedures under these conditions. An obvious limitation of the current study is that we did not identify the types of digital products students created, nor did we ask teachers to indicate their reasoning behind employing digital writing in their classrooms.

Another limitation of the current study was that we did not have comparable data for how the 38 middle and high school teachers taught writing during the previous two school years of the COVID-19 pandemic. Such data would have provided useful information for determining if and how writing instruction changed over the course of the pandemic as well as how this was related to changes in mode of instruction (i.e., in-class, online, and hybrid). Unfortunately, it is unlikely that the COVID-19 pandemic is the last pandemic that schools will have to address. We encourage educational agencies and researchers to be more planful right from the start to the end of subsequent pandemics in tracking how the teaching of writing and other subject areas progress by monitoring changes in teaching as well as student and teacher outcomes.

Middle and High School Writing Instruction

A second purpose of the present study was to describe how writing is taught to middle and high school students. Prior studies examining instructional practices in writing have relied on observations (e.g., Rietdijk et al., 2018), interviews (e.g., Hertzberg & Roe, 2016), surveys (e.g., Drew et al., 2017), or some combination of these procedures (e.g., Applebee & Langer, 2011). We applied a unique approach to studying classroom writing practices in this investigation. Teachers were asked each school day to complete a survey reporting if and for how long they applied specific writing activities. In contrast to previous surveys where teachers were asked to remember and reconstruct what they did over a long period of time (usually a school year),

teachers in the current study only had to remember what was done that day. To our knowledge, this is the first study to apply this approach to studying the writing practices of teachers.

As predicted, there were no statistically detectable differences between middle and high school teachers in the proportion of lessons during which each of the targeted writing activities were applied or the average amount of time devoted to each activity across all lessons and in lessons where the activity occurred. The only exception involved the teaching of grammar. Middle school teachers reportedly taught grammar in proportionally more lessons than high school teachers, although there were no statistically detectable differences between the time devoted to such instruction across all lessons or the ones in which grammar was taught. Likely explanations for this important and notable finding include that high school teachers believed that older students do not need this instruction as much as younger students, grammar instruction is not effective, or both. Assuming our finding regarding grammar is replicated in future research, middle and high school teachers should be interviewed to determine their beliefs about teaching grammar and how this influences their classroom practices.

Consistent with our predictions, there were statistically detectable differences in how frequently teachers in this study applied the writing activities they reported on daily. The most common writing activity reportedly applied was writing short responses. This occurred in slightly more than one-fifth of all lessons (21.9%). As anticipated, this occurred in proportionally more lessons than producing three to five paragraph texts (11% of lessons) or texts longer than five paragraphs (1.6% of lessons). These outcomes were consistent with prior studies showing that secondary school teachers assign shorter writing activities more often than longer ones (Applebee & Langer, 2011; Drew et al., 2017; Gillespie et al., 2014; Graham et al., 2014; Kiuhara et al. 2009; Ray et al., 2016). Why is this case? Teachers may favor shorter writing

assignments because they take less time to grade or provide students with feedback. Such assignments may address teachers' learning goals for students better than longer ones. Teachers may also assign shorter assignments more often than longer ones because they believe there simply is not enough class time for writing longer texts. We were not able to determine the veracity of any of these explanations in the current study, and encourage researchers to address these explanations directly in future investigations.

Also as expected, teaching translation skills of sentence construction and grammar was privileged over teaching transcription skills of typing and spelling. Teaching typing and spelling each reportedly occurred in one out of every 200 lessons or less, whereas teaching sentence skills and grammar each reportedly occurred in close to one out of every ten lessons. It is possible that teachers devoted so little instruction to spelling and typing because they assumed secondary students had already mastered these skills, they were unsure of how to teach them, they believed they did not have enough time to teach them, and/or they did not view the teaching of these skills as their responsibility. If our findings involving the teaching of translation and transcription skills are replicated, we encourage other researchers to interview secondary teachers to determine how their beliefs, knowledge, and past experiences influence the teaching of these skills.

We further assumed that teachers would place greater emphasis on planning than they did on revising or proofreading. This prediction was supported. Planning for writing reportedly occurred in one out of every six lessons, whereas revising and proofreading each occurred in one out of every 20 lessons. This may have been a direct consequence of the type of writing teachers most frequently assigned (i.e., text no more than two paragraphs in length). They may not have viewed such assignments as needing much revising or proofreading. It is also possible that teachers viewed planning as more impactful than revising and proofreading and, as a result,

placed greater emphasis on this process. Again assuming that our outcomes are replicated, researchers need to query teachers about the presumed importance of planning, revising, and proofreading, and if their beliefs about these processes differ depending upon the types of writing they assign.

It must be noted that few lessons and relatively little time was devoted to students creating digital written products. Just one out of every 30 lessons involved this writing activity, and across all reported lessons less than two minutes on average involved such writing. Composing digitally was virtually absent from the 38 teachers' classes. This outcome was consistent with previous studies with secondary students where little time was devoted to creating text digitally (Applebee & Langer, 2011; Gillespie et al., 2014; Graham et al., 2014; Kiuhara et al., 2009). The lack of digital writing in schools, as represented by the teachers in this investigation and prior studies, contrasts sharply with adolescents' use of digital writing tools outside of school (Freedman et al., 2016). Research is needed to identify methods for increasing the use of such writing in schools.

A somewhat unique feature of the current study was that we examined a commonly assumed, but infrequently tested proposition: teachers differ in how they teach writing. We tested this proposition by using Rasch analyses to determine if there were different clusters of teachers in terms of how often they included one or more writing activities in their lessons and how frequently they applied targeted writing activities across all lessons. As expected, teachers did differ in how they taught writing, and for each measure there were four separable groups of teachers. In essence, we found that individual differences in how teachers taught writing were more notable than differences in how writing was taught in-person, online, and through hybrid modes. These findings suggest that researchers need to place greater attention on why secondary

teachers differ in how they approach writing, and whether these differences are related to their preparation, knowledge about writing, and students' progress.

Collectively, as a group, it is clear that teachers in this study devoted little time to writing and teaching writing across all reported lessons. The targeted writing activities were only included in two-thirds of teachers' reported lessons. Slightly less than one of these writing activities was applied in any given lesson. An average of just 16 minutes per lesson was devoted to teaching writing when the four kinds of writing (short responses, 3 to 5 paragraphs, longer than 5 paragraphs, and creating digital writing products) and the three writing processes (planning, revising, and proofreading) were combined. An additional three minutes per reported lesson was devoted to teaching sentence skills, grammar, typing, and spelling. It should be noted, however, that when a writing activity was applied, anywhere to 15 to 40 minutes was typically devoted to it. The question facing policy makers, researchers, and educators who wish to improve school-based writing instruction is: How can we convince teachers to engage in these and other writing activities more often?

Limitations

There are three limitations that readers should keep in mind when interpreting the outcomes from this study. One, the investigation involved only 38 middle and high school teachers. While the teachers were from multiple locations across the United States, we have no way of knowing how representative they are of secondary teachers more generally.

Two, this study relied on self-report methods. While these reports were collected daily, placing much less demands on teachers' memories than surveys asking them to remember their instructional moves across larger times frames, it is possible that teachers' over- or under-represented what they did, especially in terms of time spent on each writing activity. To address

this issue, we asked teachers to indicate within 10-min intervals how much time was devoted to a writing activity when they reported applying it. While this approach meant that teachers did not have to try to determine the exact amount of time devoted to a writing activity, it meant that less certainty could be placed on any calculations involving time that were undertaken in this study.

Three, we only asked teachers to provide us with information on 11 specific writing activities daily, and one of these occurred so infrequently (i.e., teaching spelling) that it was not used in any analyses. As a result, we cannot draw a complete picture of how they taught writing because it is likely they engaged in other writing activities during surveyed lessons. We purposefully constrained the number of writing activities surveyed because we were afraid they would not complete the daily surveys very often if the number of items was increased.

Conclusions

Previous studies examining how writing was taught at the start of the COVID-19 pandemic provided evidence that writing instruction was negatively impacted when it was delivered online or in a hybrid fashion (Blikstad-Balas et al., 2021; Goodrich et al., 2022; Metga et al., 2021). This was not the case during the 2021-2022 school year of the pandemic for the middle and high school teachers in the current investigation, as there were virtually no differences in the reported writing practices of these teachers during in-class, online, or hybrid instruction. If the pandemic continues to influence educational practices, there is no guarantee that it will not subsequently have a negative impact on the teaching of writing, as it is impossible to predict exactly how it will evolve.

The positive finding that in-class, online, and hybrid instruction were similar was off-set by the relatively meager attention teachers gave to writing. Even though the participants were overwhelmingly language arts teachers, writing or writing instruction occurred in just two-thirds

of their classes, and a typical class involved a single writing activity, with 19 minutes devoted to the surveyed writing activities per lesson. Simply put, writing requires greater emphasis in secondary schools if students are to develop the writing skills they need for success and beyond. This is not a new concern (see Graham, 2019), and it is essential that the public, policy makers, researchers, administrators, and teachers demand that writing receive greater emphasis in school.

References

Applebee, A., & Langer, J. (2011). A snapshot of writing instruction in middle schools and high schools. *English Journal*, *100*, 14–27.

Azner, A., Sowden, P., Bayless, S., Ross, K., Warhurst, A., & Pachi, D. (2021). Home-schooling during COVID-19 lockdown: Effects of coping style, home space, and everyday creativity on stress and home-schooling outcomes. *Couple and Family Psychology: Research & Practice, 10,* 294-312.

Bates, D., Mächler, M., Bolker, B., Walker, S. (2015). "Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software, 67*(1), 1-48.

Blikstad-Balas, M., Roe, A., Dalland, C. P., & Klette, K. (2022). Homeschooling in Norway During the Pandemic-Digital Learning with Unequal Access to Qualified Help at Home and Unequal Learning Opportunities Provided by the School. In F. M. Reimers (Ed.), *Primary and Secondary Education During Covid-19. Disruptions to Educational Opportunity During a Pandemic* (pp. 177-201). Springer. https://doi.org/10.1007/978-3-030-81500-4_7

Brindle, M., Graham, S., Harris, K. R., & Hebert, M. (2016). Third and fourth grade teacher's classroom practices in writing: a national survey. *Reading and Writing: An Interdisciplinary Journal*, *29*(5), 929–954. https://doi.org/10.1007/s11145-015-9604-x

Common Core State Standards: National Governors Association and Council of Chief School Officers (2010). Downloaded from: http://*www.corestandards.org/.*

Decker, S., Peelet, T., & Riser-Kositsky, K. (July 1, 2020). The The Coronarius spring: The historic closing of US schools (A timeline). *Education Week*.

https://www.edweek.org/leadership/the-coronavirus-spring-the-historic-closing-of-u-s-schools-a-timeline/2020/07

Daniel, J. (2020). Education and the COVID-19 pandemic. *Prospectus, 49,* 91-96.

Di Pietro, D., Biagi, G., Costa, P., Karpinski, Z., & Mazza, J. (2020). *The likely impact of COVID-19 on education: Reflections based on existing literature and recent international datasets.* EUR 30275 EN, Publications Office of the European Union, Luxembourg.

Drew, S., Olinghouse, N., Luby-Faggella, M., & Welsh, M. (2017). Framework for disciplinary writing in science Grades 6–12: A national survey. *Journal of Educational Psychology*, *109*, 935–955.

Fitzgerald, J., (1987). Research on revision in writing. *Review of Educational Research, 57*, 481-506.

Freedman, S. W., Hull, G. A., Higgs, J. M., & Booten, K. P. (2016). Teaching writing in a digital and global age: Toward access, learning, and development for all. In D. H. Gitomer & C. A. Bell (Eds.), *Handbook of research on teaching* (5th ed., pp. 1389–1450). Washington, DC: American Educational Research Association.

Gillespie, A., Graham, S., Kiuhara, S., & Hebert, M. (2014). High school teachers' use of writing to support students' learning: A national survey. *Reading & Writing: An Interdisciplinary Journal*, *27*, 1043–1072.

Goodrich, J., Hebert, M., & Namkung. J. (2022) Impacts of the COVID-19 pandemic on elementary school teachers' practices and perceptions across the Spring and Fall 2020 semesters. *Frontiers in Education,* 6, 793285. doi: 10.3389/feduc.2021.793285

Graham, S. (2018). A revised writer(s)-within-community model of writing. *Educational Psychologist (4*), 258-279. doi:10.1080/00461520.2018.1481406

Graham, S. (1990). The role of production factors in learning disabled students= compositions. *Journal of Educational Psychology, 82*, 781-791.

Graham, S., Cappizi, A., Harris, K. R., Hebert, M., & Morphy, P. (2014). Teaching writing to middle school students: A national survey. *Reading & Writing: An Interdisciplinary Journal*, *27*, 1015–1042.

Graham, S., Harris, K. R., Fink, B., & MacArthur, C. (2001). Teacher efficacy in writing: A construct validation with primary grade teachers. *Scientific Study of Reading*, *5*(2), 177–202. https://doi.org/10.1207/S1532799Xssr0502_3

Graham, S., Harris, K.R., & Hebert, M. (2011). It is more than just the message: Analysis of presentation effects in scoring writing. *Focus on Exceptional Children, 44* (4), 1-12.

Graham, S., & Hebert, M. (2011). Writing-to-read: A meta-analysis of the impact of writing and writing instruction on reading. *Harvard Educational Review, 81,* 710-744.

Graham, S., Kiuhara, S., & MacKay, M. (2020). The effects of writing on learning in science, social studies, and mathematics: A meta-analysis. *Review of Educational Research, 90,* 179-226.

Graham, S., & Perin, D. (2007). A meta-analysis of writing instruction for adolescent students. *Journal of Educational Psychology, 99,* 445-476.

Graham, S., & Santangelo, T. (2014). Does spelling instruction make students better spellers, readers, and writers? A meta-analytic review. *Reading & Writing: An Interdisciplinary Journal, 27,* 1703-1743.

Hayes, J. (1996). A new framework for understanding cognition and affect in writing. In M.. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 1-27). Mahwah, NJ: Erbaum.

Hertzberg, F., & Roe, A. (2016). Writing in the content areas: A Norwegian case study. *Reading & Writing: An Interdisciplinary Journal*, *29*, 555–576.

Hsiang, T., Graham, S., Wang, Z., Wang, C., & Skar, G. (in press). Teaching Chinese characters to students in grades 1 to 3 through emergency remote instruction during the COVID-19 pandemic. *Reading & Writing: An Interdisciplinary Journal.*

Hammerstein, S., Kong, C., Dreisorner, T., & Frey, A. (2021). Effects of COVID-19 related school closures on student achievement – A systematic review. *Frontiers in Psychology, 12,* 746289.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review, 27,* 1-12.

Huber, S., Gunther, P., Scneider, N., Helm, C., Schwander, M., Schneider, J., & Pruitt, J. (2020). *COVID-19 und aktuelle Herausforderungen in Schule und Bildung*. *https://www.waxmann.com/index.php?eID=download&buchnr=4216*

Kiuhara, S., Graham, S., & Hawken, L. (2009). Teaching writing to high school students: A national survey. *Journal of Educational Psychology*, *101*, 136–160.

König, C., & Frey, A. (2022). The Impact of COVID-19-Related School Closures on Student Achievement—A Meta-Analysis. Educational Measurement: Issues and Practice, 41(1), 16-22. https://doi.org/10.1111/emip.12495

Linacre, J. M. (2018a). *A user's guide to FACETS. Rasch-model computer programs. Program manual 3.80.4*. Winsteps.com.

Linacre, J. M. (2018b). *Facets® (version 3.80.4) [Computer Software]*. Winsteps.com.

McSweeney M. (1967). Nonparametric post-hoc comparisons for trend. *Psychological Bulletin,67*, 401-412.

Merga, M. K., Malpique, A., Mat Roni, S., Valcan, D. & Ledger, S. (2021). Teachers' perceptions of the impact of COVID-19 on writing instruction in Australia. *Issues in Educational Research, 31*(4), 1138-1155. http://www.iier.org.au/iier31/merga.pdf

Morphy, P., & Graham, S. (2012). Word processing programs and weaker writers/readers: A meta-analysis of research findings. *Reading and Writing: An Interdisciplinary Journal, 25,* 641-678.

Oberle, E., & Schonert-Reichl, K. (2016). Stress contagion in the classroom? The link between teacher burnout and morning cortisol in elementary students. *Social Sciences and Medicine, 159*(June), 30-37.

OECD. (2021). *The state of global education: 18 months into the pandemic.* OECD Publishing. https://www.oecd.org/education/state-of-school-education-one=year-into-covid.htm

R Core Team (2020). *R: A language and environment for statistical computing.* R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.

Rasch, G. (1980). *Probabilistic Models for Some Intelligence and Attainment Tests*. The University of Chicago Press.

Rauf, D. (2020, June). Coronavirus pushes schools closer to a computer for every student. *Education Week. https://www.edweek.org/technology/coronavirus-pushes-schools-closer-to-a-computer-for-every-student/2020/06*

Ray, A., Graham, S., Houston, J., & Harris, K. R. (2016). Teachers' use of writing to support students' learning in middle school: A national survey in the United States. *Reading & Writing: An International Journal*, *29*, 1039–1068.

Rietdijk, S., van Weijen, D., Jassen, T, van den Bergh, H., & Rijlaarsdam, G. (2018). Teaching

writing in primary education: Classroom practice, time, teachers' beliefs and skills. *Journal of Educational Psychology*, *110*, 640–663.

Reimers, F. (2022). Learning from a pandemic: The impact of COVID-19 on education around the world. In F. Reimers (Ed.), *Primary and secondary education during COVID-19* (pp. 1-37). Springer

Rogers, L., & Graham, S. (2008). A meta-analysis of single subject design writing intervention research. *Journal of Educational Psychology, 100,* 879 - 906.

Schleicher, A. (2020). *The impact of COVID-19 on education: Insights from education at a glance.* OECD Publishing. https://www.oecd.org/education/education-at-a-glance/

Schumacker, R. E., & Smith, E. V. (2007). Reliability. A Rasch Perspective. *Educational and Psychological Measurement*, *67*(3), 394–409. https://doi.org/10.1177/0013164406294776Marascuilo L., &

Skar, G. B., Graham, S., & Huebner, A. (2022). Learning loss during the COVID-19 pandemic and the impact of emergency remote instruction on first grade students' writing: A natural experiment. *Journal of Educational Psychology, 114,* 1553-1566. https://doi.org/10.1037/edu0000701

Skar, G., Graham, S., & Huebner, A. (in press). The long-term effects of the COVID-19 pandemic on children's writing: A follow-up replication study. *Educational Psychology Review.*

UNESCO. (2020). *COVID-19 impact on education.* https://en.unesco.org/COVID-1919/educationresponse

Table 1. Breakdown by mode and grade-level for proportion of lessons with writing activity, average time for activity across all lessons, and average time for activity when it occurred.

Writing activity	Statistic	N	In-class	Online	Hybrid	MS	HS	Total
Write short responses (no more than two paragraphs)	Proportion of lessons	38	0.211 (0.008)	0.248 (0.008)	0.236 (0.008)	0.222 (0.008)	0.217 (0.008)	0.219 (0.008)
	Time per lesson		4.468 (10.269)	5.181 (10.787)	4.964 (10.260)	4.820 (10.623)	4.466 (10.147)	4.620 (10.356)
	Time when taught		21.165 (12.092)	20.863 (11.902)	21.012 (10.414)	21.709 (11.905)	20.616 (11.934)	21.097 (11.923)
Planning for writing	Proportion of Lessons	38	0.169 (0.007)	0.138 (0.007)	0.159 (0.007)	0.166 (0.007)	0.161 (0.007)	0.163 (0.007)
	Time per lesson		4.384 (10.972)	3.456 (9.944)	4.000 (10.543)	4.667 (11.740)	3.850 (9.974)	4.205 (10.782)
	Time when taught		25.915 (12.399)	25.103 (13.033)	25.098 (13.274)	28.098 (13.098)	23.887 (11.779)	25.747 (12.540)
Writing 3 to 5 paragraph texts	Proportion of lessons	36	0.110 (0.006)	0.104 (0.006)	0.126 (0.006)	0.118 (0.006)	0.104 (0.006)	0.110 (0.006)
	Time per lesson		3.859 (11.814)	3.007 (9.801)	3.819 (11.272)	4.131 (12.317)	3.396 (10.765)	3.715 (11.469)
	Time when taught		35.180 (13.059)	28.957 (13.242)	30.217 (14.537)	35.040 (14.285)	32.752 (12.508)	33.818 (13.391)
Teaching sentence skills	Proportion of lessons	38	0.090 (0.006)	0.093 (0.006)	0.121 (0.006)	0.084 (0.005)	0.098 (0.006)	0.092 (0.006)
	Time per lesson		2.076 (7.627)	1.947 (7.018)	2.964 (9.245)	2.181 (8.164)	2.064 (7.236)	2.115 (7.652)
	Time When taught		23.141 (12.706)	21.037 (11.516)	24.523 (13.522)	25.862 (13.382)	20.977 (11.659)	22.915 (12.575)
Teaching grammar	Proportion of lessons	28	0.092 (0.006)	0.081 (0.005)	0.060 (0.005)	0.147 (0.007)	0.043 (0.004)	0.088 (0.005)
	Time per lesson		2.000 (7.515)	1.836 (7.302)	0.929 (4.118)	2.689 (7.727)	1.289 (6.898)	1.897 (7.301)
	Time when taught		21.664 (13.689)	22.597 (13.814)	15.364 (7.941)	18.275 (11.010)	30.031 (15.756)	21.513 (13.528)
Revising text	Proportion of lessons	35	0.047 (0.004)	0.074 (0.005)	0.082 (0.005)	0.048 (0.004)	0.059 (0.005)	0.054 (0.004)
	Time perl lesson		1.065 (5.716)	1.847 (7.654)	1.313 (5.494)	0.929 (5.232)	1.428 (6.635)	1.211 (6.070)
	Time when taught		22.515 (14.478)	24.788 (14.922)	15.933 (11.859)	19.268 (14.765)	24.292 (13.970)	22.352 (14.441)
Proofreading text	Proportion of lessons	27	0.037 (0.004)	0.059 (0.005)	0.104 (0.006)	0.036 (0.004)	0.052 (0.004)	0.045 (0.004)

Writing activity	Statistic	N	In-class	Online	Hybrid	MS	HS	Total
	Time per lesson		0.559 (3.644)	1.239 (6.105)	0.810 (2.812)	0.579 (3.876)	0.774 (4.289)	0.689 (4.115)
	Time when taught		15.300 (11.800)	21.115 (14.916)	7.763 (4.750)	16.012 (13.125)	15.019 (12.028)	15.367 (12.377)
Creating digital writing products	Proportion of lessons	23	0.026 (0.003)	0.061 (0.005)	0.060 (0.005)	0.022 (0.003)	0.044 (0.004)	0.034 (0.004)
	Time per lesson		0.871 (5.638)	2.298 (9.601)	1.596 (6.522)	0.665 (4.814)	1.534 (7.582)	1.157 (6.539)
	Time when taught		33.083 (11.987)	37.704 (13.444)	26.409 (7.006)	29.731 (13.319)	35.182 (11.671)	33.641 (12.334)
Writing text longer than 5 paragraphs	Proportion of lessons	11	0.015 (0.002)	0.027 (0.003)	0.000 (0.000)	0.006 (0.001)	0.023 (0.003)	0.0157 (0.002)
	Time per lesson		0.592 (4.970)	1.074 (6.804)	0.000 (0.000)	0.248 (3.446)	0.926 (6.147)	0.632 (5.161)
	Time when taught		40.500 (8.610)	39.667 (13.790)	NA	41.214 (18.127)	40.071 (8.168)	40.262 (10.178)
Teaching typing skills	Proportion of Lessons	5	0.005 (0.001)	0.005 (0.001)	0.000 (0.000)	0.001 (0.001)	0.008 (0.002)	0.005 (0.001)
	Time per Lesson		0.146 (2.086)	0.093 (1.416)	0.000 (0.000)	0.031 (1.041)	0.202 (2.375)	0.127 (1.915)
	Time When Taught		27.272 (8.864)	20.500 (7.071)	NA	35.5 (NA)	25.458 (8.635)	26.231 (8.724)

Note: MS = middle school; HS = high school; an entry of NA for the mean indicates that the skill was not recorded as being taught for a particular mode. Also, for teaching typing, there was only one observation of a middle school reporting teaching this skill, so a standard deviation could not be computed. This was indicated as (NA) in the corresponding cell.

Table 2. Comparisons of proportion of lessons each writing activity occurred using the Marascuillo procedure.

Contrast	Value	Critical Value	Significant
$p_{Grammar} - \boldsymbol{p_{CreateDig}}$	-0.004	0.032	No
$p_{Grammar} - \boldsymbol{p_{Planning}}$	-0.075	0.037	Yes
$p_{Grammar} - \boldsymbol{p_{WriteShort}}$	-0.131	0.040	Yes
$p_{Grammar} - \boldsymbol{p_{Write\ 3\ to\ 5\ Para}}$	-0.022	0.034	No
$\boldsymbol{p_{Grammar}} - p_{WriteLong}$	0.072	0.025	Yes
$\boldsymbol{p_{Grammar}} - p_{Revise}$	0.034	0.029	Yes
$\boldsymbol{p_{Grammar}} - p_{Proof}$	0.043	0.028	Yes
$\boldsymbol{p_{Grammar}} - p_{CreateDig}$	0.054	0.027	Yes
$\boldsymbol{p_{Grammar}} - p_{Type}$	0.083	0.023	Yes
$p_{CraftSent} - \boldsymbol{p_{Planning}}$	-0.071	0.037	Yes
$p_{CrafSent} - \boldsymbol{p_{WriteShort}}$	-0.127	0.040	Yes
$p_{CraftSent} - \boldsymbol{p_{Write\ 3\ to\ 5\ Para}}$	-0.018	0.034	No
$\boldsymbol{p_{CraftSent}} - p_{WriteLong}$	0.077	0.025	Yes
$\boldsymbol{p_{CraftSent}} - p_{Revise}$	0.038	0.029	Yes
$\boldsymbol{p_{CraftSent}} - p_{Proof}$	0.047	0.028	Yes
$\boldsymbol{p_{CraftSent}} - p_{CreateDig}$	0.058	0.027	Yes
$\boldsymbol{p_{CraftSent}} - p_{Type}$	0.087	0.024	Yes
$p_{Planning} - \boldsymbol{p_{WriteShort}}$	-0.056	0.044	Yes
$\boldsymbol{p_{Planning}} - p_{Write\ 3\ to\ 5\ Para}$	0.053	0.038	Yes
$\boldsymbol{p_{Planning}} - p_{WriteLong}$	0.148	0.031	Yes
$\boldsymbol{p_{Planning}} - p_{Revise}$	0.109	0.034	Yes
$\boldsymbol{p_{Planning}} - p_{Proof}$	0.118	0.034	Yes
$\boldsymbol{p_{Planning}} - p_{CreateDig}$	0.129	0.033	Yes
$\boldsymbol{p_{Planning}} - p_{Type}$	0.158	0.030	Yes
$\boldsymbol{p_{WriteShort}} - p_{Write\ 3\ to\ 5\ Para}$	0.109	0.041	Yes
$\boldsymbol{p_{WriteShort}} - p_{WriteLong}$	0.203	0.034	Yes
$\boldsymbol{p_{WriteShort}} - p_{Revise}$	0.165	0.037	Yes
$\boldsymbol{p_{WriteShort}} - p_{Proof}$	0.174	0.037	Yes
$\boldsymbol{p_{WriteShort}} - p_{CreateDig}$	0.185	0.036	Yes
$\boldsymbol{p_{WriteShort}} - p_{Type}$	0.214	0.033	Yes
$\boldsymbol{p_{Write\ 3\ to\ 5\ Para}} - p_{WriteLong}$	0.094	0.027	Yes
$\boldsymbol{p_{Write\ 3\ to\ 5\ Para}} - p_{Revise}$	0.056	0.031	Yes
$\boldsymbol{p_{Write\ 3\ to\ 5\ Para}} - p_{Proof}$	0.065	0.030	Yes
$\boldsymbol{p_{Write\ 3\ to\ 5\ Para}} - p_{CreateDig}$	0.075	0.029	Yes
$\boldsymbol{p_{Write\ 3\ to\ 5\ Para}} - p_{Type}$	0.105	0.025	Yes
$p_{WriteLong} - \boldsymbol{p_{Revise}}$	-0.038	0.021	Yes
$p_{WriteLong} - \boldsymbol{p_{Proof}}$	-0.029	0.019	Yes
$p_{WriteLong} - \boldsymbol{p_{CreateDig}}$	-0.019	0.018	Yes
$\boldsymbol{p_{WriteLong}} - p_{Type}$	0.011	0.011	No
$\boldsymbol{p_{Revise}} - p_{Proof}$	0.009	0.024	No
$\boldsymbol{p_{Revise}} - p_{CreateDig}$	0.020	0.023	No
$\boldsymbol{p_{Revise}} - p_{Type}$	0.049	0.019	Yes

Contrast	Value	Critical Value	Significant
$\boldsymbol{p_{Proof}} - p_{CreateDig}$	0.010	0.022	No
$\boldsymbol{p_{Proof}} - p_{Type}$	0.040	0.017	Yes
$\boldsymbol{p_{CreateDig}} - p_{Type}$	0.030	0.016	Yes

Note: A writing activities in a pairwise comparison that was bolded indicated statistically detectable differences favoring the bolded item; P = proportion of lessons; Grammar = teaching grammar; CreateDig = create digital writing projects; Planning = planning text; WriteShort = write short text (2 paragraphs or shorter); Write 3 to 5 para = writing 3 to 5 paragraph text; PwriteLong = write text 5 paragraphs or longer; Revise = revise text; Proof = proofread text; Type = teach typing; CraftSent; Teach sentence skills.

Table 3. Number of lessons reported, percentages, logits and reliability of separation for teachers for Rasch analyses.

	Lessons reported	Lessons with writing		Writing activities	Writing activites/lesson	
Teacher	N	Per cent	Logits (S.E.)	N	Per cent	Logits (S.E.)
#1	81	59	0.43 (0.23)	53	7	-3.11 (0.15)
#2	77	61	0.5 (0.23)	47	6	-3.19 (0.15)
#3	93	57	0.33 (0.21)	61	7	-3.11 (0.14)
#4	64	86	1.85 (0.36)	62	10	-2.66 (0.14)
#5	84	86	1.84 (0.31)	72	9	-2.8 (0.13)
#6	111	50	0.07 (0.19)	67	6	-3.2 (0.13)
#7	80	85	1.79 (0.31)	102	13	-2.33 (0.11)
#8	112	46	-0.14 (0.19)	63	6	-3.28 (0.13)
#9	39	85	1.71 (0.44)	86	22	-1.59 (0.13)
#10	85	69	0.87 (0.24)	64	8	-2.95 (0.13)
#11	83	60	0.44 (0.22)	68	8	-2.86 (0.13)
#12	75	85	1.82 (0.33)	69	9	-2.72 (0.13)
#13	90	42	-0.25 (0.21)	41	5	-3.51 (0.16)
#14	87	67	0.74 (0.23)	62	7	-3.02 (0.14)
#15	58	66	0.72 (0.28)	46	8	-2.89 (0.16)
#16	53	72	0.98 (0.3)	39	7	-2.98 (0.17)
#17	80	61	0.49 (0.23)	53	7	-3.1 (0.15)
#18	96	22	-1.22 (0.25)	26	3	-4.06 (0.2)
#19	65	65	0.66 (0.26)	42	6	-3.13 (0.16)
#20	37	84	1.73 (0.45)	88	24	-1.48 (0.13)

#21	51	76	1.23 (0.33)	51	10	-2.62 (0.15)
#22	87	70	0.9 (0.23)	82	9	-2.69 (0.12)
#23	83	98	3.75 (0.72)	114	14	-2.23 (0.11)
#24	58	78	1.22 (0.32)	81	14	-2.21 (0.13)
#25	51	65	0.62 (0.29)	33	6	-3.12 (0.18)
#26	89	82	1.56 (0.28)	84	9	-2.69 (0.12)
#27	51	59	0.37 (0.28)	34	7	-3.09 (0.18)
#28	52	83	1.62 (0.37)	52	10	-2.62 (0.15)
#29	73	77	1.15 (0.28)	58	8	-2.89 (0.14)
#30	62	35	-0.67 (0.27)	38	6	-3.18 (0.17)
#31	73	60	0.47 (0.24)	53	7	-2.99 (0.15)
#32	54	76	1.21 (0.32)	50	9	-2.71 (0.15)
#33	80	57	0.36 (0.23)	54	7	-3.08 (0.14)
#34	88	64	0.61 (0.22)	65	7	-2.97 (0.13)
#35	71	85	1.74 (0.33)	71	10	-2.62 (0.13)
#36	46	87	1.97 (0.44)	44	10	-2.67 (0.16)
#37	32	50	0.06 (0.35)	22	7	-3.06 (0.23)
#38	25	56	0.33 (0.4)	15	6	-3.21 (0.27)
Average	70	0.68	0.89 (0.3)		0.09	-2.86 (0.15)
Reliability						
R			.88			.89
G			3.87			4.17