

Teachers' Engagement in and Coping with Emergency Remote Instruction during COVID-19-Induced School Closures: A Multinational Contextual Perspective

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Abstract

The COVID-19 pandemic required educators and learners to shift to emergency remote instruction, often with little prior notice. To understand how teachers managed the transition, from April to September 2020 we surveyed nearly 1,500 instructors from 118 countries. Using cluster analysis, we have detected two readily distinguishable groups of instructors: a group who were more *engaged* in remote instruction and *coping* with the challenges of online teaching more successfully, and another group who scored lower on both of these fronts. We compare the two groups in terms of their sociodemographic characteristics, and assess the relationship between each sociodemographic marker and teachers' engagement and coping. Overall, our results suggest that teachers were most engaged and coped best with the transition when they had prior experience with remote instruction, worked in the higher education sector, and used real-time synchronous modalities. We also find non-trivial results regarding teachers' gender, years of teaching experience, and their country's level of economic development, while observing no relationship between teachers' age and their levels of engagement or coping. The detection of the contextual effects underscores the importance of large multisite research.

Keywords: COVID-19, emergency remote teaching, remote delivery, on-line teaching, synchronous/asynchronous delivery, school closure, teacher experience, engagement, coping, global survey, contextual variables

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In the spring of 2020, school across the world closed in the effort to reduce the transmission of the COVID-19 virus, throwing educational systems into disarray, disrupting the schooling of over 80% of the students worldwide, and upending the lives of teachers and their students (International Labour Organization, 2020; UNESCO, 2020). As institutions scrambled to ensure continuity of learning, educators and learners found themselves shifting to emergency remote instruction, usually with little time given for preparation.

To understand how teachers managed the transition, from April until September 2020 we carried out a custom-made multinational survey study involving participants from 118 countries, exploring 441 interlocking factors that potentially influenced the patterns of the stakeholders' adaptation to online provision during school closures. In this paper, we zoom in on two of the key constructs differentiating the better- and the worse-coping instructors: teachers' *engagement* in remote teaching and teacher *coping* with remote instruction. We present and discuss the findings against the backdrop of one individual and three contextual variables which were identified as significant moderating predictors: *gender*, *education level handled*, *mode of delivery* (synchronous versus asynchronous), and the *economic status* of the respondent's country.

Review of Relevant Literature

Scholarship is still nascent regarding teachers' adaptation to emergency remote instruction during the COVID-19-induced school closures. Several studies have focused on institutional or system-level factors that influence teacher transitions, while others have concentrated on individual teachers' personal and interpersonal contexts.

In terms of institutional or system-level factors, the University of Houston (2020) published a report summarizing the faculty's perceptions regarding the transition to a remote teaching model, revealing significant variation in terms of the implementation of technology tools and of the mode of instruction. While the transition was claimed to have worked under the circumstances, only a small fraction of the respondents did not experience some kind of obstacles, including concerns about the conducting of final assessment. A survey by Quality Matters and Eduventures® Research (Legon et al., 2020) carried out among chief online officers at colleges and universities reported that while most believed the pivot to remote teaching to be a logistic success, most simultaneously admitted at least a measure of difficulty, citing low levels of faculty and student preparedness (in 75% and 62% of cases, respectively). Better infrastructure had generally been available at schools with significant prior experience with online learning, while regional private universities—which attract students who choose small classes and close contact with faculty—reported the most negative student reactions. A report published by Ohio State University (Jaggars et al., 2020) discovered among others that faculty who taught their courses in real time rated online teaching challenges less negatively than those who prerecorded their lectures or used a different asynchronous delivery format. A survey deployed by Indiana University's eLearning Research and Practice Lab (2020) found that two thirds of the instructors felt disconnected from their students and that it was more difficult to teach after the school shuttered, while three quarters of the students felt they had lost touch with their IU community; a similar number declared it took them more effort to complete their course assignments after the transition. Paradowski and Jelińska (under review) showed how teachers' psychological overload during this time was mediated by the

education level handled and access to resources. Nuere and de Miguel (2020), following an observation of universities in Spain during the pandemic, came to the conclusions that institutions which had been used to conducting online classes had minimal problems working under new conditions, and that the quality of the process was strongly affected by the quality of online teaching tools. Bensaid and Brahim (2021) likewise attributed the successful maintenance of the learning cycle in higher education institutions in the Gulf to their already established distance education, swift administration and policy steps, and access to resources. Similarly, Tiejun (2020) claimed that due to prior preparation, education in Chinese colleges and universities did not suffer in the course of the outbreak. Reimers and Schleicher (2020) identified the most salient education needs during the pandemic, basing on survey responses from 98 different countries. These findings reveal a complex landscape of institutional and contextual influences on the effectiveness of emergency remote teaching.

In terms of instructors' personal adjustment, Jelińska and Paradowski analyzed the impact of forced remote teaching on college and university instructors' well-being, revealing for instance the importance of maintaining productivity alongside work-life synergy (under review), as well as the way teachers' professional adaptation to the new circumstances influenced their perception of how their students were coping with the novel situation (under revision). Watermeyer et al. (2020) carried out a survey of academic teachers' reactions to the move to online delivery and found that the majority of the respondents felt confident or strongly confident in their ability to facilitate online teaching and assessment, and considered their institutions to be supportive in enabling the move to online delivery. MacIntyre, Gregersen and Mercer (2020) investigated the correlations between approach and avoidant coping strategies and positive and negative psychological outcomes among an international sample of language teachers during the conversion to online instruction. Lapada et al.'s (2020) exploration of teachers' opinions on their schools' readiness and response to the challenges of distance education in the Philippines revealed that facility to adapt to distance education was strongly correlated with the length of teaching experience as well as geographic location. These studies offer some insights into how handling of the situation may be affected by individual teacher characteristics.

However, scholarship is still lacking on the specific factors influencing teachers' and learners' coping with the switch to remote instruction, and the relationships between these factors. Moreover, the vast majority of the available studies look at single countries, tend to focus on only one educational stage (e.g., either K–12 or higher education, but not both), and only on one mode of delivery (real-time or asynchronous; many of the studies also focus on "remote learning" in general collating responses regarding both modes without ever differentiating between them), absent a comparative-contrastive perspective. To fill these gaps, we launched a survey covering all levels of education across a variety of countries and designed to disentangle synchronous from asynchronous modes of remote delivery. Our comprehensive online survey was devised to explore what circumstances, behaviors, attitudes, and psychological traits made it easier to deal with the new reality, what challenges the respondents had been facing, and what helped them and their well-being.

The research questions addressed in this contribution are as follows:

- RQ1: Can one detect distinct subgroups of educators differentiated by their coping with the transition to emergency remote instruction?
- RQ2: If distinct teacher cohorts can be isolated, what characterizes each group?

RQ3: What are the patterns of educators' *engagement* in distance teaching vis-à-vis contextual variables?

RQ4: What are the contextual patterns of teachers' *coping* with online instruction? In particular, how do the contextual factors of the educational stage handled, mode of online delivery, and country level of development influence the observed trends?

Methods

Survey data collection was carried out with a custom-made questionnaire set up on a commercial survey software platform (in order to reach respondents in countries where solutions such as Google Forms cannot be accessed without a VPN). A criterion for taking the survey was transitioning from regular face-to-face classes to online teaching as part of the response to the COVID-19 epidemic, as the focus was on the *shift* to emergency remote teaching (as opposed to continuation of pre-planned and carefully designed online learning that had also existed before the epidemic; see Hodges et al., 2020).

The questionnaire was active from late April until the end of September 2020 and recruitment was based on a snowball sampling procedure. The survey was announced through several channels: distributed through the mailing lists and websites of professional teacher associations, via the researchers' direct personal contacts, through thematic groups and pages on social media, and on an electronic grade book platform used by 7,300 schools in Poland. The protocol had received the approval of the authors' Institutional Review Board.

Materials

At the outset of the emergency transition to remote learning, it was unclear which circumstances, behaviors, attitudes, or psychological traits would be most important to teachers' management of the transition. Accordingly, the survey incorporated a wide and complex array of measures and included a total of 441 question items. Apart from sociodemographic information, the questions concerned the circumstances surrounding the participants' transition to remote instruction, their personal experiences, behaviors, attitudes, feelings, physical and mental health, and their personality traits—factors considered relevant to the adaptation. With the exception of a battery of psychological testing instruments, questions concerning participants' circumstances, behaviors, and attitudes were custom designed especially for the context of the study. While one could fall back on a few existing scales (e.g., Brief-COPE; Carver, 1997), we felt we needed items that were more relevant to the specific, unprecedented scenario of emergency remote teaching, both to better represent this novel situation, and to be more relatable to the participants. The list of items was inspired by five weeks of discussions with fellow instructors, exchanges on dedicated groups on social media platforms, and numerous articles appearing on the topic in both general and specialized press. The resultant list was ultimately reviewed by volunteers in the pilot study.

This analysis focuses on 19 items which were originally designed to understand how instructors adapted their courses to remote learning and how they felt about that adaptation, which were each measured on a six-point Likert scale ranging from "Completely disagree" to "Completely agree." For a full list of items, see Appendix Table 1. In addition, we focus on the following *sociodemographic* factors: teachers' age, gender, work location (country), type of educational institution represented, years of professional experience, and mode of online teaching (synchronous vs. asynchronous).

Analysis

Our analysis consisted of four distinct steps: (a) an exploratory factor analysis to understand the constructs underlying our 19 Likert-scale items, which revealed the constructs of coping and engagement; (b) a cluster analysis to understand whether teachers fell into easily-distinguishable patterns or groupings on the two dimensions, followed by a descriptive analysis of those clusters; (c) an examination of whether teachers with different sociodemographic characteristics differed from one another in terms of coping and engagement; and (d) a regression predicting teachers' engagement based on their coping and sociodemographic characteristics. Below, we discuss each of these four steps in more detail.

First, we conducted an exploratory factor analysis (EFA) on the 19 Likert scale items, using standardized varimax rotation. EFA is particularly useful and commonly applied in developing measurement instruments that reflect latent dimensions or constructs which are represented by observed variables (Fabrigar et al., 1999). Each such variable is highly correlated with only one factor. The Keiser-Meyer-Olkin (KMO) measure of sampling adequacy was .838 and Bartlett's test of sphericity indicated that the interitem correlations were significant at the $p < .001$ level. Internal consistency among the items was satisfactory for both factors with Cronbach's alpha values above .70. The EFA resulted in two factors: *engagement* in remote teaching and *coping* with remote instruction (Appendix Table 1 shows the loadings for each item on the two factors). Six items had relatively low loadings on both factors and were dropped from further analysis. The final *engagement* scale consisted of 7 items assessing the extent to which educators get involved in this mode of instruction, their activities related to conducting classes such as syllabus modifications, alterations to the grading scheme, as well as attitudes toward online teaching (Cronbach's $\alpha = 0.72$, McDonald's $\omega_h = 0.75$, Guttman's $\lambda_6 = 0.71$, Raykov's $\rho = 0.76$). The *coping* scale consisted of 6 items assessing teachers' perceptions of overcoming difficulties such as technical issues and their own ability to use new technologies to prepare and conduct lessons (Cronbach's $\alpha = 0.78$, McDonald's $\omega_h = 0.80$, Guttman's λ_6 & Raykov's $\rho = 0.76$). To create each scale, after exploratory factor analysis all negatively formulated items were reversed in order for higher scores to indicate higher levels of engagement and coping. Reverse-worded items were used in this context in order to eliminate socially desirable answers and consequently avoid the response-set bias (Kreitchmann et al., 2019; Suarez-Alvarez et al., 2018; van Sonderen, Sanderman, & Coyne, 2013).

Second, we performed a cluster analysis to better understand the roles of the component items and sociodemographic variables in teachers' coping with emergency transition to remote teaching (Kaufman & Rousseeuw, 2005). Instead of identifying categories on the basis of prior, often arbitrary classifications, cluster analysis allows determining categories in a dataset based on actual observed cases (Crowther et al., 2021). Detection of subgroups of educators distinguishable by their patterns of engagement and coping with the transition to the novel situation was performed first by agglomerative hierarchical clustering (HCA) with Ward's linkage in order to identify the optimal number of subgroups, followed by a k -means cluster analysis on normalized mean values of the relevant constructs. The former technique is one of the most frequently applied methods to identify the optimal number of clusters (King, 2015, p. 29). Based on the results of the agglomerative hierarchical clustering, a non-hierarchical clustering analysis was subsequently conducted with the k -means method, which allows characterizing the pre-identified groups. Computationally, this method is an ANOVA "in reverse" in that it evaluates the between-cluster variability against the within-cluster variability. The degree to which the respective dimensions

discriminate between the groups are then revealed by their difference in means on each dimension and the magnitude of the F values. Given the two classes distinguished (better- and worse-coping teachers), the key statistically significant differences between the groups were determined using ANOVA F and χ^2 tests.

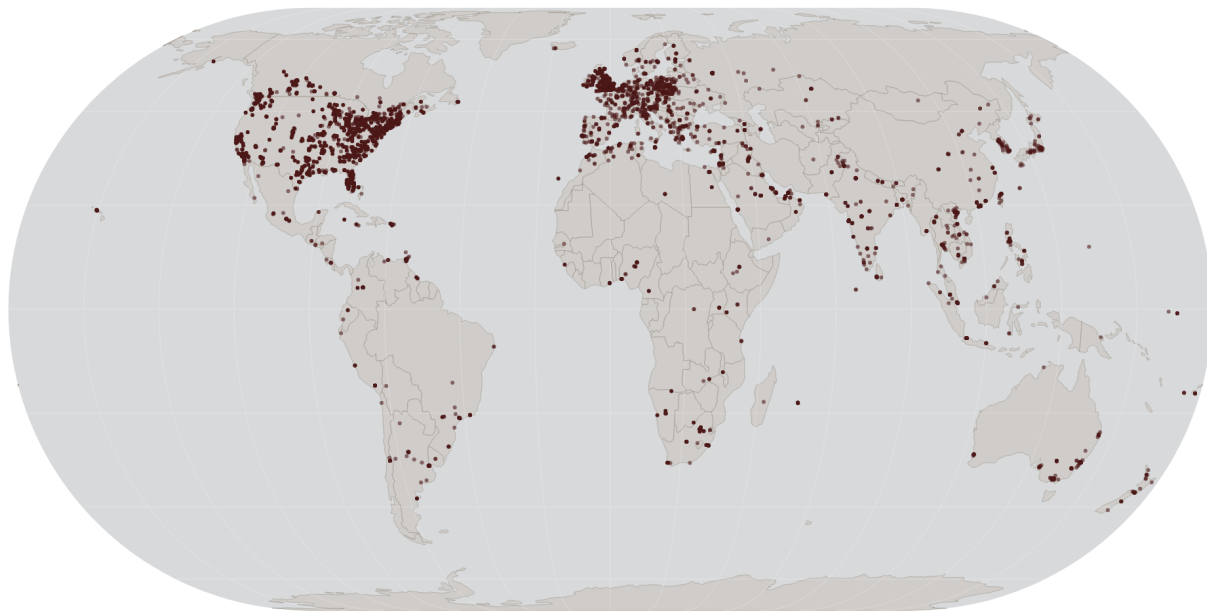
Third, in order to explore whether teachers with different sociodemographic characteristics differed from one another in terms of coping and engagement, we used ANOVA and t -tests to compare each construct (engagement and coping) between school type/level, country classification, age, gender, previous remote teaching experience, and mode of online delivery. Finally, to predict teachers' engagement based on their coping and sociodemographic characteristics, we used multivariate linear regressions with forward selection.

Respondent demographic profile

At the time of writing this paper (late August 2020), the survey discussed here had collected answers from 4,968 teachers¹, with 1,487 (30%) completing all the required questions. The answers of participants who abandoned the survey without completing all required questions are not included in this analysis in order to avoid artifacts. The respondents were resident in 118 countries (Figure and Table 1). 8.6% were teaching in a state that was not their home country.

Figure 1

Locations of the Respondents²



¹ The data analyzed in this paper form part of a much larger project (<https://schoolclosure.ils.uw.edu.pl/>) that also included university instructors in language-related fields as well as corresponding student and language learner populations. These latter data, as well as data collected during and after the mid-2020 semester break, are omitted from the analyses herein. For reasons of space and thematic coherence, we also exclude a presentation and discussion of other contextual findings as well as those from the battery of psychological tests that concluded the questionnaire.

² In a negligible number of cases, the locations may be inaccurate if the questionnaire respondents were using a VPN or IP spoofing.

Table 1

Respondent Locations (N = 1,487)

Continents and countries	Frequency (n)	Percent (%)
USA	588	39.5
Poland	248	16.7
UK	122	8.2
Canada	102	6.9
Australia	44	3.0
Rest of Europe	170	11.4
Asia	147	9.9
South America	27	1.8
Africa	25	1.7
Rest of North America	14	0.9

To better understand the potential influence of the socioeconomic conditions of working in these countries, they were classified as economically developed or developing on the basis of the World Bank classification (based on gross national income per capita). Overall, 90.05% of the teachers participating in this study work in developed countries, while the remaining 9.95% work in developing countries.

The gender distribution among the participants was 86% female and 13% male, with less than 1% (9 respondents) identifying as nonbinary/not listed. The age span was 22 to 74, with the mean and median 44; the teaching experience ranged from 0 to 49 years, with the mean 13.7 and median 12 years. Eighteen percent had previous experience with remote teaching, such as e-learning, blended courses, MOOCs, or webinars. The age range of the respondents as well as the reported length of teaching experience are presented in Tables 2 and 3, respectively. The teachers' degrees as well as subjects taught covered a full spectrum of disciplines (notably languages, science, math, history, arts, design, music, geography, biology, chemistry, health, psychology, literacy, and special education). Seventy percent of the teachers indicated that they had a fairly wide range of freedom in deciding on the topic and content of the courses they taught.³ Most teachers transitioned their courses into a real-time "synchronous" online modality (58%) while the remainder transitioned into an "asynchronous" modality, which was characterized by less directed methods such as sharing materials and/or uploading prerecorded content.

Table 2

Participant Age Groups (N= 1,487)

Age group (years)	Frequency (n)	Percent (%)
Under 35	314	21
36–45	455	31
46–55	413	28
Over 55	274	18
Not reported	31	2

³ The extent of this liberty failed to correlate with success in transitioning to distance learning or lack thereof.

Table 3

Respondents' Teaching Experience (N = 1,487)

Experience (in years)	Frequency (n)	Percent (%)
<5	293	19.7
6–10	280	18.8
11–15	256	17.2
16–20	206	13.9
21–25	212	14.3
Over 25	233	15.7
Not reported	7	0.5

The schools at which respondents taught included all sectors from K–12 through higher education. Based on the outcome of a Kruskal-Wallis test (as the non-parametric equivalent of a one-way ANOVA), kindergarten and elementary school were analyzed as one category, “K–5,” while secondary/high and vocational schools were represented as one category, “high school.” As shown in Table 4, the most common levels taught were high school (30%) and K–5 (23%). Across the schools, 74% were state schools, 19% private, 4% religious schools, and 3% run by an NGO or foundation.

Table 4

Education Institutions Represented by the Teachers (N = 1,487)

School type / level	Frequency (n)	Percent (%)
K–5	347	23
middle school	182	12
high school (including vocational school)	446	30
higher education	374	25
private tuition/self-employed/freelance/other	138	9

Results

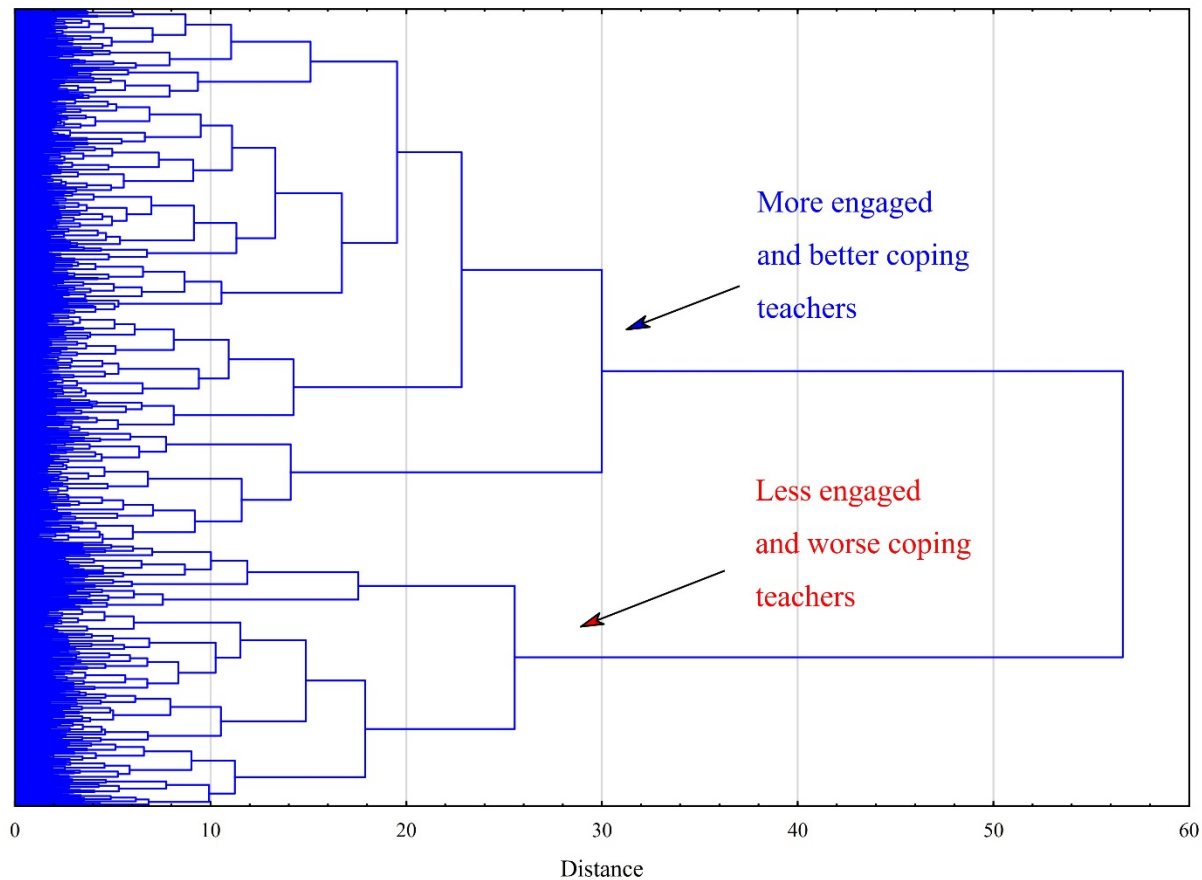
Cluster Analysis

As shown in Figure 2, the agglomerative hierarchical clustering with Ward's linkage indicated that teachers could be classified into two clusters: those who were more engaged and coped better with remote teaching ($N = 853$ educators, or 57%), and those who were less engaged and did not cope as well ($N = 597$, or 43%).

The horizontal axis measures the distance between the clusters, whereas the vertical axis represents the participants and clusters. To describe the nature and meaning of the two clusters, we compared between them in terms of their sociodemographic characteristics, as well as using non-hierarchical k -means cluster analysis.

Figure 2.

Dendrogram Demonstrating Two Clusters.



Comparisons between the two clusters in terms of their demographic characteristics revealed that they differed substantially in terms of whether they taught synchronously or asynchronously ($\chi^2 = 674.36[1], p < .001$), their school type ($\chi^2 = 237.22[4], p < .001$), prior experience with remote teaching ($\chi^2 = 39.32[1], p < .001$), their overall years of teaching experience ($\chi^2 = 89.16[56], p < .001$), and to a lesser extent in terms of gender ($\chi^2 = 12.69[2], p < .001$) and the country they work in (developed vs. developing; $\chi^2 = 4.15[1], p < .001$). The two groups did not differ, however, in terms of age ($\chi^2 = 63.14[3], p = .138$).

The cluster of more engaged and better-coping instructors tended to work in high schools (35%) or higher education (32%) and to teach remotely in real time using a synchronous modality (86%), with most (77%) declaring no previous experience with remote teaching. Teachers in this cluster had a mean age of 47 and a mean 10 years of teaching experience; most were female (84%) and worked in developed countries (89%). The cluster of relatively less engaged and more poorly coping teachers tended to teach in K–5 (41%), middle (17%), or high schools (24%). Very few taught their remote classes synchronously in real time (18%), and they were even less likely than the first cluster to have previous experience with remote teaching (11%). Compared with teachers in the first cluster, the teachers in this cluster were even more likely to be female (90%) and to work in developed countries (92%). They had a higher mean of 20 years of teaching experience, despite being slightly younger than the first cluster, with a mean age of 40. This seems due to a differential distribution in age between the two groups: while the more-engaged cluster was

relatively evenly distributed across age categories (24% under 35, 16% aged 35–44, 35% aged 45–54, 17% over 55), the less-engaged cluster was more likely to be in their late thirties or early forties (26% under age 35, 54% aged 35–44, 16% aged 45–54, 16% over 55). A full description of each cluster is available in Appendix Table 2.

The non-hierarchical *k*-means cluster analysis revealed that the two clusters of teachers differed on every item in the engagement and coping scales, as shown in Table 5. For every item, teachers in the “more engaged and better coping” group responded more positively on that item (including being less likely to agree with negatively valenced items).

Table 5

ANOVA F test for Quantitative Variables Distinguishing the Two Groups of Teachers

Nº	Item short label	M(SE) Cluster 1 (more engaged and better-coping teachers)	M(SE) Cluster 2 (less engaged and worse-coping teachers)	<i>F</i>	η_p^2
1	perceived engagement	4.38 (.05)	3.06 (.06)	316.35**	.18
2	RT unexpectedly difficult	3.24 (.05)	4.20 (.06)	197.77**	.12
3	preference for F2F format	4.57 (.05)	5.32 (.04)	89.62**	.06
4	modified lesson plans	4.86 (.05)	5.45 (.04)	77.66**	.05
5	eased grading	4.19 (.05)	5.00 (.06)	154.05**	.10
6	modified class content	3.96 (.05)	5.04 (.05)	150.09**	.10
7	reduced possibility to meet students' needs	4.15 (.05)	5.14 (.05)	207.46**	.13
8	initial confidence in RT ability	4.42 (.05)	3.67 (.06)	131.07**	.08
9	tech support	4.16 (.06)	4.05 (.07)	11.44**	.008
10	feeling left behind	2.35 (.05)	3.14 (.07)	162.37**	.10
11	tech issues	3.59 (.05)	4.11 (.06)	86.72**	.06
12	lack of hardware curtailing RT potential	2.49 (.05)	3.33 (.07)	142.27**	.10
13	cybersecurity anxiety	2.98 (.06)	3.52 (.07)	112.95**	.07

** $p < .001$

Table 6

Mean Scores of Teachers' Engagement and Teacher Coping vis-à-vis predictor variables (N=1,487).

	Engagement Mean (SE)	Difference among groups [95% CI]	Coping Mean (SE)	Difference among groups [95% CI]
School Type / Level		$F(4,1482) = 40.61^{**}$ $\eta_p^2 = .10 [.07; .12]$		$F(4,1482) = 9.31^{**}$ $\eta_p^2 = .02 [.01; .04]$
K-5 ^{aefg}	2.69 (.04)	[2.62; 2.76]	3.66 (.05)	[3.55; 3.77]
Middle school ^{af}	2.61 (.05)	[2.51; 2.70]	3.88 (.07)	[3.74; 4.03]
High school / vocational ^a	2.78 (.03)	[2.71; 2.84]	2.71 (.05)	[3.86; 4.05]
Higher education	3.17 (.04)	[3.09; 3.24]	4.08 (.05)	[3.98; 4.17]
Other ^{bcd}	3.26 (.07)	[3.12; 3.40]	4.08 (.08)	[3.92; 4.23]
Country Classification		$t(1485) = 3.59^*$ $d = .31 [.14; .48]$		$t(1485) = -.94$ $d = .08 [-.09; .25]$
Developed	2.86 (.02)	[2.82; 2.90]	3.93 (.03)	[3.87; 3.98]
Developing	3.09 (.06)	[2.98; 3.20]	3.84 (.08)	[3.69; 4.00]
Age		$F(3,1482) = .57$ $\eta_p^2 = .001 [0; .004]$		$F(3,1452) = .51$ $\eta_p^2 = .001 [0; .003]$
Under 35	2.92 (.04)	[2.84; 3.00]	3.96 (.05)	[3.85; 4.06]
35-44	2.85 (.04)	[2.78; 2.92]	3.94 (.05)	[3.85; 4.03]
45-54	2.88 (.04)	[2.81; 2.95]	3.87 (.05)	[3.77; 3.97]
Over 55	2.88 (.05)	[2.79; 2.97]	3.90 (.07)	[3.77; 4.04]
Gender		$F(2,1484) = 13.71^{**}$ $\eta_p^2 = .02 [.008; .03]$		$F(2,1484) = 2.95$ $\eta_p^2 = .004 [0; .01]$
Female ^h	2.84 (.02)	[2.80; 2.88]	3.89 (.03)	[3.84; 3.95]
Male ^h	3.13 (.06)	[3.01; 3.24]	4.08 (.07)	[3.95; 4.21]
Not listed/Nonbinary	3.21 (.18)	[2.78; 3.63]	3.98 (.41)	[3.03; 4.93]
Prior Remote Teaching Experience		$t(1485) = -7.8^{**}$ $d = .52 [.39; .66]$		$t(1485) = -8.0^{**}$ $d = .54 [.40; .67]$
No	2.81 (.02)	[2.77; 2.85]	3.82 (.03)	[3.77; 3.88]
Yes	3.19 (.05)	[3.09; 3.29]	4.35 (.05)	[4.25; 4.46]
Course Mode		$t(1485) = -11.6^{**}$ $d = .61 [.50; .71]$		$t(1485) = -6.2^{**}$ $d = .33 [.22; .43]$
Synchronous	3.06	[3.01; 3.11]	4.05	[3.99; 4.12]
Asynchronous	2.63	[2.58; 2.68]	3.73	[3.65; 3.81]

* $p < .05$, ** $p < .001$

Note. Effect sizes for the independent-samples t -test are determined with Cohen's d , whereas in ANOVA as partial eta-squared η_p^2 . Superscripts indicate significant pairwise differences based on Tukey's post-hoc test ($p < .05$) [for engagement: a = higher education, b = high school, c = middle school, d = K-5, for coping: e = higher education, f = high school, g = other, h = gender].

Sociodemographic Differences in Engagement and Coping

In addition to investigating sociodemographic differences between clusters, we also explored how the sociodemographic groups differed in terms of the coping and engagement scales. The assumption of normality was checked subjectively via a visual inspection of Q–Q and P–P plots and objectively using the Shapiro-Wilk test. Homogeneity of variance was assessed visually using a Q–Q scatterplot and objectively with Levene's test. Table 6 provides the mean of engagement and coping for each sociodemographic subgroup, an overall significance test comparing among the subgroups (F or t) and the related effect size (η_p^2 or d), as well as the 95% confidence intervals for each subgroup's mean.

In order to better verify the nature of the variables, we also calculated χ^2 values, which indicate meaningful relationships between teaching engagement and country classification ($\chi^2 = 5487.62, p < .001$) and course mode ($\chi^2 = 4188.71, p < .001$), as well as between teacher coping and country classification ($\chi^2 = 13146.81, p < .001$), previous remote teaching experience ($\chi^2 = 3246.83, p < .001$), and course type ($\chi^2 = 8822.94, p < .001$).

In terms of school type or level, university instructors assessed their *engagement* in remote teaching significantly higher than teachers from K–5, middle, and high schools. It seems worth noting that the second most-engaged group of instructors were teachers outside of the K–HE track. They also differed significantly in the perception of the difficulties to overcome during remote teaching, experiencing them to a lesser extent compared with the K–5 teacher group. The difference in *coping* was also significant between higher education instructors and all the other teacher groups, with the former reporting to cope better.

Interestingly, it transpires that teachers in developed countries felt significantly *less* engaged in remote instruction than their counterparts from developing countries. On the other hand, no significant difference was observed in this relation in coping with difficulties during remote classes.

Experience in dealing with setbacks, individual perception, cognitive abilities and other functions vary across the life span. However, in the context investigated age did not seem to play a role.

Even though there is a great gender disproportion in our sample dominated by women, the results show that female teachers reported to be significantly less engaged in their online work compared with their male colleagues. However, there were no significant differences between these groups in terms of coping with technological issues.

Previous teaching experience seems to be important for a smoother and faster adaptation to the new circumstances. As expected, teachers who had prior experience with remote instruction are significantly more engaged in their work as well as deal better with difficulties during lessons than teachers who shifted to remote teaching without having any experience in this mode of working.

In terms of online course delivery mode, instructors who taught their classes in real time were significantly more engaged in teaching compared with those who used asynchronous modes of delivery. Interestingly, educators working synchronously also reported significantly fewer difficulties in using new technologies during the lessons.

Predicting Teacher Engagement

To better understand the relative contribution of the above variables to teachers' engagement in remote teaching, a multivariate linear regression analysis was conducted using STATISTICA 13's module of General Regression Models, which method permits the inclusion of continuous and categorical predictors. The linearity assumption was tested on the basis of a visual inspection of scatterplots. Histograms indicated that the variables and the residuals of the regression were normally distributed. Lack of multicollinearity was verified by computing a matrix of Pearson's bivariate correlations among all independent variables, with the correlation coefficient values below .80. The assumption of homoscedasticity was also met, verified with a scatterplot of residuals versus predicted values. As shown in Table 7, model predictors included the overall coping score as well as key sociodemographic variables. For the predictor of education type / level, each group is compared against the reference category of "Other."

Table 7

Multivariate Linear Regressions Built with ANCOVA (Forward Selection) for Variables Predicting Teachers' Engagement

	step	b	β	SE	t	95%CI	
intercept		2.14		0.12	18.55	1.91	2.37
coping	1	0.24*	0.32	0.02	13.76	0.21	0.27
course mode: synchronous	2	0.12*	0.17	0.02	6.88	0.16	0.09
education type / level:	3						
K-5		-0.09*	-0.07	0.03	-2.68	-0.16	-0.02
middle school		-0.24*	-0.15	0.04	-5.75	-0.32	-0.16
high school		-0.08*	-0.07	0.03	-2.70	-0.14	-0.02
higher education		0.15*	0.11	0.03	4.34	0.08	0.21
country classification: developed	4	-0.07*	-0.06	0.03	-2.61	-0.13	-0.02
prior remote teaching experience: no	5	-0.06*	-0.06	0.02	-2.73	-0.11	-0.02
gender: female	6	-0.13*	-0.06	0.09	-1.41	-0.30	0.05
age	—						
years of professional experience	—						

* $p < .001$

The proposed linear model proved to be statistically significant ($F_{10,1439} = 51.19; p < .001$) and explains approximately 25.7% of the total variance of teacher engagement. The multivariate linear regression reveals that the most important predictor of teachers' engagement in online classes is coping with remote teaching difficulties ($\beta = .32, t = 13.76, p < .001$). Next, teacher engagement also depends on the mode of instruction (higher levels for the synchronous vs. asynchronous modality; $\beta = .17, t = -6.88, p < .001$) as well as education level handled (K-5: $\beta = -.07, t = -2.68, p < .001$; middle school: $\beta = -.15, t = -5.75, p < .001$; high school: $\beta = -.07, t = -2.70, p < .001$; higher education: $\beta = .11, t = 4.34, p < .001$). To a lesser extent, engagement is also predicted by lack of previous experience with online teaching ($\beta = -.06, t = -2.73, p < .001$) as well as working in a developed country ($\beta = -.06, t = -2.61, p < .001$) and gender ($\beta = -.06, t = -1.41, p < .001$). After controlling for coping and the other sociodemographic characteristics, teachers' age and years of professional experience were not significant predictors of engagement in remote teaching and were dropped from the model.

Discussion

The situation learners and teachers suddenly found themselves in upon the announcement of school closures is, with a few historic exceptions (which involved school classes taught over the radio or television), unprecedented in terms of both scale and duration. Emergency transition to remote teaching significantly affected teachers' coping with their work and general functioning. Given that distance learning is likely to increasingly become part and parcel of mainstream education (Bozkurt, 2019), it is worthwhile identifying factors that influence teacher engagement and coping in order to offer successful policy, administration, and training solutions. Our results suggest that key factors which predicted instructor engagement in the emergency transition were the type or level of school, asynchronous or synchronous modality, and the instructors' level of coping. We also discovered weaker but potentially interesting predictors of gender and the country's level of economic development. Below, we discuss these results and their potential implications.

Level or Type of School at which the Instructors Taught

The education levels at which the instruction is carried out appear to be a factor that markedly differentiates the better- and the worse-coping groups. The abrupt shift to remote instruction appeared to be a particularly difficult experience for educators overseeing lower education levels. Not only did this group feel unprepared for this mode of teaching, they were also more disengaged in the process. This finding is congruent with the observation by Hvas and Aller (2020) about the greater difficulty of the remote teaching of nursery and primary school pupils. The lower coping and engagement emerging from the responses of teachers instructing the youngest age groups may be due to several factors. One is that young learners are the most reliant on assistance, scaffolding and support in their scholastic process (Zaccoletti et al., 2020), and parents and other guardians may not always be around during the pandemic to help with technology, establish schedules, ensure that the children stay on task and submit their work in a timely manner (Reilly, 2020; Szabo et al., 2020), and help out in other ways necessary (even older and more mature learners—including university students—may need assistance and guidance in their autonomous, self-directed learning; Hung et al., 2010; Paradowski, 2014, p. 8; 2015, pp. 43ff.; Owusu-Fordjour, Koomson, & Hanson, 2020; Reimers & Schleicher, 2020, p. 21). Older students with more developed self-regulation strategies are better able to take control over their learning (Herold, 2017). Smaller children are moreover more likely to miss their grandparents during this time (Dalton et al., 2020) and to be affected by contextual factors (Sameroff, 2010), and less likely to have a computer, tablet or smartphone to access remote classes in real time. It is also much more difficult for them to have to spend long hours stationarily in front of the screen. Additionally, many teachers from lower education levels have students with special needs, for whom it is especially difficult to spend hours focused on classes while sitting in front of the computer (Susana Sotillo, personal communication, October 2, 2020). Also, unlike higher education instructors, K–12 teachers are often responsible for contact tracing on top of their usual commitments. Hvas and Aller (2020) add that it is easier to stay at home for the older, secondary school students, and that the reopening of schools for the youngest children provides relief to parents and allows them to continue working.

However, it should be noted that reluctance to teach remotely cannot be limited to educators teaching at lower education levels. Ebner et al. (2020) mentioned that a large group of university professors in Germany stated that they could not teach online. Our findings indicate that such patterns cannot be dismissed by simply invoking the factor of age. Still, college and university

instructors tend to be the readiest to switch to distance teaching, likely due to the availability of the facilities, equipment, infrastructure, and institutional IT support, and the tradition of innovation in education (Li & Wang, 2020). For instance, where their home situation does not provide the optimal environment for online instruction, academics in most scenarios can use their offices and/or classrooms. In contrast, depending on the location, some basic education schools may lack the facilities and training even if they are located in urban areas (Lapada et al., 2020). Institutional training and backing as well as social support had been found to determine the successful adoption of e-learning in the past (Singh, Naz, & Narayan, 2017). Higher education may also have endured more crises in the past (Giridharan, 2020, p. 108).

The group that experienced the second-highest level of engagement in remote instruction and reported experiencing the fewest problems were teachers outside of the K–HE track. One speculative explanation for this interesting finding may be that, having had to navigate a volatile private/freelance tuition market, these instructors had worked out robust coping strategies and resilient, dependable, and perhaps more personally engaged contacts with their students. Alternatively, without a permanent employment contract or with only a precarious one, these teachers may have been more invested in maintaining their source of income. The finding certainly merits closer inspection.

The detection of the contextual effect of the education level handled underscores the importance of large multisite research (MSR; Moranski & Ziegler, 2020), as the impact of the level of education handled had failed to reach significance in smaller, national studies (e.g., Lapada et al., 2020, p. 138).

Online Modality

The better coping and engagement in real-time classes is consistent with the findings by Jaggars and colleagues (2020, p. 25). The prevalence of asynchronous communication in the worse-coping cluster likely contributed to barriers in teacher-students interaction and the difficulty of seeing students' reactions, which could have translated into problems with evaluation of learners' activity. This is congruent with other studies revealing problems establishing communication with students, with the monitoring of responses, and with providing tailored thoughtful feedback as some of the major challenges identified by teachers (Iwai, 2020; Lapada et al., 2020, p. 135; Reimers & Schleicher, 2020, p. 15). As reminded by Durden (2020), in the massive turn to online learning we must bear in mind that it will begin to be a viable educational model only when it manages to maximally approximate the affordances of the live classroom environment—which among others means “preferably a full or partly synchronous experience.” In the words of Genone (2020), “one of the most important lessons of the forced adoption of remote instruction may turn out to be the realization that pedagogy, rather than technology, is the key ingredient for delivering effective education online.” One recommendation might also be for academics to create an online presence to make students feel they are part of a community (McMurtrie, 2020).

Given that the better-coping teachers were mainly teaching remotely in real time while instructors who coped worse with the transition (and were doing more asynchronous instruction) were primarily teaching at more junior education levels, epidemic situation permitting, this might be an argument for reopening kindergartens and primary schools, given children's need for the development of social competences (Jarynowski et al., in press).

Coping

The findings also showed that initial convictions and confidence regarding distance teaching heavily bear on actual performance. This emphasizes the importance of the provision of proper (re-)training ahead of instruction, as well as of institutional backing in general—educators who felt more supported by their school fared better. Lack of training and school tech support had been found to induce higher technostress among teachers (Joo et al., 2016; Li & Wang, 2020). The provision of adequate teacher training was also listed as one of five major moves in the Chinese education policy of “Suspending Classes Without Stopping Learning” (“停课不停教、停课不停学”); Zhang et al., 2020; see also Huang et al., 2020). Tiejun (2020) also highlighted the importance of prior preparation. Thus, technological training ought to become permanent part-and-parcel of teachers' pre-service, on-the-job, and just-in-time (Reimers & Schleicher, 2020, pp. 5, 8) professional development to help them keep abreast of the developments.

Gender and Type of Country

Our results suggest that women experienced more challenges in adjusting to the emergency transition. Considering that women constitute a vast majority of the participants taking part in this research, the results should be treated with caution. Still, one potential explanation for the higher engagement in male teachers could be their not only stereotypical greater involvement in technology (among friends and colleagues from different continents, social media posts of instructional set-ups with multiple screens and studio-quality microphones have predominantly come from men's profiles—although men may also be more inclined to share updates about their devices), or a tendency to overestimate own capacity. Both possibilities would be congruent with the findings of Alemany-Arrebola and colleagues' (2020) study carried out among 427 students in Spain, where men indicated the highest perception of self-efficacy, while women had higher scores in trait and state anxiety. Emerging studies from the pandemic generally tend to indicate higher levels of COVID-generated stress in women (Cao et al., 2020; Qiu et al., 2020; Taylor et al., 2020), who perceived the emergency as more serious than males did (Commodari & La Rosa, 2020; Li et al., 2020), in line with earlier research demonstrating that women tend to have a higher perception of risk (e.g., Harris et al., 2006). Females are also consistently found to be more anxious about privacy and risky online behavior (Milne et al., 2009; Mohamed & Ahmad, 2012; Hajli & Lin, 2016; Chou & Sun, 2017). Another viable hypothesis might be a lower number of other time-consuming commitments such as childcare, looking after relatives, and (typically) household and domestic chores.

Another intriguing result suggested a higher level of *engagement* among teachers from *developing* countries. Time constraints have not yet permitted us to analyze the responses to the open-ended questions, but one speculative explanation might be that teachers in these settings manage to establish a deeper connection with their students, for whom continuity of education is particularly crucial. Another possibility might be that educators in developing countries are significantly more dependent on their job for their subsistence. The finding certainly merits further investigation. Meanwhile, it is estimated that in 2021, 67 low- and lower-middle income countries will only get vaccines for a tenth of their population (Oxfam International, 2020), while those which have managed to secure the jab may be being charged much steeper rates (e.g., South Africa reportedly having been quoted nearly 2.5 times more than EU member states; AFP, 2021).

Conclusion

Teacher coping significantly affects all sides of the education process. For instance, an analysis of U.S. and Canadian students' tweets regarding the transition to an online class format performed by *EDUCAUSE Review* revealed that students appreciate faculty who remain positive, comfortable, and calm, and want their instructors to be at ease with technology. While the pandemic has taken its toll on our lives and well-being, there is hope the experience may bring some positive developments and insights for post-pandemic education. Institutions should consider not only ad hoc, but also longer-term adjustments to support teachers and students. Given that distance education via online learning, including MOOCs, had already been a growing trend pre-pandemic (Xu & Jaggars, 2014; Tarone, 2015; Jaggars, 2018; Marciniak et al., 2018), in the future teachers may use online delivery to complement their face-to-face teaching (Kim, 2020). As the World Bank observed, "the COVID-19 crisis might retrospectively be considered as an opportunity to strategically revamp systems and prepare for the challenges to come" (2020a, p. 17; see also Brown & Salmi, 2020). This can best be done with support for all stakeholders, advancement of teachers' and students' digital skills, and adequate investment in infrastructure and the ecosystem.

The current study, by deliberate design, only solicited responses from educators who had reacted to the new necessity by moving their classes online. One of the obvious limitations, shared by most large-scale surveys (national censuses notwithstanding), is the issue of participant self-selection. Unlike in "captive" groups common in many education scenarios, participation in this study was completely voluntary. Given that on many occasions the questionnaire took upwards of 45 minutes to complete, the respondents were already motivated, could relate to the topic, and had the spare time and technology⁴ to comfortably fill out the survey. This means a limit on the representativeness and generalization potential of the data and resultant findings (see Brown, 2001, p. 85).

This article presents only a slice of the teachers' vantage point; this will be complemented with later publications on other relevant aspects of educators' adaptation to the transition (Jelińska & Paradowski, under review; under revision; Paradowski & Jelińska, under review), as well as analyses of students' perspectives. Also, we have not yet investigated the relationship between the timing of the responses relative to the date of the shift to remote instruction; this will be calculated in forthcoming longitudinal analyses comparing early and late reactions from the same respondents.

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⁴ E.g., one respondent from Syria could not complete the survey due to their slow VPN connection.

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Appendix: Supplementary Tables

Appendix Table 1

Teachers' engagement in remote teaching scale and teacher coping with remote instruction scale (with the results of exploratory factor analysis; EFA)

Item	Short Label	Factor Loading	
		1	2
During this epidemic, I have felt that I have to alter not just the medium and method, but also the content of my classes.	modified class content	.71*	.08
I have had to modify my lesson plans for remote teaching.	modified lesson plans	.70*	-.11
I have eased the grading scheme.	eased grading	.65*	-.10
I preferred the 'normal' class format to the remote one I'm teaching now.	preference for F2F format	.58*	.22
I feel that remote teaching reduces my possibility to meet students' individual/special needs.	reduced possibility to meet students' needs	.58*	.34
I feel disengaged in the remote teaching.	perceived engagement	.56*	.41
I hadn't expected remote teaching to be this hard.	RT unexpectedly difficult	.51*	.34
I haven't been able to fully utilise the potential of remote teaching because of lack of access to hardware.	lack of hardware curtailing RT potential	.23	.60*
I feel that I have been left behind by the shift to remote teaching.	feeling left behind	.22	.60*
I felt confident in my ability to teach remotely when I was told to do so.	initial confidence in RT ability	-.29	-.53*
I have often encountered technical problems with the class.	tech issues	.24	.51*
I worry about privacy and the security of the software/platform.	cybersecurity anxiety	.14	.51*
I have someone to turn to for support if I experience technical problems with the remote teaching.	tech support	.06	-.50*
I think that during these times, my teaching does not need to be perfect.	N/A	.30	-.05
I am willing to devote more time to an online class.	N/A	-.07	-.38
I had full freedom in how to adapt my course(s).	N/A	-.06	-.37
My class has been crashed or 'bombed' by unauthorised participants.	N/A	-.02	.33
I have been trying to use this opportunity to make my classes inclusive and accessible to everyone, in line with universal design (UDL/508 compliant, e.g. accessible for students with disabilities).	N/A	.10	-.26
I have been trying my best to teach well during this time.	N/A	.04	-.23

* The component loadings > .50. Component loadings were obtained using exploratory factor analysis, which allows reducing the data. To extract the factors, we applied the principal components method with orthogonal varimax rotation. As a result, two factors were obtained: Factor 1 measuring teachers' engagement is loaded by 7 items, whereas Factor 2 reflecting teacher coping is composed of 6 items.

Appendix Table 2

Cluster compositions: number and percentage of teachers in each cluster

	More engaged and better coping teachers (Cluster 1)		Less engaged and worse coping teachers (Cluster 2)	
	n	%	n	%
country economic status				
developed	755	89	548	92
developing	98	11	49	8
age				
under 35	202	23.7	156	26.1
35 – 44	132	15.5	324	54.3
45 – 54	300	35.2	98	16.4
over 55	145	17.0	93	15.6
gender				
female	714	83.7	538	90.1
male	134	15.7	58	9.7
non-binary/not listed	5	0.6	1	0.2
education level handled				
K–5	98	11	246	41.2
Middle school	77	9	102	17.1
High school / vocational	295	35	140	23.5
Higher education	277	32	80	13.4
Other	106	12	29	4.9
previous experience in online teaching				
yes	200	23	63	11
no	653	77	534	89
mode of online delivery				
synchronous	736	86	107	18
asynchronous	117	14	490	82
years of professional experience	10		20	
perceived engagement	3.89		2.51	
RT unexpectedly difficult	3.78		2.63	
preference for F2F format	2.36		1.69	
modified lesson plans	2.11		1.52	
eased grading	2.83		1.87	
modified class content	2.93		1.98	
reduced possibility to meet students' needs	4.18		5.23	
confidence in ability to teach remotely	4.44		3.54	
availability of tech support	4.23		3.93	
feeling left behind	4.70		3.68	
tech issues	3.47		2.73	
RT potential unutilized due to lack of hardware	4.53		3.51	
cybersecurity anxiety	4.15		3.22	
Frequency (n)	853		597	
Percent of all participants	59		41	

Note: This analysis excludes 37 participants where some data points were missing.