

Exploring Students' Perceptions of Mitigations in Four Teaching and Learning Delivery Modes – a Quantitative Study

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Abstract

The expansion of digital teaching during and after the COVID-19 pandemic has sparked debates about barriers to delivery modes in higher education. However, research on mitigating these barriers has received less attention. This study examines how students perceive mitigation measures across four teaching and learning delivery modes: face-to-face, blended, hybrid, and online. Based on a survey of 192 students, the study analyses the perceived relevance of 36 mitigation measures related to previously identified barrier dimensions. The results show that mitigations associated with online teaching are primarily infrastructural and institutional. In contrast, face-to-face teaching is linked to pedagogical and participatory measures that emphasize student and teacher agency. Students perceive blended and hybrid formats as less responsive to mitigation. The findings suggest that effective digital teaching requires not only technical investments but also clearer pedagogical positioning of delivery modes.

Keywords: Digital teaching; mitigations; delivery modes.

1. Introduction

Emergency Response Teaching (ERT) emerged during the COVID-19 pandemic. The term was coined because more traditional delivery modes (Hodges et al., 2020) were substituted without time for proper preparation, operationalization, or quality assurance. Still, there have been major initiatives to digitize delivery modes in higher education (HE) before the pandemic, leading to four teaching and learning delivery modes: face-to-face, blended, hybrid, and online.

However, various barriers hindered comprehensive digital teaching and learning (Tesar & Sieber, 2010). To mitigate the effects of barriers in more digital delivery modes, institutions often ignore them or resort to quick, temporary fixes (Hadjimanolis, 2003). Even if ERT and regular online teaching have different characteristics (Tesar & Sieber, 2010), barriers in and mitigations for delivery modes require thorough research. The pandemic and post-pandemic

period provided an opportunity to collect data and derive insights into the far-reaching use of several instructional methods and their delivery modes. These valuable conclusions should be used to improve HE instruction.

Besides insights into barriers, there is less research on their mitigation. Hence, this paper's research question (RQ) is: How do students relate mitigation recommendations for barriers to digital higher education teaching and learning to the four different delivery modes?

To answer the RQ, we will sketchily review the challenges and solutions from the relevant literature (Draxler-Weber, Voigt, et al., 2022). After, the quantitative method will be explained. We used survey research to examine barriers to instructional formats and potential mitigations. We then present the results and conclude with a discussion and outlook.

Our study contributes to understanding potential mitigation recommendations and their importance for students in a specific delivery mode. With this knowledge, educational administrators and lecturers may choose modes more informedly. Further, they can address their potential benefits and go beyond merely replacing one mode with another. The Substitution, Augmentation, Modification, and Redefinition (SAMR) paradigm (Hamilton et al., 2016) proposes moving beyond replacement to higher levels to provoke real change in delivery modes. As many universities adopt a "student-as-consumer" strategy and face increased competition for admission (Molesworth et al., 2009), empirical HE research that addresses these issues is valuable to educational administrators and lecturers.

2. Background

Identifying and overcoming problems often requires the involvement of multiple parties. Studies have focused on methods used by Higher Education Institutions (HEIs) and governments (Popova et al., 2020), while others have been case studies (Marshalsey & Sclater, 2020). However, research on mitigations, defined as approaches to overcome barriers (Prabhleen, 2025), especially post-pandemic, is limited.

Education research frames technology integration through the TPACK paradigm. It emphasizes aligning technological, pedagogical, and content knowledge in course design (Harris et al., 2010). During Emergency Response Teaching (ERT), this integration was enforced but not aligned, due to a strong focus on technology. Post-pandemic, continued growth in digital higher education is expected. Still, it is mandatory to safeguard educational quality (Daniel, 2020; Ramola, 2021). Student evaluations and teacher training play a key role in maintaining instructional quality (Donitsa-Schmidt & Ramot, 2020). Additionally, findings highlight the importance of mental health support, reliable internet access, and improved socioeconomic conditions as mitigations for effective digital learning (Pokhrel & Chhetri, 2021; Toquero, 2020). Also, a framework for responding, healing, and rethinking has been proposed to guide

the development of mitigations (Bhagat & Kim, 2020). Studies show a mismatch between teachers' increased provision of theoretical learning materials and students' desire for more practice-oriented assignments (Mishra et al., 2020).

Prior research also examines the effects of technology on learning outcomes (Janson et al., 2014) and system adoption (Irons et al., 2002). Specifically, blended learning designs are influenced by the context in which they operate (Scherer et al., 2019). At the organizational level, limited resources, resistance to change, and curricular constraints hinder digital teaching, underscoring the need for institutional solutions (Al-Senaidi et al., 2009). Political and economic pressures further challenge HEIs' adaptability (Burch & Mohammed, 2019). While online teaching led during ERT, other delivery modes such as face-to-face, blended, and hybrid dominated before the pandemic. Face-to-face (F2F) teaching remains the traditional classroom model. Online instruction represents its counterpart. In between, hybrid formats integrate F2F and online instruction simultaneously. Blended learning, by contrast, combines in-person and self-study phases (Artino, 2010; Hwang, 2018).

3. Method

Fueled by the pandemic, literature on categories of barriers to digital teaching became more prevalent. In a previous study, the authors identified barriers to digital HE teaching (Draxler-Weber, Packmohr, et al., 2022). Based on these findings, a survey was constructed. One part of the survey addressed different barriers within delivery modes. Another part focused on potential mitigations to overcome these barriers.

In its first part, the study operationalized each identified barrier into survey items, generating 34 questions distributed across eight barrier categories. The response scale represented the four delivery modes. Participants indicated whether they encountered specific barriers in any of these delivery modes. The dimensions ranged from barriers concerning technology, interaction, personal skills, didactics and pedagogy, workload, health, personal readiness, and environment. Based on these barriers, 36 potential mitigations were formulated in the survey's second part. Also, stakeholders were added to indicate who might be responsible for driving a mitigation. Again, participants indicated the delivery mode(s) they perceived as a potential mitigation. Even if they have not personally experienced all delivery modes. Nearly all respondents had experience with face-to-face teaching (98.5%), whereas experience with blended (78.9%), hybrid (73.7%), and online formats (68.0%) was less universal.

The survey produced categorical data, which inherently impose analytical limitations (Agresti, 2013). Still, we consciously chose this design, as an alternative to a Likert-scale approach would have produced 280 items (34 + 36 multiplied by 4), a volume likely to overwhelm respondents and yield unacceptably low completion rates. The questionnaire also included demographic

questions about participant age, current academic level, field of study, exposure to different teaching formats, and geographic location.

The data collection during the winter term of 2023 involved 192 students from three universities, with one institution located in each of Germany (119 respondents), Sweden (61 respondents), Türkiye (9 respondents), and no location stated (3 respondents). At the time of the survey, the participant group comprised 141 Bachelor's students, 42 Master's students, and 9 individuals who did not report their degree level. To obtain varied perspectives across disciplines, the authors recruited students from multiple academic programs. The largest group studied Business Administration with 78 participants, followed by Media and Management with 61 participants, and Information Systems with 45 participants. Additional participants came from smaller cohorts in Mathematics, Project Management, Law, and Economics.

The three participating universities used different technological infrastructures for their delivery modes. Each institution selected a distinct learning management system paired with specific videoconference software. Students at the German university accessed content through Stud.IP and used BigBlueButton. Their Turkish counterparts used Google Classroom, while Swedish students used Canvas alongside Zoom. These technological variations may influence how barriers manifest in different institutional settings.

4. Results

From the collected data, we derived the frequencies for each delivery mode for the recommended mitigations to show how much a mitigation is perceived as a valid contribution. Afterward, we subtracted the frequency for the F2F mode from that for the Online mode, as these are the extreme ends of the scale. Table 1 shows the values of the subtractions in the column to the right. We selected the highest negative, the highest positive, and the differences closest to zero for each dimension to provide an overview. Thus, we focus on the mitigations perceived as most beneficial for Online, for F2F, and for neither. In the Tech dimension, the largest positive difference is also the closest to zero. In the environment dimension, there were only two items, and no difference was positive.

To explore differences at the dimensional level, the results for the F2F and Online modes were converted to absolute values, and their averages were calculated. This procedure yielded averages of 11.5 (technical), 7.0 (interaction), 4.3 (regulations), 5.6 (didactics), 5.9 (skills), and 3.6 (environment)

The highest negative value in Table 1 is -31.3 in the technical mitigation of securing internet access through industry and government. The highest positive values are 11.5 in the dimensions of interaction mitigations (the teachers to foster interactivity in lectures) and didactic mitigations (the students to apply the learned knowledge). On average (2.7), the delivery modes

F2F and Online are rather similarly perceived in their potential to be mitigated. Whereas the delivery modes, Blended and Hybrid, are perceived as less applicable.

Table 1: Selected Frequencies of the delivery modes in relation to mitigations (in %)

Dimension	I recommend ...	F2F	Blended	Hybrid	Online	F2F - Online	Position
Tech (9 items)	the industry and government to ensure internet access.	43.2	49.5	60.4	74.5	-31.3	Neg.
	the students to use mobile devices for simpler assignments.	50.0	37.0	41.1	47.9	2.1	Pos. + Zero
Interaction (6 items)	the teachers to offer supervision for student concerns.	49.0	42.7	44.3	57.3	-8.3	Neg.
	the teachers to foster interactivity in lectures.	53.1	27.1	32.8	41.7	11.5	Pos.
	the teachers to organize student learning groups.	31.3	24.0	24.5	35.9	-4.7	Zero
Regulations (7 items)	the HEI to set general communication guidelines.	10.4	10.4	14.6	17.7	-7.3	Neg.
	the teachers to implement mandatory attendance.	17.2	5.7	5.7	9.9	7.3	Pos
	the HEI to set general lecture policies at the institute level.	23.4	16.1	19.8	22.9	0.5	Zero
Didactics (7 items)	the teachers to adjust the lecture design.	41.1	32.3	32.3	44.3	-3.1	Neg
	the students to apply knowledge.	53.6	39.1	39.1	42.2	11.5	Pos
	the teachers to monitor the learning progress of the students.	21.4	19.3	20.3	24.5	-3.1	Zero
Skills (5 items)	the HEI to offer IT training for teachers.	50.0	45.8	49.5	62.0	-12.0	Neg
	the teachers to change their mindset to be open for innovations.	56.3	41.7	46.4	55.7	0.5	Pos
	the students to change their mindset to be open for innovations.	43.2	37.0	38.5	43.8	-0.5	Zero
Environment (2 items)	the students to ensure an appropriate work space.	43.8	35.4	34.9	47.9	-4.2	Neg
	the students to create a daily structure.	38.0	31.3	31.8	41.1	-3.1	Zero
average	across all 36 items	42.0	33.1	36.2	44.6	-2.7	

Applying the median to sort all the mitigations by their differences yields a value of 5.7. Thus, we see a large spread in the upper half, reaching a maximum of 31.3 (the industry and

government to ensure internet access). The minimum difference is 0.5 for mitigations in the skills domain; teachers need to change their mindset to be open to innovations in teaching, and students need to change their mindset to be open to such innovations.

The results indicate that mitigations for online delivery revolve around technologies. Whereas mitigations for F2F revolve around didactics.

5. Discussion and Conclusion

The results in Table 1 reveal a pattern in how students relate mitigation measures to delivery modes: Mitigations perceived as most relevant to Online teaching are predominantly infrastructural and institutional. Thus, students view industry and government as responsible stakeholders in further developing broadband connections. For governments, this is a classic infrastructure investment (Webber et al., 2022). For institutions, it is a matter of further developing staff. Still, encouraging changes in teaching and communication practices could produce new tensions and barriers. Thus, HEIs might consider creating positions for academic staff developers who, in their development initiatives, need to take staff's fundamental beliefs about teaching, learning, and communication into account (Smyth, 2003). Generally, students associate the Online delivery mode with systemic dependencies beyond individual control.

In contrast, Face-to-Face delivery is linked to pedagogical and participatory mitigations. These include fostering interactivity, applying learned knowledge, and enforcing attendance. Even when staff are involved in these mitigations, students perceive their own agency. Also, teaching design, rather than infrastructure and regulations, is the primary lever for improvement in this mode. Viewing teaching as design (Goodyear, 2015) might further improve these mitigations. Notably, Blended and Hybrid formats are consistently perceived as less applicable. It might be that students lack a clear mental model of, or experience with, these delivery modes. Also, the sample's composition might bias the results. Most respondents come from a German institution, but Sweden ranks higher in rankings such as the Networked Readiness Index (Portulans Institute, 2026). Thus, perceptions, especially in the realm of technology, might differ. For barriers, Hybrid is perceived as similar to Online (Packmohr, 2025). Thus, presumably, it applies to mitigations as well. Also, this finding aligns with critiques of digital transformation efforts that remain at the substitution or augmentation levels of the SAMR model (Hamilton et al., 2016). Formats need to be introduced with fundamentally redefined pedagogical practices.

In conclusion, mitigations in Online teaching center on institutional accountability. Face-to-Face teaching emphasizes instructional quality and engagement. If Blended and Hybrid formats are positioned as stand-alone, not only technical investments but also a clearer pedagogical positioning is needed.

Further research will focus on the relationship between barriers and mitigations. By analyzing cross-tabulations, we plan to assess how well barriers and mitigations align. By targeting the most effective alignments, we might inform more targeted pedagogical and institutional interventions. On a broader scale, longitudinal research on the acceptance of delivery modes is needed, including mixed-methods approaches to ensure that more digital delivery modes are an integral part of teaching and learning, rather than just ERT in a crisis, especially when time and place are major barriers to learning (OECD, 2025).

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