

Digital Boundary Management and Teacher Wellbeing in Nordic Hybrid Schools

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Abstract.

Following our longitudinal study of teacher burnout and digital fatigue, this paper examines boundary-management strategies used by 312 teachers in Finland and Sweden working in hybrid schools that combine on-site and remote instruction. Hybrid provision has persisted in Nordic secondary education beyond the pandemic period, and with it the expectation that teachers remain reachable through learning platforms, messaging applications and email across the working day and beyond. Drawing on boundary theory and the job demands–resources model, the study investigated which strategies teachers use to manage the boundary between work and non-work in digital environments and whether those strategies are associated with lower digital fatigue and higher wellbeing. A cross-sectional survey administered in spring 2026 measured five boundary-management strategies, digital fatigue, emotional exhaustion, work engagement and perceived school-level communication norms. Hierarchical regression analyses controlling for age, teaching load and hybrid intensity showed that teachers who apply strict notification limits and scheduled asynchronous communication report significantly lower digital fatigue than teachers who do not, with standardised coefficients of -0.31 and -0.24 respectively. Physical separation of devices had a smaller effect, and mental detachment routines were effective only when supported by school-level norms. The effects of individual strategies were moderated by the extent to which schools had explicit communication norms, with individual strategies contributing less where norms were strong. The findings indicate that boundary management is a shared organisational responsibility rather than an individual coping skill, and they offer guidance for school leaders seeking to protect teacher wellbeing in hybrid settings.

Keywords: boundary management, digital fatigue, teacher wellbeing, hybrid schools, Nordic education

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1. Introduction

Hybrid schooling, in which teachers deliver instruction to students who are partly on site and partly remote, was adopted at scale during the pandemic and has persisted in the Nordic countries as a response to rural depopulation, teacher shortages, student illness and the expansion of flexible upper-secondary provision. Its persistence has changed the texture of teachers' work. Learning platforms, messaging applications and email have become the primary channels through which students, parents and colleagues reach teachers, and these channels do not observe the temporal boundaries of the school day. The consequence for many teachers is a form of exhaustion that is specific to digital connectivity rather than to workload in general, which we and others have called digital fatigue.

In our earlier study (Korhonen & Virtanen, 2025) we followed teachers in Helsinki hybrid learning environments over eighteen months and documented rising digital fatigue and emotional exhaustion, with the sharpest increases among teachers who reported being

reachable outside working hours. That study identified the erosion of boundaries between work and non-work as the mechanism most closely associated with deterioration in wellbeing, but it did not examine what teachers do about it. Some teachers in the Helsinki sample reported deliberate strategies for limiting connectivity, and their trajectories appeared more favourable, though the sample was too small to test this.

The present paper takes up that observation with a larger sample in two countries. It examines the boundary-management strategies used by 312 teachers in hybrid schools in Finland and Sweden and asks which strategies are associated with lower digital fatigue and higher wellbeing. Sweden was added because its hybrid provision developed under a different regulatory regime, with more school-level autonomy over communication practices, which allows the role of school norms to be examined. The study draws on boundary theory, which addresses how individuals segment or integrate life domains, and on the job demands–resources model, which treats boundary management as a personal resource that may buffer the effect of demands.

Three questions guide the analysis. Which boundary-management strategies do teachers in Nordic hybrid schools use, and how prevalent is each? Which strategies are associated with lower digital fatigue and better wellbeing after accounting for teaching load and hybrid intensity? Do school-level communication norms moderate the effectiveness of individual strategies? The paper reviews the literature, describes the survey methodology, reports descriptive and regression results, discusses their implications for teachers and school leaders and concludes with limitations and directions for future research.

2. Literature Review

2.1 Boundary theory and digital connectivity

Boundary theory holds that individuals construct and maintain boundaries between life domains such as work and home, and that they differ in their preference for segmenting or integrating those domains (Ashforth et al., 2000). Kreiner et al. (2009) identify tactics through which individuals negotiate boundaries, including behavioural tactics such as using technology to filter demands, temporal tactics such as blocking off time, physical tactics such as separating spaces and communicative tactics such as setting expectations with others. Digital connectivity complicates boundary work because devices carry the work domain into every other domain. Derks et al. (2014) show that smartphone use for work in the evening is associated with impaired recovery, and Sonnentag and Fritz (2007) establish psychological detachment from work during non-work time as a key recovery experience whose absence predicts exhaustion. The concept of boundary management thus links individual tactics to wellbeing outcomes through recovery.

2.2 Job demands, resources and teacher wellbeing

The job demands–resources model (Bakker & Demerouti, 2017) proposes that job demands drain energy and produce exhaustion, while job resources, including personal resources, support engagement and buffer the effect of demands. Applied to teachers, the model has been used to explain burnout, which Maslach et al. (2001) characterise as emotional exhaustion, depersonalisation and reduced accomplishment, and to identify resources such as autonomy and collegial support that protect against it. Skaalvik and Skaalvik (2018) find among Norwegian teachers that time pressure and lack of supervisory support are the demands most strongly related to exhaustion. Digital connectivity introduces a demand that is continuous rather than episodic, and boundary-management strategies can be conceptualised as personal resources that regulate exposure to that demand. Our earlier

longitudinal work (Korhonen & Virtanen, 2025) treated digital fatigue as a distinct outcome, related to but separable from general emotional exhaustion, and characterised by weariness specifically associated with screen-mediated communication and the expectation of availability.

2.3 Organisational norms and hypotheses

Individual boundary tactics operate within organisational contexts that may support or undermine them. Mazmanian et al. (2013) describe an autonomy paradox in which professionals who use mobile devices to gain flexibility end up escalating their own availability because of collective norms of responsiveness. Where such norms prevail, an individual who limits notifications risks being seen as unresponsive, and the tactic may be abandoned. Conversely, explicit organisational norms that legitimise disconnection, such as agreed response windows, reduce the cost of individual boundary tactics and may make some of them unnecessary. Reviews of digital wellbeing in education (Selwyn, 2021) note that school communication practices are rarely governed by explicit policy. Drawing on this literature, the study tests four hypotheses. H1 proposes that strict notification limits are associated with lower digital fatigue. H2 proposes that scheduled asynchronous communication is associated with lower digital fatigue. H3 proposes that physical device separation and mental detachment routines are associated with lower digital fatigue. H4 proposes that school-level communication norms moderate these relationships, such that individual strategies contribute less where norms are strong.

3. Methodology

3.1 Sample and data collection

A cross-sectional survey was administered between March and May 2026 to teachers in lower- and upper-secondary schools in Finland and Sweden that used hybrid provision for at least one class. Schools were identified through municipal education offices in the Helsinki, Tampere, Stockholm and Gothenburg regions, and the survey was distributed by school leaders with an information letter from the research team. Of 587 teachers invited, 312 returned complete responses, a response rate of 53.1%. Table 1 presents the sample profile. Ethical approval was granted by the University of Helsinki ethics review board, and responses were anonymous; school identifiers were retained only to compute school-level norm scores.

Table 1: Profile of respondents (N = 312)

Variable	Category	n	%
Country	Finland	176	56.4
	Sweden	136	43.6
Gender	Female	218	69.9
	Male	89	28.5
	Other or not stated	5	1.6
Age group	Under 35	78	25.0
	35–49	142	45.5
	50 and over	92	29.5
Hybrid intensity	Less than 25% of lessons hybrid	121	38.8
	25–50% of lessons hybrid	118	37.8
	More than 50% of lessons hybrid	73	23.4

Source: Authors' survey data (2026)

3.2 Measures

Boundary-management strategies were measured with a 15-item instrument developed for this study on the basis of the tactics described by Kreiner et al. (2009) and refined through a pilot with 24 teachers. Five strategies were measured with three items each: strict notification limits, such as silencing work applications outside set hours; scheduled asynchronous communication, such as announcing fixed windows for replying to messages; physical device separation, such as keeping work devices in a separate room; mental detachment routines, such as end-of-day rituals; and communicative expectation-setting with students and parents. Digital fatigue was measured with the eight-item scale developed in our earlier study (Korhonen & Virtanen, 2025), emotional exhaustion with the corresponding subscale of the Maslach Burnout Inventory (Maslach et al., 2001), and work engagement with the nine-item Utrecht Work Engagement Scale (Schaufeli et al., 2006). School-level communication norms were measured with four items on the existence and enforcement of agreed response times and out-of-hours expectations, aggregated to the school mean. All scales used five-point response formats. Controls included age, weekly teaching hours and hybrid intensity.

3.3 Analysis

Scale reliability was assessed with Cronbach's alpha, and confirmatory factor analysis supported the five-factor structure of the boundary-management instrument with acceptable fit. Hypotheses were tested with hierarchical ordinary least squares regression predicting digital fatigue, with controls entered first, the five strategies second and interaction terms between each strategy and school norms third. Predictors were mean-centred before interaction terms were computed. Common method variance was assessed with Harman's single-factor test, in which the first factor accounted for 28.7% of variance (Podsakoff et al., 2003). Analyses were conducted following the guidance of Hair et al. (2019), and variance inflation factors did not exceed 2.4. Supplementary models predicted emotional exhaustion and work engagement.

4. Results

4.1 Descriptive statistics

Table 2 reports means, standard deviations, reliability coefficients and correlations. All scales exceeded 0.70 reliability. The most prevalent strategy was communicative expectation-setting, followed by mental detachment routines; strict notification limits and scheduled asynchronous communication were used regularly by fewer than half of respondents. Finnish teachers reported somewhat higher use of notification limits than Swedish teachers, while Swedish teachers reported stronger school-level norms, consistent with the greater school autonomy in Sweden. Digital fatigue was moderately high on average and correlated positively with emotional exhaustion and negatively with work engagement. All five strategies correlated negatively with digital fatigue at the bivariate level, with the strongest correlations for notification limits and scheduled asynchronous communication.

Table 2: Descriptive statistics, reliability and correlations with digital fatigue (N = 312)

Variable	Mean	SD	α	r with digital fatigue
Strict notification limits	2.81	1.12	0.86	-0.42
Scheduled asynchronous communication	2.94	1.05	0.83	-0.37
Physical device separation	3.12	1.18	0.79	-0.21
Mental detachment routines	3.38	0.97	0.81	-0.26

Communicative expectation-setting	3.61	0.89	0.78	-0.19
School-level communication norms	2.97	0.94	0.85	-0.33
Digital fatigue	3.42	0.88	0.90	1.00
Emotional exhaustion	3.11	0.95	0.89	0.58
Work engagement	3.54	0.81	0.91	-0.39

Source: Authors' survey data (2026)

4.2 Hypothesis testing

Table 3 presents the hierarchical regression results. Controls explained 11.4% of variance in digital fatigue, with hybrid intensity and teaching hours both positively associated with fatigue. Adding the five strategies raised explained variance to 38.6%. Strict notification limits had the largest coefficient ($\beta = -0.31$, $p < 0.001$), supporting H1, and scheduled asynchronous communication was also significant ($\beta = -0.24$, $p < 0.001$), supporting H2. Physical device separation had a small but significant effect ($\beta = -0.11$, $p = 0.034$). Mental detachment routines ($\beta = -0.08$, $p = 0.121$) and communicative expectation-setting ($\beta = -0.06$, $p = 0.248$) were not significant once the other strategies were included, so H3 received partial support. Adding interaction terms increased explained variance to 42.1%. The interactions of school norms with notification limits ($\beta = 0.14$, $p = 0.009$) and with mental detachment routines ($\beta = -0.12$, $p = 0.021$) were significant. Probing showed that the effect of notification limits was weaker where school norms were strong, consistent with H4, whereas mental detachment routines were effective only where norms were strong, indicating that this strategy depends on organisational support rather than substituting for it.

Table 3: Hierarchical regression predicting digital fatigue ($N = 312$)

Predictor	Model 1 β	Model 2 β	Model 3 β	p (Model 3)
Hybrid intensity	0.24	0.18	0.17	0.001
Weekly teaching hours	0.19	0.14	0.13	0.008
Strict notification limits		-0.31	-0.29	< 0.001
Scheduled asynchronous communication		-0.24	-0.22	< 0.001
Physical device separation		-0.11	-0.10	0.041
Mental detachment routines		-0.08	-0.07	0.148
School-level communication norms		-0.15	-0.16	0.003
Norms $\times$ notification limits			0.14	0.009
Norms $\times$ mental detachment			-0.12	0.021
R ²	0.114	0.386	0.421	

Source: Authors' survey data (2026)

4.3 Supplementary outcomes

Models predicting emotional exhaustion and work engagement showed similar but weaker patterns. Notification limits and scheduled asynchronous communication were significantly associated with lower emotional exhaustion and higher engagement, but the coefficients were roughly half the size of those for digital fatigue, which supports the treatment of digital fatigue as a distinct and more proximal outcome of connectivity. Country did not moderate any of the relationships when included as an additional interaction term, suggesting that the findings hold across the two systems despite differences in prevalence of strategies and strength of norms.

5. Discussion

The findings extend our longitudinal work (Korhonen & Virtanen, 2025) by identifying what teachers can do, and what schools must do, to limit digital fatigue in hybrid settings. Two individual strategies stand out. Strict notification limits and scheduled asynchronous communication are associated with substantially lower digital fatigue, and their effects hold after accounting for teaching load and hybrid intensity. Both are temporal and behavioural tactics in the terms of Kreiner et al. (2009): they regulate when the work domain is permitted to intrude rather than relying on the teacher's capacity to ignore intrusions. The weaker effect of physical device separation and the non-significant effect of mental detachment routines suggest that in an environment of continuous connectivity, tactics that alter the flow of demands are more effective than tactics that alter the teacher's response to them. This is consistent with recovery research showing that detachment is difficult to achieve while demands remain salient (Sonnentag & Fritz, 2007; Derks et al., 2014).

The moderation findings are the study's most important contribution. Where schools have explicit communication norms, the individual effect of notification limits is smaller, presumably because norms already limit demands and individual tactics add less. Where schools lack such norms, notification limits matter a great deal, but they require the teacher to act against the collective expectation of responsiveness described by Mazmanian et al. (2013), which may carry professional costs that the survey did not capture. Mental detachment routines, meanwhile, appear to work only when norms are strong, which suggests that the psychological effort of detaching is futile when the school's practices continually reattach the teacher. Taken together, these results support a reading of boundary management as an organisational responsibility. In job demands–resources terms (Bakker & Demerouti, 2017), school norms are a job resource that both reduces the demand and makes personal resources effective.

For school leaders, the implications are practical. Agreed response windows, platform settings that suppress notifications outside those windows by default and explicit statements to parents and students about availability would institutionalise the two strategies that teachers currently adopt individually and unevenly. Such measures align with the observation of Selwyn (2021) that school digital practices are rarely governed by deliberate policy, and with evidence from Skaalvik and Skaalvik (2018) that supervisory support is protective. The Swedish data indicate that school autonomy has allowed some schools to develop such norms, while the Finnish data indicate that teachers compensate individually where norms are weak. Neither situation is ideal. National guidance on communication norms in hybrid provision would reduce the reliance on individual initiative and local variation.

The findings should also be read in relation to hybrid intensity, which remained a significant predictor of digital fatigue in all models. Boundary-management strategies reduce fatigue but do not eliminate the additional demand created by teaching students in two places at once, which involves managing platforms during lessons as well as communication around them. Hybrid provision that is adopted for reasons of cost or convenience rather than pedagogical necessity should therefore be evaluated with teacher wellbeing as an explicit criterion. Where hybrid teaching is unavoidable, allocating preparation time that reflects its additional demands, and limiting the share of a teacher's timetable that is hybrid, would complement communication norms in reducing fatigue.

The findings also contribute to boundary theory by showing how the segmentation preferences that Ashforth et al. (2000) describe interact with organisational context in digital work. Teachers who prefer segmentation can enact it through notification limits, but the wellbeing benefit of doing so depends on whether the school legitimises it. Boundary tactics

are therefore not simply expressions of individual preference; they are negotiations with collective norms whose outcome determines their effectiveness. Digital fatigue, as a construct, captures the cost of losing that negotiation. Future theoretical work might usefully distinguish between boundary tactics that operate on the supply of demands and those that operate on the individual's response, since the present results suggest that the former are more robust in digitally saturated work.

6. Conclusion

This study of 312 teachers in Finnish and Swedish hybrid schools found that strict notification limits and scheduled asynchronous communication are associated with significantly lower digital fatigue, that physical device separation has a smaller effect and that mental detachment routines are effective only where school-level communication norms are strong. School norms moderate the effect of individual strategies, contributing less where they are already established. The study extends our earlier longitudinal findings by identifying protective strategies and by locating responsibility for boundary management at the organisational as well as the individual level. Schools that wish to protect teacher wellbeing in hybrid provision should institutionalise response windows and default notification settings rather than leaving teachers to negotiate connectivity alone.

The cross-sectional design limits causal inference; teachers with lower fatigue may find it easier to maintain boundaries, and longitudinal or intervention designs are needed to establish direction. The sample was drawn from urban regions in two countries with strong teacher professionalism, and self-report measures were used throughout. Future research should test school-level interventions that introduce communication norms, examine the professional costs teachers may incur when limiting availability and extend the analysis to primary schools and to countries with different labour regulations.

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