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EDITED BY
Jabeen Fayyaz,
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REVIEWED BY
Patrícia Albergaria Almeida,
Universidade Aberta, Portugal
Daniela Schmitz,
Witten/Herdecke University, Germany

*CORRESPONDENCE
Sylvia Olsson
sylvia.olsson@mdu.se

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Lecturer presence is linked to perceived learning, while pedagogical and technical factors are linked to satisfaction in synchronous hybrid teaching

Sylvia Olsson*

Department of Social Sciences and Humanities, Division of Social Work, Mälardalen University, Eskilstuna, Sweden

Introduction: Hybrid teaching, in which students attend lectures either in the physical presence of a lecturer or synchronously via video link from another location, has become increasingly common at multi-campus institutions, yet research systematically comparing student satisfaction and perceived learning in this format remains limited.

Methods: This study examined synchronous hybrid teaching in an undergraduate Social Work programme delivered across two Swedish campuses, in which the defining difference between student groups was not physical attendance as such, since students at both sites were present in university classrooms, but whether the lecturer taught in person or via videoconference from the other campus. A total of 282 students completed a study-specific questionnaire across three consecutive semesters, assessing overall satisfaction, perceived learning under both lecturer conditions, ability to focus, sense of community, and technical problems.

Results: Perceived learning was consistently higher when the lecturer was physically present than when teaching remotely ($d = 1.24$), a pattern that held within students at both campuses, indicating that it was not attributable to campus affiliation alone. Students at the satellite campus reported significantly higher overall satisfaction than students at the main campus, but this campus-level difference was no longer statistically significant once pedagogical and technical factors were accounted for in a multiple regression model; instead, perceived learning during remote-lecturer sessions, ability to focus, sense of community, and technical problems emerged as the strongest independent predictors of satisfaction, together explaining 57.4% of its variance.

Discussion: These findings suggest that satisfaction and perceived learning represent partly distinct dimensions of the hybrid teaching experience and suggest that local pedagogical support and reliable technical delivery during remote-lecturer sessions may matter more for student satisfaction than physical co-location with the lecturer itself.

KEYWORDS
higher education, hybrid teaching, lecturer presence, multi-campus education, perceived learning, social work education, student satisfaction, synchronous videoconferencing

1 Introduction

Hybrid teaching, in which one group of students attends a lecture in person while another group participates synchronously via video link from a different location, has become an increasingly common feature of higher education, even though it still often coexists alongside purely in-person and purely online teaching (Shephard et al., 2024). The format is widely adopted as a pragmatic response to geographic dispersion and growing demands for flexible participation, particularly at institutions that operate across multiple campuses (Gudoniene et al., 2025). Despite its widespread use, the maturity of hybrid teaching has been constrained by a lack of research-based development, and systematic research on how students actually experience hybrid lectures and on the extent to which they perceive themselves to have assimilated the taught content, remains comparatively limited (Shephard et al., 2024).

Hybrid teaching implementations vary considerably in scope. At one end, single hybrid sessions involve occasional synchronous connections for isolated lectures; at the other, hybrid courses or, as in the present study, hybrid teaching sustained across entire semesters of a degree programme, involve a continuous, structurally embedded format rather than an *ad hoc* arrangement. Existing evidence predominantly concerns single-session or short-term implementations (Gudoniene et al., 2025; Shephard et al., 2024), leaving the experience of sustained, programme-level hybrid delivery comparatively underexamined — the gap the present study addresses.

This gap persists in the closely related area of HyFlex or multi-access learning, in which students choose session-by-session whether to attend in person, remotely, or asynchronously. A recent systematic review of 30 empirical studies found that well-implemented HyFlex courses can sustain student engagement and academic performance comparable to conventional face-to-face instruction, provided instructors maintain a strong presence across modalities and institutions provide robust technological infrastructure (Mahmud et al., 2026). Programme-level hybrid delivery designed and evaluated as a sustained institutional model, rather than as a short-term accommodation, remains comparatively rare; one exception is a hybrid Master's programme in which flexible, blended delivery was found to support students balancing study with work or caregiving responsibilities, while requiring ongoing coordination to sustain (Terpstra-Rundel and Möller, 2025).

It is useful to distinguish hybrid teaching from the closely related but conceptually distinct notion of blended learning. While blended learning is generally student-centered and oriented toward optimizing learning outcomes through a combination of online and campus-based components, hybrid teaching is characterized by the teacher's leading role in a synchronous session that connects on-site and remote learners simultaneously, producing more complex teaching and learning scenarios than conventional classroom instruction (Li et al., 2025). This distinction is central to the present study, which examines the specific case of synchronous hybrid teaching in which the lecturer is physically present at one campus while students at another campus attend via video link.

These constructs can be situated within the Community of Inquiry framework (Garrison et al., 1999), which distinguishes teaching presence, social presence, and cognitive presence as interacting dimensions of the learning experience. In the present study, lecturer presence corresponds most closely to teaching presence — the direct facilitation and instructional guidance provided by the lecturer — while satisfaction and perceived learning represent distinct downstream outcomes that may be differentially shaped by this dimension, consistent with Alqurashi's (2019) finding that satisfaction and perceived learning are driven by partially different mechanisms.

Prior research has generally converged on the finding that physical co-location with the instructor benefits students' experience of hybrid instruction. In a study of 241 students who attended synchronous hybrid classrooms either on-site or remotely, on-site students reported significantly higher perceived usability, social presence, and perceived learning than their remote peers, with social presence and perceived usability emerging as significant predictors of perceived learning (Wagner et al., 2023). A related natural-experiment study similarly investigated how participation mode affects perceived learning in synchronous hybrid classrooms, examining social presence as a potential mediating mechanism between on-site versus remote attendance and learning outcomes (Wagner et al., 2025). Consistent with this, research comparing on-site and remote hybrid learning designs through the activity-centred analysis and design (ACAD) framework similarly examined how different levels of student and teacher presence relate to engagement and learning outcomes (Raes, 2022). Together, this body of work suggests that physical presence and perceived learning tend to move together, largely through the mediating role of social presence.

At the same time, broader reviews of the field emphasize that hybrid teaching continues to face substantial pedagogical and technological challenges for both teachers and learners, including technical difficulties, time management, communication barriers, and complexities in assessment (Gudoniene et al., 2025). These challenges are not necessarily distributed evenly between on-site and remote participants and may depend heavily on how the local technical and pedagogical environment at each campus is designed and supported. Consistent with this, a mixed-methods study of hybrid teaching in engineering education found that the teaching field, encompassing subject matter and instructional design, had the strongest positive effect on students' overall satisfaction with hybrid teaching, suggesting that satisfaction may be shaped by factors beyond physical presence alone (Li et al., 2025).

Beyond addressing technical and organisational challenges, some research has explored whether alternative technologies can actively strengthen remote students' sense of presence rather than merely compensating for its absence. For instance, telepresence robots, mobile, remotely controlled devices that allow a distant student to "occupy" physical space in the classroom, have been shown to promote a heightened sense of presence and autonomy compared to conventional videoconferencing tools, provided their pedagogical integration is deliberately designed rather than left to improvisation (Kasuk et al., 2025).

Satisfaction and perceived learning, while often reported together, are conceptually distinct constructs. Satisfaction reflects students' subjective evaluation of the learning experience, whereas perceived learning captures students' own assessment of how much they have understood or retained (Alqurashi, 2019). In a study of online learners, self-efficacy and learner–content interaction emerged as the strongest predictors of satisfaction, while online learning self-efficacy was the strongest predictor of perceived learning, indicating that the two outcomes, although correlated, can be driven by partially different mechanisms (Alqurashi, 2019). This distinction is directly relevant to synchronous hybrid teaching: if satisfaction and perceived learning are shaped by different underlying processes, it becomes plausible that a factor such as physical co-location with the lecturer could influence one outcome without correspondingly influencing the other.

It is against this backdrop that the present study's preliminary findings stand out as a departure from the pattern reported in much of the existing literature. Whereas prior work tends to link physical presence to both higher satisfaction and higher perceived learning, the present findings indicate that these two dimensions can diverge: students whose lecturer taught remotely via video link reported higher overall satisfaction than students whose lecturer was more often physically present, even though the lecturer's physical presence is consistently associated with higher perceived learning across both campuses.

1.1 Aims

The present study aims to compare students attending hybrid lectures with and without the lecturer physically present, in order to better understand how satisfaction and perceived learning relate to one another in synchronous hybrid teaching. To the author's knowledge, no prior study has directly compared student satisfaction and perceived learning across two campuses within the same synchronous hybrid teaching format, where the lecturer is physically present at one campus while teaching students synchronously at another campus via video link. This design allows the association between the lecturer's physical presence and students' outcomes to be examined somewhat independently of other confounding factors that typically vary between institutions or courses, such as subject matter, class size, or instructor identity. By explicitly distinguishing between student satisfaction and perceived learning, this study seeks to provide a more nuanced understanding of the pedagogical mechanisms underlying successful synchronous hybrid teaching, with direct implications for how hybrid teaching formats are designed, digital tools are optimized, and student needs are supported across multi-campus institutions. Specifically, the study addresses the following research questions:

RQ1: How do students experience satisfaction and perceived learning in synchronous hybrid teaching?

RQ2: To what extent is lecturer presence associated with students' perceived learning and satisfaction?

RQ3: Which factors appear to be associated with positive experiences of synchronous hybrid teaching?

2 Methods

This study employed a quantitative, questionnaire-based design to compare student satisfaction and perceived learning across two campuses within the same synchronous hybrid teaching format. Data were collected over three consecutive semesters to reduce the likelihood that findings reflected circumstances specific to a single cohort.

2.1 Educational context and hybrid teaching model

While the main campus is situated in Eskilstuna, a smaller satellite campus was established in Karlshamn to increase regional access to higher education and enable students to complete the programme without relocating from their local community. Approximately 70–80 students attended the main campus in Eskilstuna, whereas approximately 20 students attended the satellite campus in Karlshamn. Unlike many hybrid teaching models, students at both campuses participate on-site in university classrooms rather than from home. To support this multi-campus model, synchronous hybrid teaching was implemented, allowing students at both campuses to participate simultaneously in the same lectures.

Lectures are delivered synchronously using videoconferencing technology, allowing students at both campuses to participate simultaneously, ask questions, and interact in real time. Across the three semesters, the same lecturer delivered the synchronous hybrid lectures to both student groups throughout the study period, teaching physically from the main campus in Eskilstuna in approximately 80% of sessions and from Karlshamn in the remaining 20%; because the same lecturer taught both groups throughout, differences between campuses cannot be attributed to differences in lecturer identity, teaching style, or subject expertise. At the Karlshamn campus, a locally based senior lecturer in social work with a doctoral degree was present during most teaching sessions, providing pedagogical support, facilitating discussions, assisting students when needed, and occasionally delivering lectures to both campuses.

The lectures covered core areas of the Social Work curriculum across the three semesters, including introduction to social work, the welfare state and the individual, law and society, children, family, and the individual across the life course, social vulnerability, and a course on professional methods. Lectures lasted 1 h and 45 min and were typically structured as lecturer-led presentations interspersed with regular checks for understanding; students could raise questions by hand throughout, and were occasionally asked to discuss briefly in small groups of two to three before returning to plenary discussion. Because the video connection between campuses was continuous throughout each lecture, the lecturer could see both groups of students at all times and respond to raised hands from either campus as they occurred; at the Karlshamn campus, the locally based senior lecturer could also draw attention to students' questions on the lecturer's behalf. The lecturer attended to both groups symmetrically, addressing the remote group directly by looking toward its video feed as routinely as

addressing the on-site group. Attendance at lectures was compulsory, with a minimum attendance requirement of 75%; in practice, absence rarely exceeded approximately five students per session at either campus.

Seminars were generally conducted separately at each campus, with the local teacher facilitating discussions; in Karlshamn, all practical exercises and discussion-based seminars were led on-site by the locally based senior lecturer described above, while equivalent sessions in Eskilstuna were led by locally based teachers at that campus. Seminars at the two campuses were typically scheduled to take place at the same time, but each was held independently on-site, without a video connection between campuses. Most courses included three seminars, conducted as an assessed component in which students discussed in small groups, typically producing a written text linked to the seminar topic.

Consequently, the principal difference between the two student groups was not whether students attended on-site or remotely from home, but whether the lecturer was physically present in the classroom or connected through synchronous videoconferencing. This design enabled the effects of lecturer presence to be examined while both student groups remained physically present within comparable university classroom environments. Unlike most previous studies of hybrid teaching, which compare students attending on-site with students participating from home, the present study compared two groups of students who were both physically present in university classrooms under otherwise similar educational conditions.

2.2 Participants and data collection

Data were collected during three consecutive semesters (Spring 2025, Autumn 2025, and Spring 2026) from undergraduate students enrolled in the Social Work programme at a Swedish university. During the study period, the location of the lecturing teacher alternated between campuses, enabling students at both sites to experience teaching both with the lecturer physically present and via synchronous videoconferencing.

Students apply to and are admitted at a specific campus (Eskilstuna or Karlshamn) as part of the Swedish national university admissions system, and do not switch between campuses during the programme. During lectures, students at both campuses can interact directly with the lecturer and with one another in real time through the videoconferencing system. Participation is synchronous only; sessions are not recorded, so students who are unable to attend a given session cannot access it afterward.

The survey was administered during the final weeks of each semester following students' experiences of hybrid teaching during that semester. Collecting data across multiple semesters and student cohorts reduced the likelihood that the findings reflected circumstances specific to a single semester or cohort. Participation was voluntary and anonymous. Students accessed the questionnaire by scanning a QR code at the end of each semester, and no personally identifiable information was collected.

A total of 282 students participated in the study. Across the three semesters, questionnaires were distributed to all enrolled students eligible to attend the hybrid lectures (Spring 2025: $n = 187$; Autumn 2025: $n = 103$; Spring 2026: $n = 94$; $N = 384$ in total), yielding response rates of 94.7%, 67.0%, and 38.3%, respectively (73.4% overall). Because data collection was anonymous, individual non-respondents could not be identified, and it was not possible to determine whether the declining response rate across semesters reflected survey fatigue, changes in class composition, or other factors. Table 1 presents the characteristics of the study sample.

2.3 Measures

Students completed a study-specific questionnaire designed to assess key aspects of synchronous hybrid teaching. The questionnaire included items measuring overall satisfaction with hybrid teaching, perceived learning when the lecturer was physically present or teaching remotely, ability to maintain focus during lectures, sense of community between campuses, frequency of technical problems, and the perceived impact of technical problems on learning. The questionnaire consisted of seven items representing the principal dimensions examined in the present study.

Unless otherwise specified, all items were rated on five-point Likert-type scales, where higher scores indicated more positive experiences. Three items were coded in the reverse direction, consistent with the original questionnaire: ability to focus (lower scores indicating better ability to concentrate), frequency of technical problems (higher scores indicating more frequent problems), and impact of technical problems (higher scores indicating greater negative impact on learning).

Overall satisfaction assessed students' overall satisfaction with the hybrid lectures during the semester. Response options ranged from 1 = very dissatisfied to 5 = very satisfied.

Learning (remote) assessed the extent to which students felt they had assimilated the lecture content when the lecturer was teaching from the other campus via videoconferencing. Response options ranged from 1 = not at all to 5 = completely.

Learning (lecturer present) assessed the extent to which students felt they had assimilated the lecture content when the

TABLE 1 Characteristics of the study sample ($N = 282$).

Characteristic	*n*	%
Campus		
Eskilstuna	214	75.9
Karlshamn	68	24.1
Programme semester		
Semester 1	151	53.5
Semester 2	95	33.7
Semester 3	36	12.8

Participants were recruited across three consecutive semesters (Spring 2025, Autumn 2025, and Spring 2026).

lecturer was physically present in the classroom. Response options ranged from 1 = not at all to 5 = completely.

Ability to focus assessed how the hybrid teaching format influenced students' ability to concentrate during lectures. Response options were 1 = positively, I was able to focus better, 2 = no noticeable difference, and 3 = negatively, it was more difficult to maintain focus. Lower scores therefore indicate better ability to maintain focus during hybrid lectures.

Sense of community assessed students' perceptions of the social connectedness between the two campuses. Response options ranged from 1 = very weak to 5 = very good.

Technical problems measured how frequently students experienced technical difficulties (such as audio, video, or internet connection problems) during the semester. Response options ranged from 1 = never to 5 = very often.

Impact of technical problems assessed the extent to which technical difficulties affected students' learning. Response options ranged from 1 = not at all to 5 = very often.

The questionnaire was developed specifically for the present study to assess students' experiences of synchronous hybrid teaching. During development, it was reviewed and discussed by teaching staff on three occasions, with items and wording revised based on their feedback. A pilot study was subsequently conducted with a separate group of 10 students, who did not take part in the main data collection, to assess the clarity and comprehensibility of the questionnaire items prior to fielding it with the study sample, and minor adjustments were made based on their feedback. The instrument was not subjected to formal psychometric validation or cognitive interviewing. The complete questionnaire, including additional quantitative items and open-ended qualitative questions not analyzed in the present study, is provided in the Supplementary Material in its original Swedish version (Supplementary Table S1), together with an English translation for international readers (Supplementary Table S2).

2.4 Statistical analyses

Descriptive statistics were calculated for all study variables. Pearson correlation analyses were conducted to examine associations between students' experiences of hybrid teaching and overall satisfaction. Independent-samples *t*-tests were used to compare students attending on-site and remotely, with Cohen's *d* reported as a measure of effect size. Where Levene's test indicated unequal variances, Welch-corrected *t*-tests were used. Multiple linear regression analysis was performed to identify the factors independently associated with overall satisfaction with hybrid teaching. Prior to interpretation, variance inflation factors (VIFs) were inspected to assess multicollinearity among predictors; all VIF values were below 2.25 (tolerance >0.44), indicating no substantial multicollinearity. Statistical significance was set at $p < .05$. All analyses were conducted using IBM SPSS Statistics 30.0. Because participation was anonymous across the three data-collection periods, it was not possible to determine whether individual students responded on more than one occasion. To assess the stability of the main findings, campus differences and the principal bivariate associations were examined separately by programme semester as sensitivity analyses. Separate multivariable regression models were not estimated by semester because the smaller subgroup sizes, particularly in Semester 3, were insufficient for a stable seven-predictor model. The pooled inferential analyses were therefore treated as exploratory.

3 Results

3.1 Students' overall experiences of hybrid teaching

Table 2 presents the descriptive statistics for students' experiences of synchronous hybrid teaching. Students generally reported moderate levels of overall satisfaction with hybrid teaching (M = 2.89, SD = 1.11), although experiences varied across different aspects of the learning environment. Perceived learning was rated substantially higher when the lecturer was physically present in the classroom (M = 4.21, SD = 0.75) than when teaching remotely (M = 2.70, SD = 1.10). Students also reported challenges related to maintaining focus and developing a sense of community across campuses. Technical problems were reported relatively frequently during the semester and were perceived as having a noticeable impact on the learning experience.

3.2 Lecturer presence and perceived learning: a within-person comparison

To examine the association between lecturer presence and perceived learning independently of campus affiliation, a paired-samples t-test compared perceived learning when the lecturer was physically present with perceived learning when the lecturer taught remotely, using each student's own two ratings ($n = 281$). Perceived learning was significantly higher when the lecturer was physically present (M = 4.21, SD = 0.75) than when teaching remotely (M = 2.70, SD = 1.10), $t(280) = 20.85$, $p < .001$, Cohen's $d = 1.24$. The difference was also evident when each campus was analysed separately [Eskilstuna: $t(212) = 21.83$, $p < .001$, Cohen's $d = 1.50$; Karlshamn: $t(67) = 6.94$, $p < .001$, Cohen's $d = 0.84$]. Perceived learning was higher with the lecturer physically present at both campuses, with a descriptively larger within-person difference at Eskilstuna.

TABLE 2 Descriptive statistics for students' experiences of synchronous hybrid teaching ($N = 282$).

Variable	Mean	SD
Overall satisfaction	2.89	1.11
Perceived learning (remote)	2.70	1.10
Perceived learning (present)	4.21	0.75
Ability to focus	2.51	0.57
Sense of community	2.17	1.21
Technical problems	3.95	1.06
Impact of technical problems	3.38	1.12

3.3 Associations between students' experiences and overall satisfaction

Pearson correlations among the study variables are presented in Table 3. Overall satisfaction with hybrid teaching was most strongly associated with students' perceived learning when the lecturer taught remotely ($r = .624$, $p < .001$). Negative associations were observed with difficulty maintaining focus during hybrid lectures ($r = -.592$, $p < .001$), the perceived impact of technical problems on learning ($r = -.549$, $p < .001$), and the frequency of technical problems ($r = -.547$, $p < .001$). In contrast, perceived learning when the lecturer was physically present showed a weak positive association with overall satisfaction ($r = .191$, $p = .001$), while sense of community demonstrated a small to moderate positive association ($r = .327$, $p < .001$).

3.4 Differences between campuses

Table 4 presents comparisons between the Eskilstuna and Karlshamn campuses. Students at Karlshamn reported significantly higher overall satisfaction with hybrid teaching than students at Eskilstuna (M = 3.78, SD = 0.81 vs. M = 2.61, SD = 1.04), $t(144.43) = -9.64$, $p < .001$, $d = 1.18$. Significant differences were also observed for perceived learning, ability to maintain focus, frequency of technical problems, and the perceived impact of technical problems on learning. No significant difference was found regarding students' sense of community between campuses.

3.5 Robustness and sensitivity analyses across semesters

To examine whether the campus-level difference in overall satisfaction was consistent across programme semesters, or potentially driven by a single semester group, the campus comparison was repeated separately within each of the three programme semesters. Karlshamn students reported significantly higher satisfaction than Eskilstuna students in all three semesters [Semester 1: $t(136.4) = -10.06$, $p < .001$, $d = 1.36$; Semester 2: $t(28.2) = -2.81$, $p = .009$, $d = 0.71$; Semester 3: $t(16.3) = -4.51$, $p < .001$, $d = 1.68$.]. Effect sizes varied somewhat across semesters, which may partly reflect differences in subsample size, particularly the smaller sample in Semester 3 ($n = 36$).

As an additional sensitivity analysis, the principal bivariate associations observed in the pooled sample were examined separately by programme semester. The direction of the major associations was generally consistent across the three semester groups. In particular, the association between overall satisfaction and perceived learning when the lecturer was remote was positive across all three groups, while overall satisfaction was negatively associated with difficulty maintaining focus and with the frequency of technical problems across all three groups. Estimates for Semester 3 should, however, be interpreted

TABLE 3 Pearson correlations among study variables ($N = 279–281$).

Variable	1	2	3	4	5	6	7
1 Overall satisfaction	–						
2 Perceived learning (remote)	.624***	–					
3 Perceived learning (present)	.191**	.173**	–				
4 Ability to focus	−.592***	−.490***	−.166**	–			
5 Sense of community	.327***	.223***	.026	−.278***	–		
6 Technical problems	−.547***	−.427***	−.040*	.456***	−.231***	–	
7 Impact of technical problems	−.549***	−.404***	−.103	.497***	−.208***	.688***	–

Pearson correlation coefficients are presented. Higher scores on the ability to focus item reflect greater difficulty maintaining focus during hybrid lectures.
*$p < .05$.
**$p < .01$.
***$p < .001$.

TABLE 4 Comparison of study variables between campuses.

Variable	Eskilstuna M (SD)	Karlshamn M (SD)	t	p	Cohen's d
Overall satisfaction	2.61 (1.04)	3.78 (0.81)	−9.64	<.001	1.18
Perceived learning (remote)	2.35 (0.98)	3.79 (0.61)	−14.44	<.001	1.60
Perceived learning (present)	4.15 (0.77)	4.41 (0.63)	−2.58	.010	0.36
Ability to focus[a]	2.65 (0.54)	2.07 (0.47)	8.48	<.001	1.10
Sense of community	2.16 (1.24)	2.22 (1.10)	−0.36	.722	0.05
Technical problems	4.16 (1.04)	3.28 (0.81)	7.27	<.001	0.89
Impact of technical problems	3.65 (1.07)	2.54 (0.84)	8.81	<.001	1.08

[a]Lower values indicate better ability to focus.

cautiously because of the small sample size ($n = 36$). Separate multivariable regression models were not estimated by semester because the smaller subgroup sizes, particularly in Semester 3, were insufficient for a stable model containing seven predictors.

3.6 Predictors of overall satisfaction with hybrid teaching

To identify which factors were independently associated with students' overall satisfaction with hybrid teaching, a multiple linear regression analysis was conducted (Table 5). The overall model was statistically significant, explaining 57.4% of the variance in overall satisfaction [$R^2 = .574$; adjusted $R^2 = .563$; $F(7, 271) = 52.07$, $p < .001$.].

Perceived learning when the lecturer taught remotely showed the strongest positive association with overall satisfaction in the multivariable model ($\beta = .319$, $p < .001$). Students' ability to maintain focus during hybrid lectures also made a substantial independent contribution ($\beta = -.220$, $p < .001$), followed by sense of community between campuses ($\beta = .124$, $p = .004$.). In addition, both the frequency of technical problems ($\beta = -.162$, $p = .005$) and their perceived impact on learning ($\beta = -.151$, $p = .010$) were independently associated with lower satisfaction. In contrast, perceived learning when the lecturer was physically present in the classroom was not significantly associated with overall satisfaction after controlling for the other variables ($\beta = .063$, $p = .120$). Likewise, campus affiliation was not independently associated with overall satisfaction ($\beta = .045$, $p = .382$). Variance inflation factors for all predictors ranged from 1.05 to 2.16., well below common thresholds for concern, indicating that multicollinearity did not distort the regression estimates.

These findings suggest that students' overall satisfaction with hybrid teaching is more strongly associated with pedagogical and learning-related factors than with the physical location of teaching or the campus attended.

4 Discussion

This study examined satisfaction and perceived learning in synchronous hybrid teaching across two campuses, where the defining difference between student groups was not whether they attended from home versus campus, but whether the lecturer was physically present in their classroom or teaching via videoconference from the other site. Consistent with the pattern reported in the introduction, students at Karlshamn, who attended lectures on-site but with the lecturer usually connecting remotely from Eskilstuna, reported significantly higher overall satisfaction than students at Eskilstuna [$M = 3.78$, $SD = 0.81$ vs. $M = 2.61$, $SD = 1.04$), $t(144.43) = -9.64$, $p < .001$, $d = 1.18$], while perceived learning was consistently higher across both campuses when the lecturer was physically present than when teaching remotely, $t(280) = 20.85$, $p < .001$, $d = 1.24$ (see Section 3.2). However, when other pedagogical and technical factors were entered into a regression model, campus itself no longer significantly predicted satisfaction ($\beta = .050$, $p = .332$); instead, perceived learning during remote-lecturer sessions showed by far the strongest association with satisfaction ($\beta = .304$, $p < .001$), followed by ability to maintain focus ($\beta = -.229$, $p < .001$) and sense of community ($\beta = .129$, $p = .002$). This pattern, a striking campus-level difference in satisfaction that dissolves once pedagogical experience is accounted for, forms the central puzzle this discussion addresses.

TABLE 5 Multiple linear regression predicting overall satisfaction with hybrid teaching.

Predictor	B	SE	β	t	p
Campus	.115	.132	.045	.88	.382
Perceived learning (remote)	.321	.053	.319	6.04	< .001
Perceived learning (present)	.093	.060	.063	1.56	.120
Ability to focus	−.424	.098	−.220	−4.33	< .001
Sense of community	.113	.039	.124	2.90	.004
Technical problems	−.170	.060	−.162	−2.84	.005
Impact of technical problems	−.149	.057	−.151	−2.59	.010

Model summary: $N = 279$; $R^2 = .574$; adjusted $R^2 = .563$; $F(7, 271) = 52.07$, $p < .001$.

4.1 The role of the lecturer's physical presence in perceived learning

The finding that perceived learning was higher when the lecturer was physically present aligns closely with recent research on synchronous hybrid classrooms. Wagner et al. (2023) found that on-site students reported significantly higher perceived learning than remote students, and that this effect operated indirectly through social presence: remote participation was associated with lower social presence, which in turn predicted lower perceived learning. A related natural-experiment study by the same research group found that social presence mediated the effect of interactive learning activities on perceived learning in both on-site and remote groups, with the mediating effect particularly strong for active and interactive activities delivered on-site (Wagner et al., 2025). This finding, that it is specifically the lecturer's physical location, rather than the student's own location, that is associated with perceived learning, is consistent with, and arguably sharpens, this literature, since both student groups in the present study were physically present in a classroom throughout. Li et al. (2025) similarly found that the "teaching field" (encompassing the lecturer's social and symbolic capital, i.e., their relational presence and teaching style) was the strongest positive predictor of positive perceptions of hybrid teaching, while the "learning field" (students' own engagement with content) had no significant direct effect. Notably, the gap in perceived learning between the two campuses when the lecturer was physically present was comparatively small (Eskilstuna $M = 4.15$ vs. Karlshamn $M = 4.41$, $d = 0.35$), whereas the gap in perceived learning when the lecturer taught remotely was substantially larger (Eskilstuna $M = 2.35$ vs. Karlshamn $M = 3.79$, $d = 1.60$). This asymmetry suggests that remote-lecturer sessions are considerably more sensitive to local classroom conditions than in-person sessions are, a point taken up further below.

4.2 Interpreting the satisfaction paradox

The regression results indicate that campus affiliation itself does not independently predict satisfaction once pedagogical and technical experience are accounted for; rather, students' perceived learning specifically during remote-lecturer sessions was most strongly associated with satisfaction. This reframes the "paradox" identified in the introduction: it is not that remote attendance is inherently more satisfying, but that Karlshamn students appear to have had a substantially better learning experience during remote-lecturer sessions than Eskilstuna students did, and this difference, rather than campus location *per se*, appears to be associated with the satisfaction gap.

Because the campuses differed not only in lecturer location but also in group size, technical experience, and local pedagogical support, the observed campus differences cannot be attributed to lecturer presence alone; the interpretation that follows should therefore be read as identifying plausible contributing factors rather than an established explanation.

A plausible explanation lies in the educational context described in Section 2.1. Because the same lecturer delivered the hybrid lectures to both student groups throughout the study period, differences in lecturer identity, teaching style, or subject-matter expertise cannot account for the campus-level satisfaction gap. Instead, unlike most previous studies of hybrid teaching, in which remote students participate unsupported from home, students in Karlshamn were supported throughout by a locally based senior lecturer with a doctoral degree, who provided pedagogical support, facilitated discussions, and assisted students during sessions where the primary lecturer was connecting from Eskilstuna. Moreover, because seminars and practical exercises were conducted separately at each campus, this same senior lecturer led all seminar-based teaching in Karlshamn, meaning that students there had continuous access to doctorally qualified pedagogical support well beyond the remote-lecturer lecture sessions specifically. This local academic support may function similarly to what Li et al. (2025) describe as the "assistant teaching field", administrative, technical, and pedagogical support surrounding the primary instructor, which they found to be a significant positive predictor of positive perceptions of hybrid teaching, alongside the teaching field itself. In the present study, this would mean that Karlshamn students were rarely, if ever, learning entirely without direct pedagogical support in the room, whether during lectures or seminars, a structural advantage that Eskilstuna students, who relied on the visiting lecturer during hybrid sessions and on their own locally based seminar teachers otherwise, did not have in the same continuous form. The presence of a locally based senior lecturer in Karlshamn may have contributed to continuity, support, and interaction; however, this was not independently measured and should therefore be regarded as a plausible contextual explanation rather than an established mechanism.

This interpretation is further supported by the pattern of technical problems, which runs counter to what might initially be expected. Students at Eskilstuna, the main campus, where the lecturer was more often physically present, reported technical problems significantly more frequently than students at Karlshamn ($M = 4.17$ vs. $M = 3.28$, $t = 7.41$, $p < .001$, $d = 0.91$), and rated these problems as having a significantly greater impact on their learning ($M = 3.65$ vs. $M = 2.54$, $t = 8.81$, $p < .001$, $d = 1.08$). Given that frequency and impact of technical problems were both strong independent predictors of lower satisfaction in the regression model ($\beta = -.141$ and $\beta = -.168$, respectively), this asymmetry in technical experience, in the "wrong" direction relative to which campus more often hosted the lecturer, appears to be a further plausible contributor to the satisfaction gap, distinct from lecturer presence itself. Consistent with this, students at Eskilstuna reported that teachers would sometimes arrive early specifically to try to resolve technical issues before class began, suggesting that technical setup and troubleshooting at the main campus was, if anything, less reliable than at the satellite site — plausibly because the Karlshamn-based lecturer's continuous local presence supported more consistent technical management, whereas technical responsibility at Eskilstuna may have been more *ad hoc* when the visiting lecturer was unfamiliar with the local room setup. This pattern is consistent with Gudoniene et al.'s (2025) observation that technological and organisational challenges in hybrid teaching are highly dependent on local implementation rather than being an inherent feature of the format itself.

An additional, complementary explanation concerns differing reference points: Eskilstuna students, as the main-campus group, may implicitly compare their hybrid lectures against an idealised, fully in-person teaching experience, whereas Karlshamn students may evaluate their experience against the counterfactual of having no local, doctorally qualified pedagogical support at all. Such asymmetric baselines could further amplify the satisfaction gap independently of the mechanisms described above, echoing Shephard et al.'s (2024) observation that hybrid formats are often valued specifically for the access and support they provide relative to the alternative, rather than being judged purely on the quality of the lecture experience itself.

The difference in group size between campuses may further contribute to this pattern. The smaller Karlshamn cohort (approximately 20 students per semester) spent an entire semester together in a comparatively small, stable group, which may have fostered greater interpersonal familiarity and more comfortable social norms for participation than the larger Eskilstuna cohort — a mechanism that could plausibly compound the local pedagogical support discussed above.

4.3 Theoretical integration: why satisfaction and perceived learning diverge

A recurring theme across the literature consulted here is that satisfaction and perceived learning are not simply two indicators of the same underlying construct but are shaped by at least partially distinct mechanisms. Alqurashi (2019) demonstrated this directly in online learning, showing that different predictors (learner–content interaction vs. self-efficacy) most strongly explained satisfaction and perceived learning respectively. Li et al. (2025), working from Bourdieu's field theory, similarly separate a teaching field (relational, symbolic) from a learning field (cognitive engagement), finding that only the former

significantly predicted positive perceptions, while also identifying a distinct assistant teaching field as an independent contributor. This pattern is not unique to synchronous hybrid teaching: in a recent study of HyFlex education, student satisfaction and perceived learning were likewise examined as related but conceptually distinct outcomes (Jerlinder et al., 2025), reinforcing the case for treating them separately in evaluations of flexible teaching formats more generally.

The present findings extend this picture in a specific way: perceived learning during remote-lecturer sessions, rather than perceived learning during in-person sessions, or campus location itself — showed the strongest association with overall satisfaction. This suggests that satisfaction with hybrid teaching may depend less on how good the "best case" (lecturer present) experience is, and more on how well the format performs during its more vulnerable condition (lecturer remote). In other words, hybrid teaching appears to be judged largely by its weakest link. This has a direct practical corollary, discussed further below: institutions seeking to improve satisfaction with hybrid formats may gain more by strengthening the quality and support available during remote-lecturer sessions than by further optimising already-strong in-person sessions.

4.4 Practical implications

These findings carry direct implications for how hybrid lectures might be designed and supported. Wagner et al. (2025) recommend that teachers deliberately design interactive learning activities to strengthen remote students' sense of social presence, since interactive activities showed the strongest presence-mediated effect on perceived learning in their study. Gudoniene et al. (2025) emphasise sustained technical and pedagogical training for staff delivering hybrid sessions as a precondition for narrowing the on-site/remote gap. Shephard et al. (2024) further highlight that robust audio-visual infrastructure, cameras, microphones, and dedicated technical support, is a prerequisite rather than an optional extra for hybrid formats to function well; institutions unwilling to invest in this infrastructure risk the "unwanted and frightening" experience some of their interviewed teachers described. For Mälardalen University specifically, these findings suggest that improving perceived learning may require strengthening the lecturer's relational presence toward the remote campus (e.g., through camera work, eye contact practices, or explicit engagement strategies directed at the remote group), while satisfaction gains at Eskilstuna may depend more on addressing local implementation quality than on presence *per se*. Beyond infrastructure alone, emerging technologies specifically designed to strengthen remote students' sense of presence may offer a further avenue for narrowing the perceived-learning gap identified in this study. Kasuk et al. (2025), for example, found that telepresence robots—which allow remote students a degree of physical agency within the classroom—can foster a stronger sense of presence and autonomy than standard videoconferencing, though only when supported by deliberate pedagogical design and adequate technical infrastructure. While Mälardalen University's current hybrid setup relies on conventional video-link technology, this line of research suggests that the lecturer-presence pattern observed here need not be treated as fixed: technologies that give remote students greater agency within the shared learning space could, in principle, help offset the disadvantage associated with the lecturer's physical absence.

Beyond the specific recommendations above, findings from faculty-focused studies of hybrid and HyFlex teaching point to broader institutional implications for sustaining this model over time. In a study of 57 instructors across three Spanish universities, faculty viewed hybrid teaching as valuable for widening access and flexibility, but reported persistent challenges around assessment authenticity, increased workload, and uneven technological confidence across generations of staff; sustaining hybrid delivery was found to require not only infrastructure investment but also formal recognition of the additional effort it demands from teaching staff (González Ruiz et al., 2025). Consistent with this, a qualitative study of hybrid teaching in a health-sciences programme found that students endorsed the format but identified inadequate technological infrastructure and limited digital skills as significant barriers, recommending sustained investment in both digital facilities and faculty development (Hu, 2024). For institutions such as Mälardalen University considering sustained, multi-campus hybrid delivery beyond the present study, these findings suggest that faculty development should extend beyond initial technical training to include ongoing pedagogical support, workload planning, and formal acknowledgement of the demands that facilitating both on-site and remote learners simultaneously places on teaching staff.

4.5 Limitations and future research

Several limitations should be noted. First, like much of the cited literature, the present study focuses primarily on the student perspective. Yalan and Marcial (2025) found that students consistently rate hybrid learning quality lower than teachers and administrators do across nearly all domains, including leadership, staffing, and student support. This study cannot speak to whether Eskilstuna and Karlshamn lecturers would characterise the satisfaction gap in the same way students do; a lecturer-facing follow-up, as suggested by Shephard et al. (2024) regarding teachers' own reservations about hybrid formats, would help clarify whether the satisfaction gap reflects student-side factors, delivery-side factors, or both. This aligns with recent evidence that university teachers themselves hold complex and sometimes ambivalent views of HyFlex and hybrid formats, weighing perceived pedagogical benefits against practical and workload-related demands (Badiozaman and Segar, 2025).

Second, each construct in this study (e.g., overall satisfaction, perceived learning, sense of community) was assessed using a single item rather than a multi-item validated scale. While single-item measures are common in applied educational evaluation and offer practical advantages in terms of respondent burden, particularly across three repeated data collections, they do not allow for an assessment of internal consistency (e.g., Cronbach's alpha) and may be more susceptible to measurement error than multi-item constructs. Although the questionnaire was reviewed by teaching staff

and piloted with a small group of students prior to data collection (Section 2.3), it did not undergo formal psychometric validation or cognitive interviewing, and its psychometric properties remain unknown. Future research should consider validated multi-item instruments, such as the CRiSP questionnaire (Richardson et al., 2015) or comparable scales used in prior hybrid learning research, to strengthen the reliability of these constructs.

Third, because responses were collected anonymously across three consecutive semesters, it is possible that some students completed the questionnaire on more than one occasion, particularly students enrolled across multiple semesters. As individual respondents could not be tracked or linked across time points, this violates the assumption of fully independent observations underlying the t-tests and regression analysis reported here and may have modestly inflated the precision of significance estimates. As an informal robustness check, the satisfaction difference between campuses was examined separately within each semester. The direction of the effect was consistent across all three semesters, with Karlshamn students reporting significantly higher satisfaction than Eskilstuna students in each case [Semester 1: $t(136.4) = -10.06$, $p < .001$, $d = 1.36$; Semester 2: $t(28.2) = -2.81$, $p = .009$, $d = 0.71$; Semester 3: $t(16.3) = -4.51$, $p < .001$, $d = 1.68$]. The direction of the campus-level satisfaction difference was consistent across all three programme-semester groups. However, these analyses cannot rule out an influence of repeated participation. Future data collection could address this limitation more directly by using anonymous but persistent identifiers to allow individual-level tracking while preserving anonymity.

Because participation was anonymous, it was not possible to determine whether individual students responded in more than one data-collection period. Complete independence of observations in the pooled analyses therefore cannot be assured. Although semester-specific sensitivity analyses indicated that the principal patterns were generally consistent across semester groups, these analyses cannot eliminate the possibility of repeated participation. The pooled inferential findings should therefore be interpreted as exploratory and with appropriate caution.

Response rates declined across the three data-collection periods, from 94.7% to 67.0% and 38.3%, respectively. The lower response rate in the final semester increases the possibility of non-response bias, as students who chose to participate may have differed systematically from those who did not. Comparisons across semesters and the representativeness of the later responses should therefore be interpreted with caution. The consistent direction of the campus-level satisfaction difference across all three semesters (Section 3.5) offers some reassurance in this respect, but does not rule out the influence of non-response bias on the pooled estimates.

A further limitation concerns the specific institutional context of this study: both student groups were physically present in university classrooms rather than participating from home, and the satellite campus benefited from a permanently co-located, doctorally qualified senior lecturer. These findings may therefore not generalise to hybrid teaching settings without equivalent local resources or classroom-based participation.

Future research could usefully combine student and lecturer perspectives, as recommended by Yalan and Marcial (2025), and could explore whether the satisfaction/perceived-learning divergence observed here replicates across additional campus pairs or subject areas, extending the natural-experiment logic applied by Wagner et al. (2023, 2025) to a Swedish multi-campus context. The present quantitative findings will be complemented by analyses of the extensive qualitative material collected as part of the same evaluation, allowing a deeper understanding of the mechanisms underlying students' experiences of hybrid teaching.

5 Conclusion

This study examined student satisfaction and perceived learning in synchronous hybrid teaching across two campuses, where the lecturer's physical location, rather than the students' own, varied between sessions. Perceived learning was consistently higher when the lecturer was physically present, supporting the notion that direct instructor presence remains important for how well students feel they understand lecture content. However, overall satisfaction followed a different pattern: it was not primarily associated with campus location itself, but with how well students felt they had learned specifically during sessions when the lecturer taught remotely, alongside their ability to maintain focus, their sense of community, and the frequency and impact of technical problems. These findings suggest that satisfaction and perceived learning, although related, are associated with partly distinct sets of factors, and that a well-supported hybrid format, including strong local pedagogical presence and reliable technical delivery, may help offset the disadvantage of the lecturer's physical absence. For multi-campus institutions such as Mälardalen University, this points to a clear practical priority: rather than treating physical co-location as the primary lever for improving hybrid teaching, resources may be better directed toward strengthening the quality and reliability of remote-lecturer sessions specifically.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Participation in the study was voluntary and anonymous. Students were informed about the purpose of the study and that participation was entirely voluntary. Completion of the anonymous questionnaire was regarded as providing informed consent. No personally identifiable information or sensitive personal data, as defined under the Swedish Ethical Review Act (2003:460), were collected, and individual participants could not be identified from their responses. As the study involved anonymous educational quality evaluation rather than research involving sensitive personal data or physical intervention on participants, formal ethical review was not required under Swedish law.

Author contributions

SO: Validation, Resources, Investigation, Formal analysis, Writing – review & editing, Methodology, Software, Data curation, Project administration, Conceptualization, Writing – original draft, Visualization.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author declares that generative AI (Claude, Anthropic) was used solely to improve the language of the manuscript. All interpretations of the data, the study design, the statistical analyses, and the scientific conclusions are the author's own. The author has reviewed and takes full responsibility for the content of the manuscript.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2026.1926616/full#supplementary-material

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