Electronic Supplementary Material

Teaching and Learning During the first COVID-19 School Lockdown: Realization and Associations with Parent-Perceived Students' Academic Outcomes—A study and preliminary overview

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Overview

Supplement 1. Further information on the sample

The majority of the study's participants (44.8 %) was from North-Rhine-Westphalia, 18.5 % of parents were from Lower Saxony, 11.9 % from Baden-Wuerttemberg, 4.6 % from Bavaria, 3.9 % from Hesse, 3.1 % from Rhineland-Palatinate, 2.6 % from Schleswig-Holstein, 2.6 % from Thuringia, 2.0 % from Berlin, 1.7 % from Saxony, 0.9 % from Mecklenburg-Western Pomerania, 0.6 % from Brandenburg. 0.6 % from Saxony-Anhalt, 0.5 % from Hamburg, and 0.5 % from Saarland.

Parents indicated that their children attended the following schools: 40.2 % of all children attended elementary schools, 37.5 % academic track secondary schools ("Gymnasium"), 8.8 % comprehensive secondary schools ("Gesamtschule"), 7.9 % intermediate track secondary schools ("Realschule"), 0.8 % lowest track secondary schools ("Hauptschule"), 0.6 % schools for special educational needs ("Förderschule"), and 4.1 % another school type.

Parents indicated that their children attended the following grades: Grade 1: 9.2 %; Grade 2: 10.0 %; Grade 3: 11.6 %; Grade 4: 9.6 %; Grade 5: 16.4 %; Grade 6: 12.6 %; Grade 7: 11.0 %; Grade 8: 6.8 %; Grade 9: 6.6 %; Grade 10: 2.6 %; Grade 11: 1.7 %; Grade 12: 0.6 %; Grade 13: 0.2 %.

Supplement 2. Description how the distant teaching activities were modelled

The measurement model for distant teaching activities were set up the following way: items with the same word stem rated for teachers in different subjects (math, language arts, English, science/biology) were regressed on a factor indicating how often this distant teaching activity over different subjects was realized in the class that the student attended. In all federal states, it was up to the schools to decide how to realize distant teaching. Thus, all activities were correlated as it might be assumed that at one school the principal and/or the teachers agreed on which distant teaching activities had to be realized. Furthermore, four additional latent factors indicating the four subject teachers were modeled. All distant teaching activities that one teacher realized were regressed on the corresponding teacher factor. Beside the schools' decision on how to realize distant teaching it might well be that some teachers were more engaged in the realization of distant teaching than others. This potential additional variance was captured by these teacher factors. We explicitly asked parents to rate each subject, even if one teacher taught more than one subject, which is especially likely in elementary school but also happens in secondary school. Thus, we correlated the teacher factors in order to control for this (s. Figure 1 in the manuscript). We also tested a hierarchical model with a general distant teaching activities factor indicated by all single distant teaching activities. The model fit did not differ from the measurement model depicted in Figure 1. As we were primarily interested in how each distant teaching activity and not a general distant teaching activity factor was associated with students' motivation, competent and independent learning, and learning progress during the school lockdown, we decided to model distant teaching activities as described above.

Supplement 3. Frequencies and percentages of all distant teaching activities by elementary school teachers

Table S3

Frequencies and percentages of all distant teaching activities by elementary school teachers

How often did the following teacher…	Not yet		1 every 3 weeks		1 every 2 weeks		Every week		2 per week		3 per week (or more)	
	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.
… send tasks?												
Math teacher	22	2.1	94	8.8	199	18.7	678	63.8	26	2.4	44	4.1
Language arts teacher	25	2.4	95	8.9	191	18.0	683	64.3	27	2.5	42	4.0
English teacher	563	53.0	120	11.3	93	8.7	271	25.5	6	0.6	10	0.9
Biology/Science teacher	434	40.8	118	11.1	127	11.9	364	34.2	10	0.9	10	0.9
… send solutions?												
Math teacher	550	52.2	47	4.5	77	7.3	316	30.0	16	1.5	48	4.6
Language arts teacher	564	53.5	49	4.6	77	7.3	313	29.7	13	1.2	38	3.6
English teacher	824	78.2	30	2.8	39	3.7	147	13.9	2	0.2	12	1.1
Biology/Science teacher	761	72.2	37	3.5	51	4.8	180	17.1	7	0.7	18	1.7
… requested students' solutions?												
Math teacher	497	47.5	90	8.6	98	9.4	305	29.2	20	1.9	36	3.4
Language arts teacher	450	43.0	105	10.0	106	10.1	331	31.6	21	2.0	33	3.2
English teacher	792	75.7	42	4.0	44	4.2	150	14.3	9	0.9	9	0.9
Biology/Science teacher	701	67.0	60	5.7	78	7.5	187	17.9	10	1.0	10	1.0
… gave feedback on students' solutions?												
Math teacher	613	59.4	101	9.8	80	7.8	196	19.0	18	1.7	24	2.3
Language arts teacher	565	54.7	120	11.6	89	8.6	211	20.4	20	1.9	27	2.6
English teacher	859	83.2	38	3.7	39	3.8	79	7.7	9	0.9	8	0.8
Biology/Science teacher	784	76.0	63	6.1	61	5.9	101	9.8	12	1.2	11	1.1
… graded students' solutions?												
Math teacher	957	93.4	19	1.9	17	1.7	28	2.7	4	0.4		
Language arts teacher	947	92.4	27	2.6	19	1.9	29	2.8	3	0.3		
English teacher	987	96.3	12	1.2	6	0.6	19	1.9	1	0.1		
Biology/Science teacher	983	95.9	14	1.4	9	0.9	17	1.7	2	0.2		
… taught via videoconference?												
Math teacher	912	89.2	32	3.1	11	1.1	50	4.9	7	0.7	10	1.0
Language arts teacher	886	86.7	53	5.2	11	1.1	51	5.0	10	1.0	11	1.1
English teacher	977	95.6	10	1.0	8	0.8	16	1.6	5	0.5	6	0.6
Biology/Science teacher	979	95.8	10	1.0	7	0.7	16	1.6	4	0.4	6	0.6
… had contact with their child?												
Math teacher	646	63.5	155	15.2	54	5.3	119	11.7	22	2.2	22	2.2
Language arts teacher	570	56.0	207	20.3	70	6.9	122	12.0	26	2.6	23	2.3
English teacher	877	86.1	47	4.6	24	2.4	53	5.2	9	0.9	8	0.8
Biology/Science teacher	810	79.6	80	7.9	28	2.8	77	7.6	12	1.2	11	1.1
… had contact with a parent?												
Math teacher	497	49.1	204	20.1	83	8.2	184	18.2	25	2.5	20	2.0
Language arts teacher	439	43.3	225	22.2	92	9.1	205	20.2	30	3.0	22	2.2
English teacher	823	81.2	67	6.6	36	3.6	68	6.7	13	1.3	6	0.6
Biology/Science teacher	742	73.2	84	8.3	50	4.9	107	10.6	15	1.5	15	1.5

Notes. $N = 1{,}063$. Fre. = Frequency. Perc. = valid Percent.

Supplement 4. Frequencies and percentages of all distant teaching activities by secondary school teachers

Table S4

Frequencies and percentages of all distant teaching activities by teachers at a Gymnasisum (academic track), Realschule (intermediate track), Hauptschulde (lowest track), and Gesamtschule (comprehensive school)

How often did the following teacher…	Not yet		1 every 3 weeks		1 every 2 weeks		Every week		2 per week		3 per week (or more)	
	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.	Fre.	Perc.
… send tasks?												
Math teacher	21	1.4	78	5.4	125	8.6	987	67.8	151	10.4	94	6.5
Language arts teacher	25	1.7	84	5.8	167	11.5	958	65.8	144	9.9	78	5.4
English teacher	27	1.9	69	4.7	154	10.6	976	67.0	152	10.4	78	5.4
Biology/Science teacher	193	13.3	152	10.4	259	17.8	775	53.2	52	3.6	25	1.7
… send solutions?												
Math teacher	254	17.6	79	5.5	141	9.8	818	56.7	89	6.2	62	4.3
Language arts teacher	493	34.2	54	3.7	144	10.0	629	43.6	73	5.1	50	3.5
English teacher	402	27.9	53	3.7	141	9.8	718	49.8	74	5.1	55	3.8
Biology/Science teacher	620	43.0	85	5.9	166	11.5	520	36.0	34	2.4	18	1.2
… requested students' solutions?												
Math teacher	341	23.9	70	4.9	94	6.6	766	53.7	101	7.1	55	3.9
Language arts teacher	327	22.9	103	7.2	137	9.6	731	51.2	81	5.7	48	3.4
English teacher	322	22.6	94	6.6	132	9.3	747	52.3	85	6.0	47	3.3
Biology/Science teacher	529	37.1	99	6.9	175	12.3	569	39.9	36	2.5	19	1.3
… gave feedback on students' solutions?												
Math teacher	671	47.4	116	8.2	121	8.6	420	29.7	55	3.9	32	2.3
Language arts teacher	648	45.8	137	9.7	152	10.7	397	28.1	52	3.7	29	2.0
English teacher	636	44.9	123	8.7	172	12.2	393	27.8	59	4.2	32	2.3
Biology/Science teacher	870	61.5	100	7.1	119	8.4	287	20.3	24	1.7	14	1.0
… graded students' solutions?												
Math teacher	1,297	92.2	30	2.1	22	1.6	46	3.3	5	0.4	6	0.4
Language arts teacher	1,287	91.5	31	2.2	29	2.1	50	3.6	4	0.3	5	0.4
English teacher	1,286	91.5	32	2.3	28	2.0	49	3.5	5	0.4	6	0.4
Biology/Science teacher	1,316	93.6	28	2.0	25	1.8	33	2.3	1	0.1	3	0.2
… taught via videoconference?												
Math teacher	982	70.1	84	6.0	60	4.3	211	15.1	39	2.8	24	1.7
Language arts teacher	1,045	74.6	72	5.1	57	4.1	169	12.1	36	2.6	21	1.5
English teacher	1,028	73.4	81	5.8	66	4.7	177	12.6	31	2.2	17	1.2
Biology/Science teacher	1,223	87.4	35	2.5	27	1.9	87	6.2	16	1.1	12	0.9
… had contact with their child?												
Math teacher	737	52.9	140	10.0	81	5.8	287	20.6	80	5.7	69	4.9
Language arts teacher	736	52.8	142	10.2	100	7.2	292	20.9	67	4.8	57	4.1
English teacher	726	52.1	138	9.9	100	7.2	311	22.3	62	4.4	57	4.1
Biology/Science teacher	1,020	73.2	74	5.3	62	4.4	187	13.4	27	1.9	24	1.7
… had contact with a parent?												
Math teacher	1,092	78.6	130	9.4	54	3.9	90	6.5	11	0.8	13	0.9
Language arts teacher	1,072	77.1	159	11.4	59	4.2	77	5.5	10	0.7	13	0.9
English teacher	1,106	79.6	122	8.8	51	3.7	84	6.0	16	1.2	11	0.8
Biology/Science teacher	1,260	90.6	50	3.6	28	2.0	40	2.9	4	0.3	8	0.6

Notes. N = 1,456. Fre. = Frequency. Perc. = valid Percent.

Supplement 5. Figures depicting the frequencies of all distant teaching activities by elementary and secondary school teachers
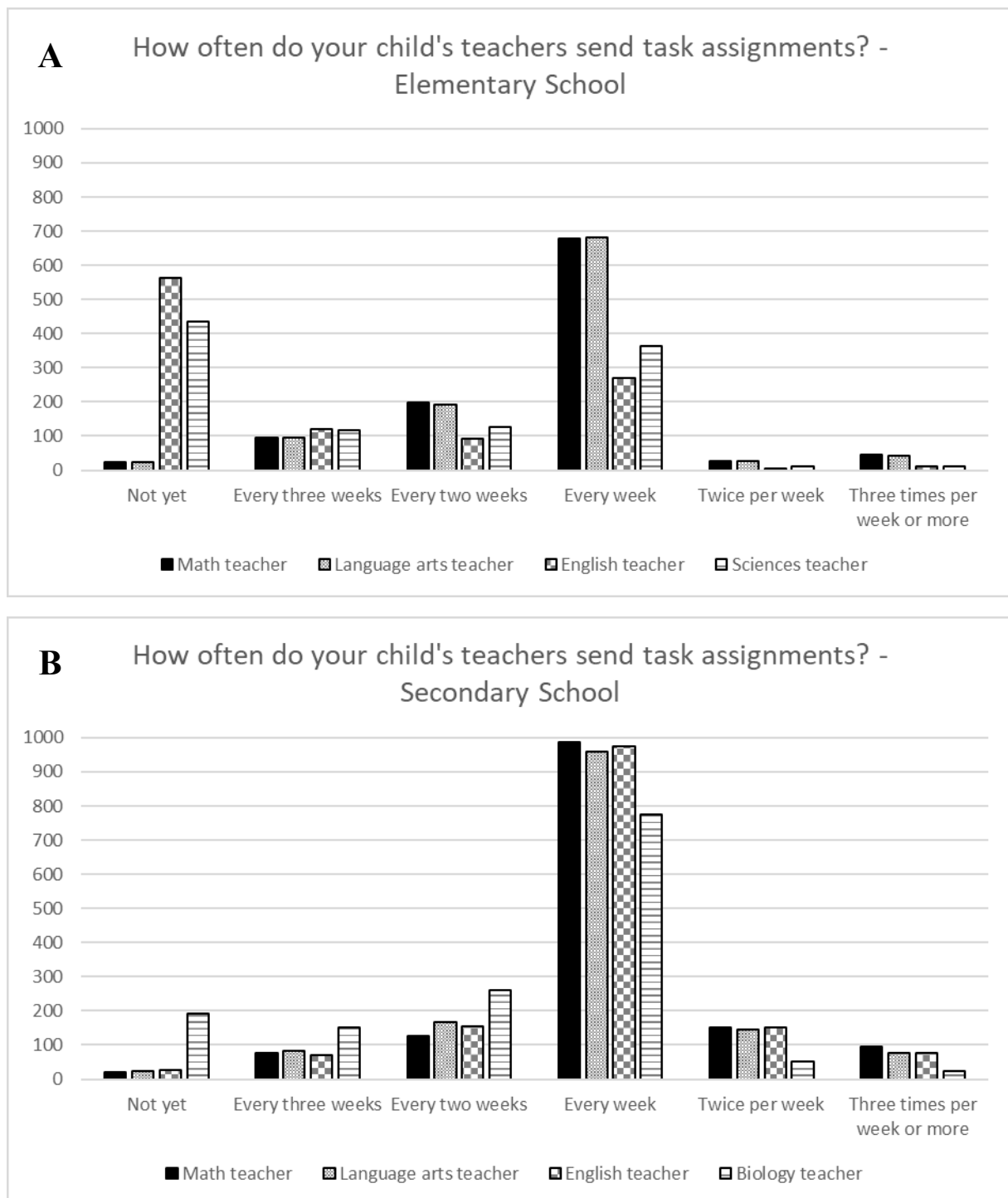
Figure S5.1. Frequencies of sending task assignments in elementary school (A) and secondary school (B).

A How often do your child's teachers provide solutions for the task assignments? - Elementary School

B How often do your child's teachers provide solutions for the task assignments? - Secondary School
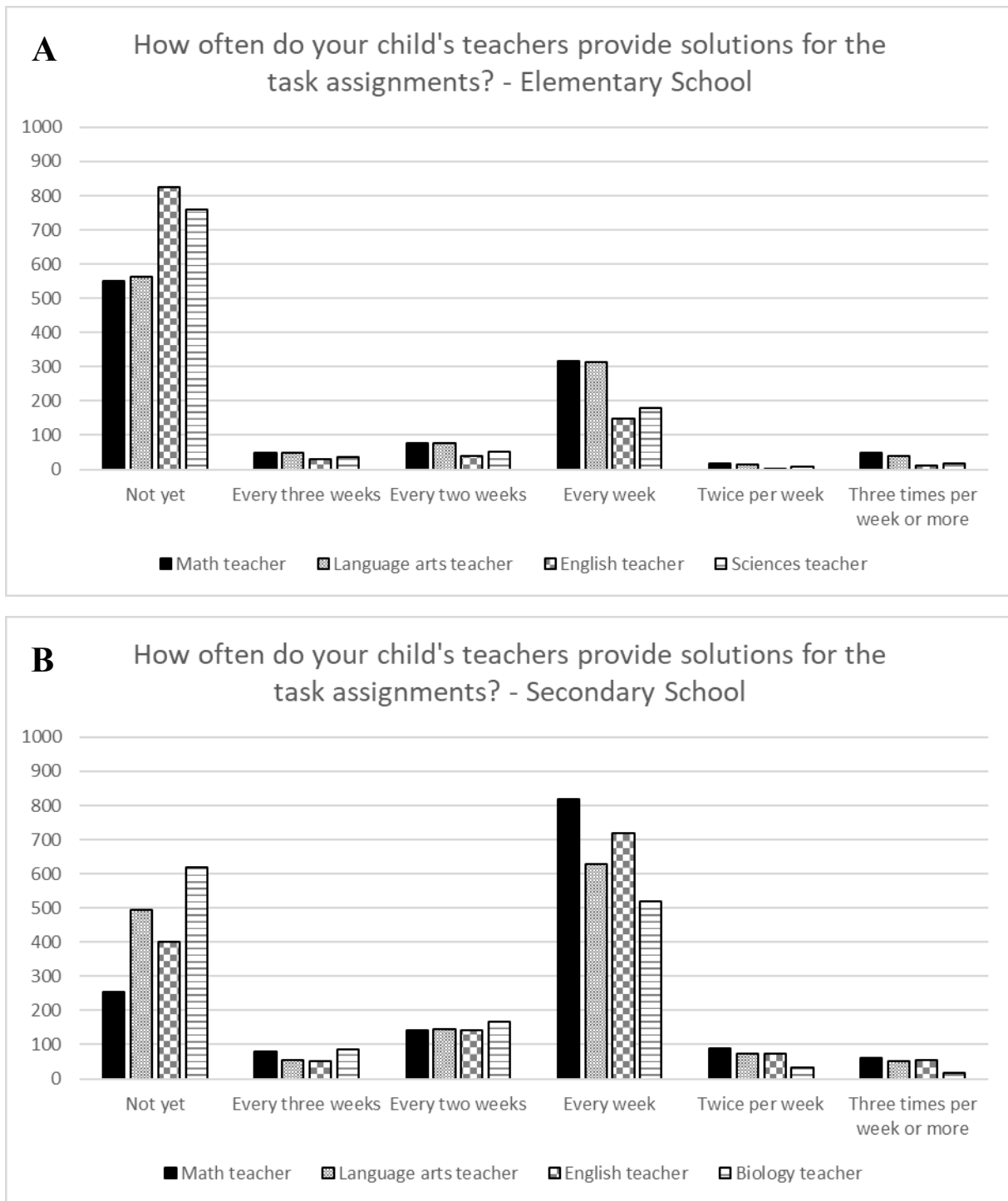
Figure S5.2. Frequencies of providing solutions for the task assignments in elementary school (A) and secondary school (B).
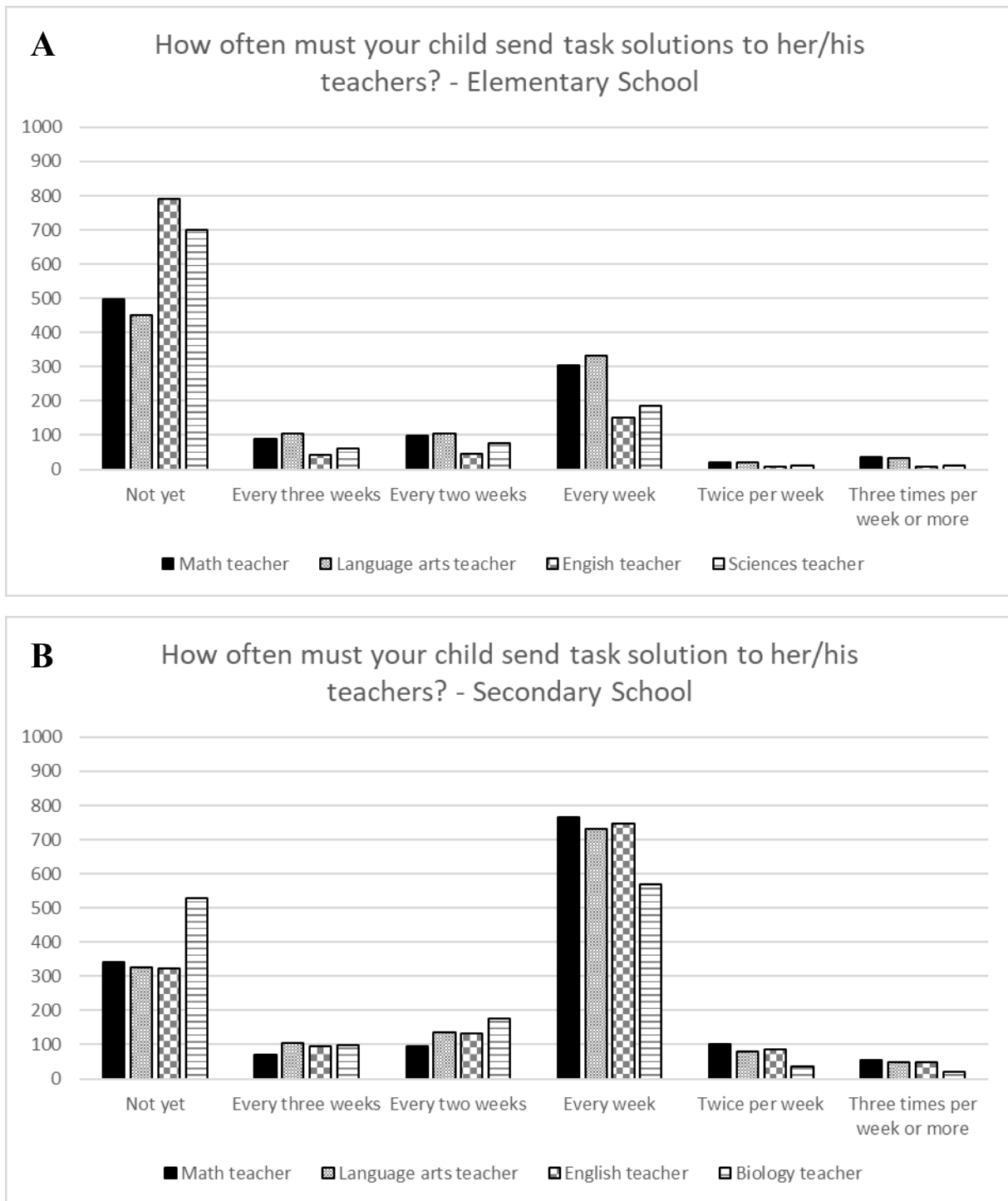
Figure S5.3. Frequencies of requesting solutions for the task assignments from the students in elementary school (A) and secondary school (B).
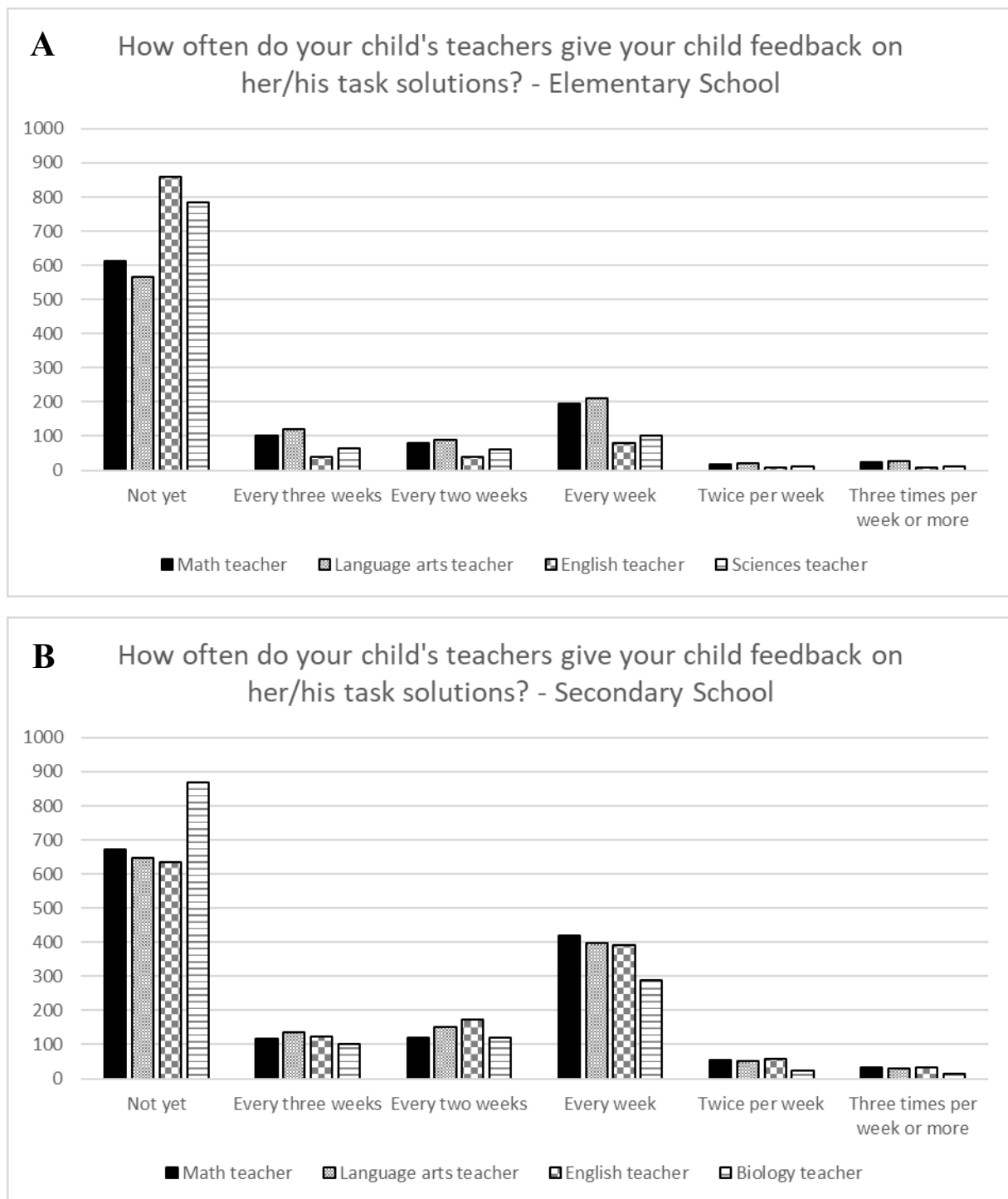
Figure S5.4. Frequencies of giving feedback on the students' task solutions in elementary school (A) and secondary school (B).

A

How often do your child's teachers make videoconferences with teaching content? - Elementary School

Legend: ■ Math teacher ▨ Language arts teacher ▣ English teacher ▥ Sciences teacher

B

How often do your child's teachers make videoconferences with teaching content? - Secondary School

Legend: ■ Math teacher ▨ Language arts teacher ▣ English teacher ▥ Biology teacher
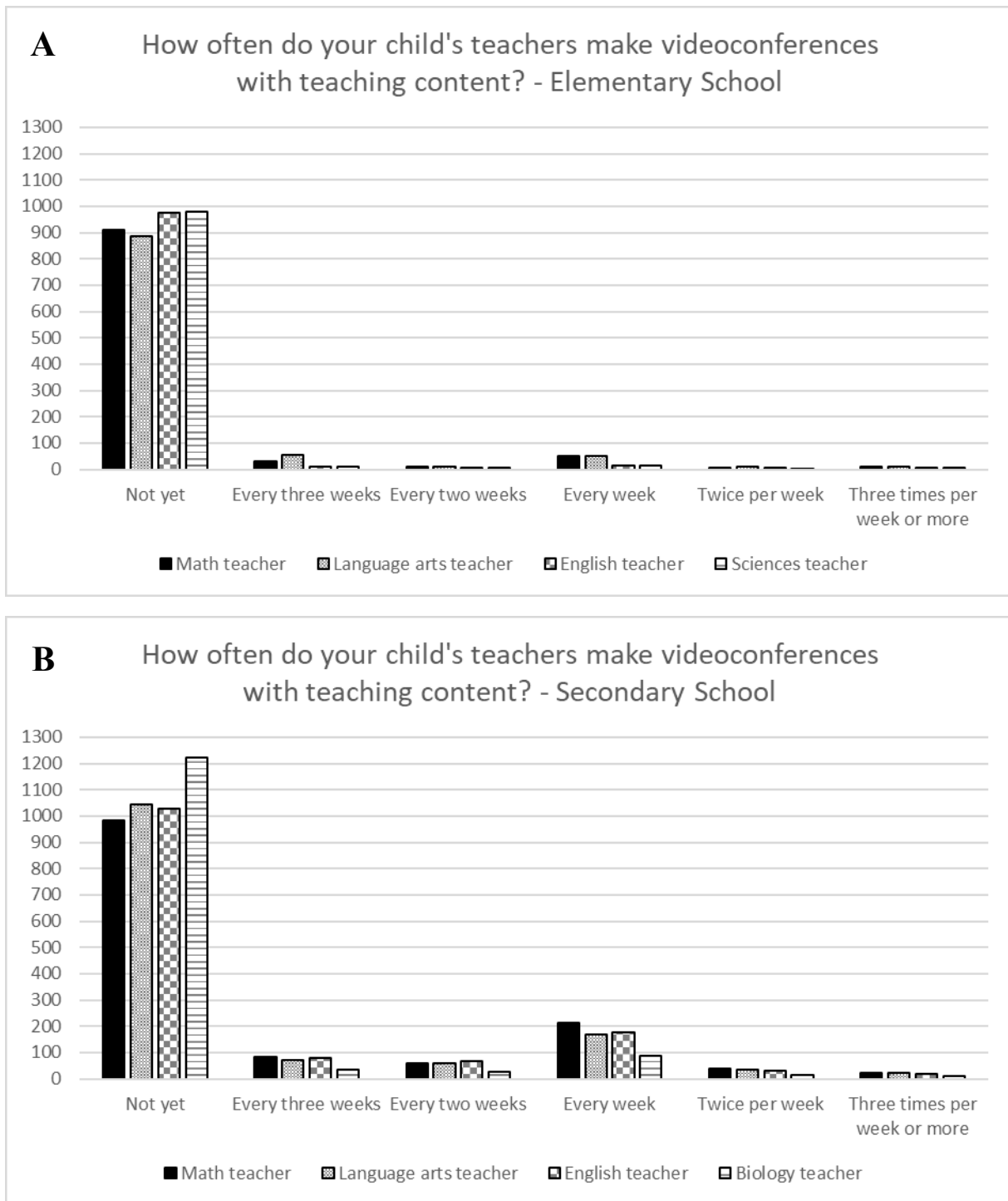
Figure S5.5. Frequencies of making videoconferences with teaching content in elementary school (A) and secondary school (B).

A How often do your child's teachers chat, mail or phone with your child? - Elementary School

■ Math teacher ▨ Language arts teacher ▣ English teacher ⊟ Sciences teacher

B How often do your child's teachers chat, mail or phone with your child? - Secondary School

■ Math teacher ▨ Language arts teacher ▣ English teacher ⊟ Biology teacher
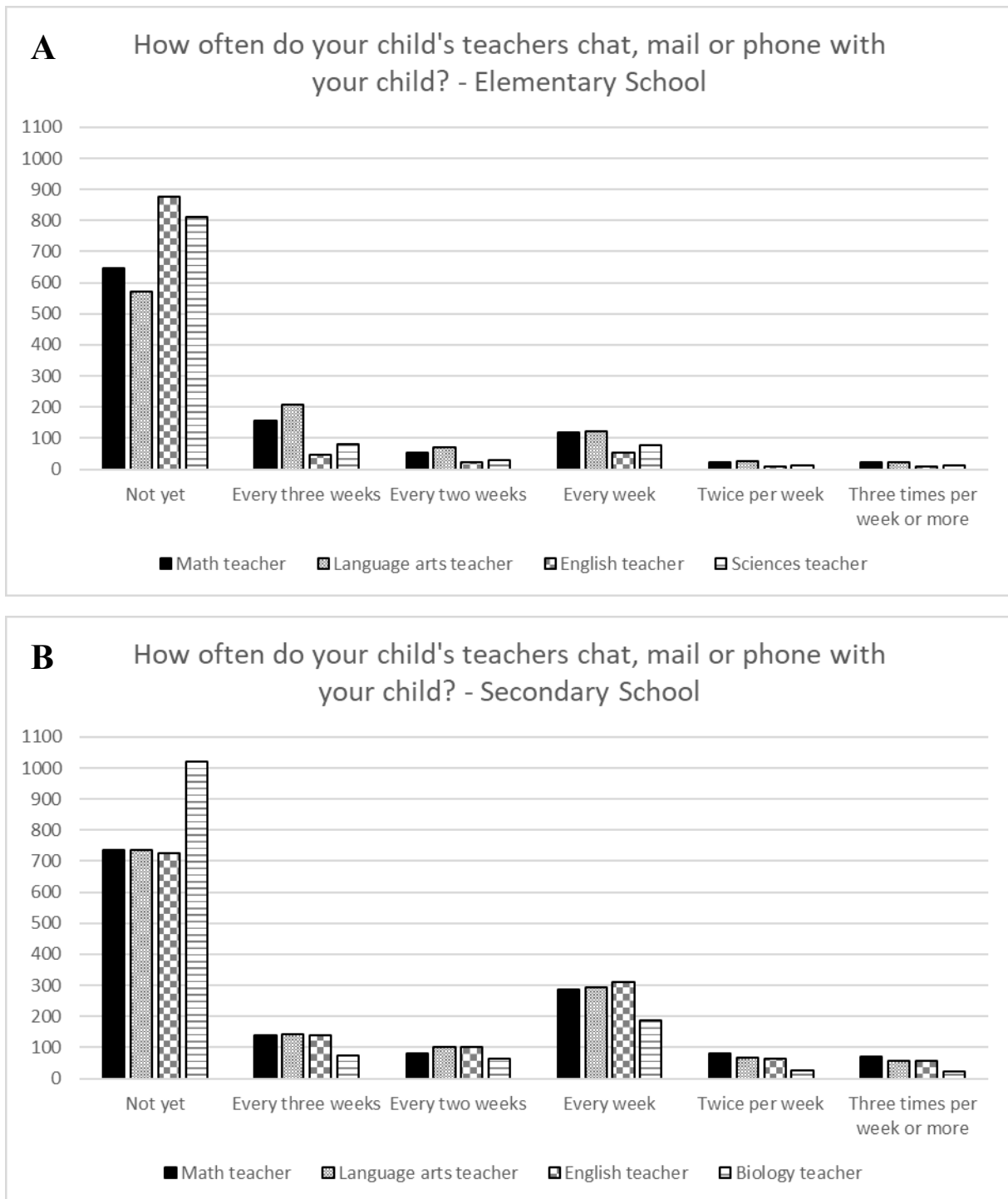
Figure S5.6. Frequencies of chatting, mailing or phoning with the students in elementary school (A) and secondary school (B).
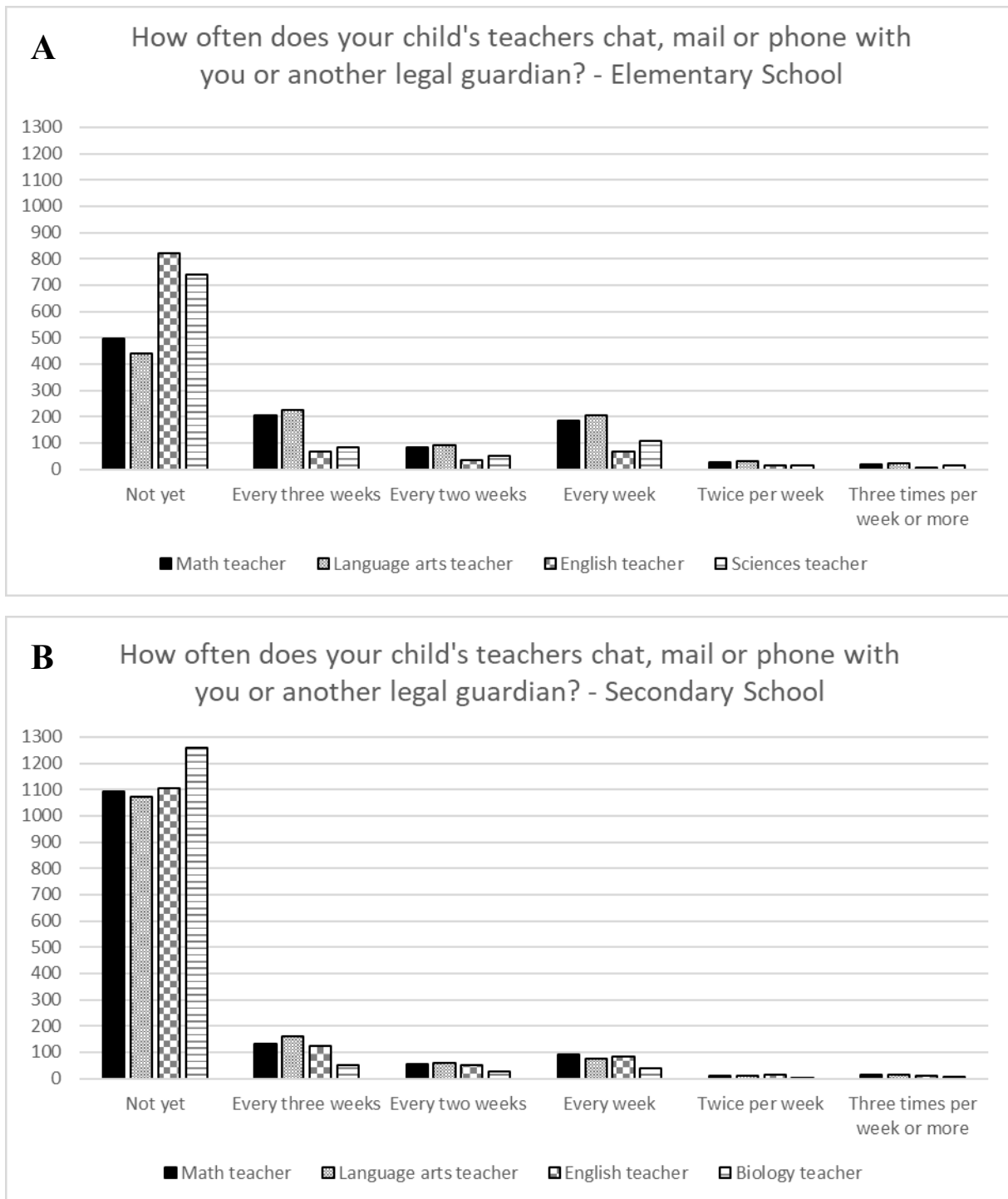
Figure S5.7. Frequencies of chatting, mailing or phoning with the parents or another legal guardian in elementary school (A) and secondary school (B).

A How often do your child's teachers grade the sent solutions from your child? - Elementary School

Math teacher Language arts teacher English teacher Sciences teacher

B How often do your child's teachers grade the sent solutions from your child? - Secondary School

Math teacher Language arts teacher English teacher Biology teacher

Figure S5.8. Frequencies of grading the task solutions in elementary school (A) and secondary school (B).

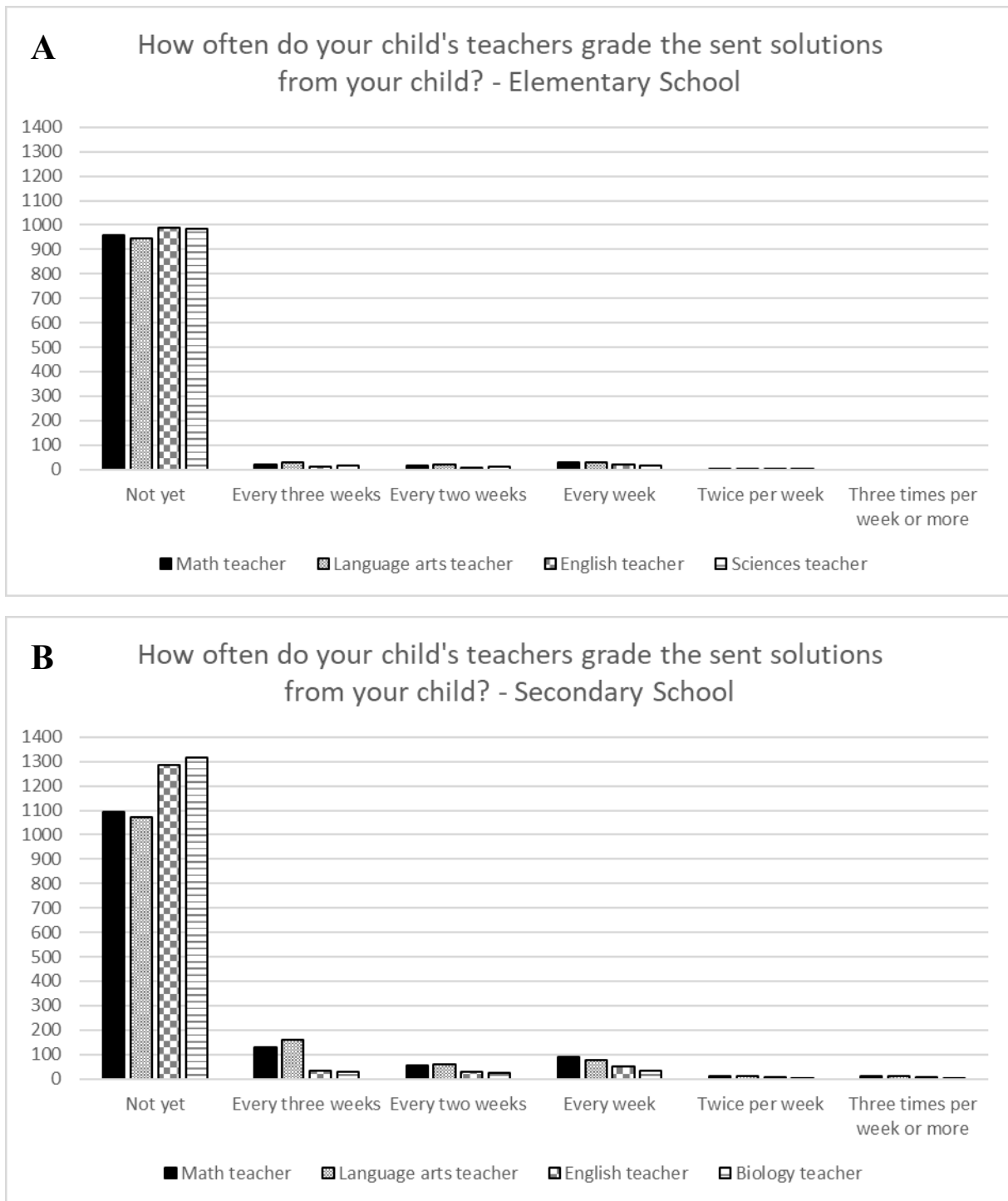**Supplement 6. Descriptive statistics for the elementary school sample**

Table S6

Means (M), standard deviation (SD), internal consistencies (α) as well as bivariate correlations (above the diagonal parametric, below non-parametric) in the elementary school sample

	M	SD	α	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	17)	18)	19)	20)	21)	22)	23)
Student outcomes during the school lockdown																										
1) Motivation[b]	2.68	1.13	.91		.51	.54	.12	.13	.09	.11	.06	.09	.18	.15	-.31	.42	.19	.16	.02	.03	-.04	-.06	<-.01	.03	.04	.03
2) Competent and independent learning[b]	3.08	1.05	.85	.50		.34	.10	.10	<.01	.06	<.01	.04	.13	.08	-.27	.36	.41	.29	.14	-.02	-.07	-.08	.04	.04	-.06	.02
3) Learning Progress[b]	2.96	1.16		.52	.33		.12	.10	.07	.10	.03	.08	.12	.20	-.12	.22	.17	.16	.09	<.01	-.04	.10	-.10	-.03	-.07	-.10
Frequency of distant teaching activities																										
4) Tasks[c]	2.99[a]	0.87	.74	.10	.11	.11		.50	.39	.39	.10	.25	.36	.32	-.01	.08	.08	.06	<-.01	-.03	-.01	-.12	-.03	.07	-.04	.14
5) Task Solutions[c]	2.01[a]	1.21	.88	.10	.09	.07	.43		.28	.40	.13	.24	.34	.31	<-.01	.06	.06	.01	<-.01	.02	-.02	-.08	-.04	.03	-.06	.17
6) Request Solutions[c]	2.09[a]	1.20	.89	.08	<.01	.07	.34	.24		.67	.21	.19	.27	.20	-.02	.04	.04	.04	-.04	.06	.01	-.05	-.09	.07	-.03	.11
7) Feedback[c]	1.78[a]	1.08	.88	.10	.05	.10	.32	.35	.67		.22	.24	.37	.31	.03	.04	.06	.09	-.01	.03	<-.01	-.09	-.05	.05	-.03	.11
8) Grading[c]	1.12[a]	0.48	.90	.05	<.01	.02	.05	.11	.18	.22		.05	.06	.05	-.06	.03	<.01	.03	-.10	.07	.02	<-.01	-.08	.02	.03	.04
9) Videoconference[c]	1.21[a]	0.64	.85	.08	.04	.08	.21	.21	.14	.14	.01		.40	.21	<.01	-.01	-.01	<-.01	-.02	-.01	.02	-.06	-.07	.02	-.01	.02
10) Communication Child[c]	1.63[a]	0.98	.88	.16	.10	.12	.30	.24	.23	.30	.03	.28		.47	-.03	.06	.06	.03	.02	.04	-.03	-.18	-.02	.03	-.02	.07
11) Communication Parent[c]	1.85[a]	1.05	.87	.13	.06	.18	.24	.20	.21	.31	.05	.14	.40		.03	.03	.04	.06	.05	.02	-.02	-.10	<.01	.01	-.02	-.03
Student characteristics																										
12) Negative emotionality[d]	3.98	1.21	.83	-.32	-.26	-.11	<-.01	<.01	-.01	.04	-.05	-.01	-.04	.05		-.29	-.08	-.07	.02	-.06	<.01	<-.01	.05	.01	-.09	-.04

	M	SD	α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
13) School Engagement[d]	4.07	1.18	.79	.41	.35	.20	.10	.04	.03	.02	.03	<.01	.05	.02	-.28		.43	.41	.08	<-.01	-.03	-.09	-.01	.04	.03	.02
14) Math competencies[d]	4.76	1.51	.97	.18	.40	.16	.08	.06	.03	.05	<-.01	.03	.05	.02	-.09	.40		.39	.12	.04	-.04	-.07	-.02	-.01	-.22	<.01
15) Language arts competencies[d]	4.93	1.30	.92	.16	.30	.15	.06	.02	.04	.08	.02	.02	.04	.04	-.07	.41	.37		.14	-.02	.01	-.06	<.01	.05	.05	-.03
Social background																										
16) Highest school leaving certificate	0.80	0.40		.03	.14	.09	<-.01	<.01	-.04	-.01	-.10	<.01	.02	.06	.02	.07	.11	.14		.02	-.03	-.09	-.04	.18	.02	-.05
17) Migration background	0.07	0.26		.02	-.01	<.01	-.05	.02	.07	.05	.06	-.04	.01	<-.01	-.06	<-.01	.04	-.01	.02		<.01	.03	<-.01	.02	<.01	<-.02
18) Child has an own room	0.87	0.33		.04	.07	.04	-.01	.02	<-.01	<-.01	-.05	<-.01	.03	<-.01	-.02	.03	.04	<-.01	.03	<-.01		-.07	.02	.14	.02	.06
19) Child has a computer/tablet	0.88	0.32		.07	.08	.05	.12	.07	.05	.10	<.01	.03	.14	.09	.01	.09	.08	.06	.09	-.03	-.07		-.03	.09	-.05	.10
Child's and parent's gender and age																										
20) Parent's gender	1.85	0.35		<-.01	.04	.09	-.01	-.04	-.07	-.02	-.07	-.07	<.01	.01	.05	-.02	-.02	<-.01	-.04	<-.01	-.02	.03		-.20	.07	-.03
21) Parent's age	40.85	5.13		.04	.04	-.01	.07	.03	.07	.03	-.02	.03	.05	<.01	<.01	.02	-.01	.06	.18	.01	-.15	-.09	-.16		.03	.20
22) Child's gender	1.47	0.50		.04	-.06	-.07	-.03	-.06	-.01	-.03	.04	.02	<-.01	-.04	-.09	.04	-.23	.05	.02	<.01	-.02	.05	.07	.04		-.04
23) Child's age	8.31	1.26		.03	.03	-.10	.15	.20	.10	.08	.05	.03	.06	-.06	-.04	.02	.02	-.01	-.04	-.02	-.07	-.10	-.04	.19	-.03	

Notes. N = 960 – 1,063. Highest school leaving certificate: 0 = no or vocational track school leaving certificate, 1 = academic track school leaving certificate; Child has an own room: 0 = no, 1 = yes; Child has a computer/tablet: 0 = no, 1 = yes; Gender: 0 = male, 1 = female; migration background: 0 = no, 1 = yes.

[a]The median was reported instead of the mean as the scores were skewed. [b]Scale ranged from 1 to 5. [c]Scale ranged from 1 to 6. [d]Scale ranged from 1 to 7. Correlations: r < .04, p < .05.

Supplement 7. Descriptive statistics for the secondary school sample

Table S7

Means (M), standard deviation (SD), internal consistencies (α) as well as bivariate correlations (above the diagonal parametric, below non-

parametric) in the secondary school sample

	M	SD	α	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	17)	18)	19)	20)	21)	22)	23)
Student outcomes during the school lockdown																										
1) Motivation[b]	2.73	1.08	.88		.52	.63	.13	.15	.16	.25	.09	.09	.23	.06	-.30	.40	.13	.19	.04	.05	<.01	-.09	<.01	.04	.17	.12
2) Competent and independent learning[b]	3.24	1.02	.86	.50		.28	.04	.07	.09	.15	.05	.10	.14	-.03	-.31	.36	.21	.31	.09	.02	-.07	-.09	.03	.08	.14	.31
3) Learning Progress[b]	2.72	1.13	.61	.27			.15	.16	.18	.25	.07	.12	.24	.13	-.13	.28	.10	.14	.02	.06	.01	-.03	.05	-.02	.08	.01
Frequency of distant teaching activities					.																					
4) Tasks[c]	3.79[a]	0.73	.74	.13	.04	.15		.53	.50	.40	.13	.24	.25	.09	.01	.09	.06	.07	-.03	.01	-.01	-.02	-.03	-.03	.04	-.07
5) Task solutions[c]	2.99[a]	1.13	.79	.16	.05	.16	.52		.35	.48	.14	.33	.30	.14	.01	.07	.07	.05	-.05	-.07	-.02	<-.01	-.05	<.01	.05	-.10
6) Request solutions[c]	3.09[a]	1.18	.84	.16	.09	.18	.50	.36		.58	.17	.21	.34	.09	-.01	.04	-.03	.05	<.01	.02	-.03	.04	-.06	.07	.01	.11
7) Feedback[c]	2.31[a]	1.18	.82	.24	.15	.24	.37	.46	.56		.26	.33	.49	.22	-.06	.10	.01	.06	-.05	-.03	-.01	-.04	-.02	.04	.05	.05
8) Grading[c]	1.18[a]	0.62	.93	.08	.03	.04	.07	.08	.10	.21		.14	.19	.16	-.03	.05	-.01	-.02	-.07	.03	.04	-.02	-.01	<.01	.04	.11
9) Videoconference[c]	1.62[a]	0.95	.78	.09	.12	.10	.16	.28	.18	.30	.08		.42	.19	.01	.02	.05	.03	.01	-.05	.01	-.03	-.05	.04	.01	-.01
10) Communication child[c]	2.15[a]	1.26	.85	.22	.12	.23	.21	.25	.32	.47	.12	.35		.26	<-.01	.08	-.01	.08	-.03	-.03	-.03	-.08	-.04	.02	.05	.07
11) Communication parent[c]	1.38[a]	0.77	.85	.03	-.06	.11	.05	.10	.04	.16	.06	.14	.23		.05	-.02	-.01	-.04	-.08	-.01	.06	-.01	.02	-.06	-.01	-.13
Student characteristics																										

Variable	M	SD	α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
12) Negative emotionality[d]	3.66	1.27	.84	-.29	-.31	-.12	-.02	.01	-.02	-.05	-.05	.01	<-.01	.08		-.24	-.08	-.11	-.01	-.05	-.01	.02	.01	-.07	-.20	-.17
13) School engagement[d]	4.10	1.25	.83	.40	.36	.27	.08	.06	.05	.11	.03	.02	.09	-.03	-.24		.36	.48	.09	.00	<.01	-.04	.05	.03	.26	.07
14) Math competencies[d]	4.51	1.49	.98	.13	.21	.08	.05	.07	-.03	.03	<.01	.06	<-.01	.01	-.08	.35		.28	.11	-.06	-.04	.02	-.05	.02	-.16	-.05
15) Language arts competencies[d]	4.78	1.34	.93	.19	.33	.15	.04	.04	.05	.07	-.02	.06	.11	-.04	-.14	.47	.27		.16	.01	.00	-.05	-.01	.05	.15	.05
Social background																										
16) Highest school leaving certificate	0.77	0.42		.05	.10	.03	-.02	-.04	<.01	-.04	-.06	.08	.00	-.07	-.01	.10	.11	.16		-.01	-.05	-.05	-.11	.17	<.01	-.04
17) Migration background	0.07	0.25		.04	.02	.05	.01	-.06	.01	-.04	.01	-.05	-.02	-.02	-.05	<-.01	-.06	.02	-.01		.12	-.04	.03	-.09	.01	.03
18) Child has an own room	0.94	0.24		<-.01	.07	<-.01	<.01	.02	.03	.01	-.03	-.01	.03	-.04	<.01	.01	.04	.01	.05	-.12		-.08	-.02	.14	-.02	.05
19) Child has a computer/tablet	0.96	0.19		.09	.09	.04	<-.01	<-.01	.04	.04	<.01	.03	.08	.02	-.01	.05	-.01	.05	.05	.04	-.08		-.01	.05	.03	.05
Child's and parent's gender and age																										
20) Parent's gender	1.83	0.37		<-.01	.03	.05	-.02	-.05	-.06	-.01	.02	-.06	-.03	.01	.02	.05	-.05	-.01	-.11	.03	.02	.01		-.23	.09	<-.01
21) Parent's age	45.01	5.28		.04	.08	-.03	-.03	<.01	.07	.06	.01	.08	-.04	-.08	-.08	.04	.03	.06	.16	-.08	-.13	-.05	-.21		-.02	.27
22) Child's gender	1.48	0.50		.17	.13	.08	.04	.05	.01	.05	.03	.03	.05	-.01	.20	.26	-.16	.16	<.01	.01	.02	-.03	.09	<-.01		-.03
23) Child's age	12.55	1.86		.11	.31	<-.01	-.06	-.09	.13	.07	.14	.02	.09	-.16	-.16	.04	-.04	.05	-.05	.04	-.06	-.06	.01	.26	-.04	

Notes. $N = 1{,}273 - 1{,}456$. Highest school leaving certificate: 0 = no or vocational track school leaving certificate, 1 = academic track school leaving certificate; Child has an own room: 0 = no, 1 = yes; Child has a computer/tablet: 0 = no, 1 = yes; Gender: 0 = male, 1 = female; migration background: 0 = no, 1 = yes.

[a]The median was reported instead of the mean as the scores were skewed. [b]Scale ranged from 1 to 5. [c]Scale ranged from 1 to 6. [d]Scale ranged from 1 to 7. Correlations: $r < .04$, $p < .05$.

Supplement 8. Model fit of structure equation models without student characteristics and demographics as additional predictors

Table S8

Model Fit indices and inter-correlations between exogenous variables for structure equation models regressing distant teaching activities on students' academic outcomes during the school lockdown without student characteristics and demographics as additional predictors for the total sample (All), elementary school (ES) and secondary school (Sec)

Sample	χ^2 (*df*)	RMSEA (CI 90%)	CFI	TLI	$r_{resM \, x \, resC}$	$r_{resM \, x \, resL}$	$r_{resC \, x \, resL}$
All	860.29 (541)	.015 (.013 - .017)	.992	.990	.642	.625	.456
ES	618.00 (541)	.012 (.006 - .016)	.997	.996	.568	.579	.388
Sec	681.35 (541)	.013 (.010 - .016)	.992	.990	.639	.654	.347

Notes. resM = residual factor motivation, resC = residual factor competent and independent learning, resL = residual learning process.

Supplement 9. Results of structure equation models without student characteristics and demographics as additional predictors

Table S9

Path weights of the structure equation model (SEM) regressing distant teaching activities regressed on students' motivation, competent and independent learning, and learning progress during the school lockdown

	Motivation						Competent and independent learning						Learning progress					
	All		ES		Sec		All		ES		Sec		All		ES		Sec	
	B	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*
Tasks	.05	.03	-.01	.05	.20*	.04	.07*	.02	.06	.06	.06	.04	.10*	.04	-.01	.06	.18*	.08
Task solutions	.11*	.03	.12*	.05	< .01	.04	.04	.03	.12*	.03	-.04	.05	.04	.02	.11	.06	.03	.08
Request solutions	.03	.03	-.01	.05	-.11*	.04	-.04	.02	-.05	.04	-.09*	.02	.03	.04	.00	.07	-.03	.08
Feedback	.09*	.04	.21*	.06	.29*	.03	.09*	.03	.16*	.05	.22*	.03	.10*	.04	.20*	.06	.24*	.06
Grading	.01	.03	-.04	.08	-.09*	.03	-.04	.04	-.13*	.06	-.05	.05	-.05*	.02	-.12	.07	-.19*	.05
Video	-.04	.03	-.04	.05	-.07	.07	.02	.03	-.06	.07	.07	.04	-.02	.03	.05	.06	-.05	.05
Com. child	.20*	.03	.18*	.04	.19*	.08	.16*	.03	.16*	.04	.11*	.03	.14*	.03	.01	.05	.17*	.07
Com. parent	-.02	.01	.06	.06	.01	.03	-.11*	.03	-.03	.07	-.13*	.03	.14*	.02	.19*	.05	.11*	.04
R^2	.115		.103		.163		.054		.056		.067		.121		.089		.169	

Notes. All = total sample; ES = Elementary school; Sec = Secondary School; Tasks = Sending Tasks; Tasks Solutions = Sending Task Solutions; Request Solutions = Requesting students' solutions; Feedback = Providing feedback on students' solutions; Video = Teaching via videoconference; Com. Child = Student-teacher communication; Com. Parent = parent-teacher communication.
*p < .05.