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The post-COVID-19 future of digital learning in higher education: Views from educators, students, and other professionals in six countries

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Abstract

Predictions about the post-pandemic future of digital learning vary among higher education scholars. Some foresee dramatic, revolutionary change while others speculate that growth in educational technology will be buffeted both by modest expansion and unevenness. To this debate we contribute evidence from four groups across six countries on four continents: college and university educators (n = 281), students (n = 4,243), senior administrators (n = 15), and instructional design specialists (n = 43). Our focus is on the future of digital learning after the pandemic-induced pivot to emergency remote instruction. Using data from interviews and self-administered questionnaires, our findings reveal a high degree of congruency between respondent groups, with most envisioning more blended/hybrid instruction post-pandemic and some modest increases in fully online courses. Student opinion is more sceptical about future change than within the other groups. Among respondents in all groups there is little expectation for a full-blown, revolutionary change in online or digital learning.

Practitioner Notes

What is already known about this topic

• Digital learning has been growing in higher education, although a digital disconnect continues whereby the availability of educational technology exceeds its application to learning.
• Expectations regarding technology-mediated learning post-COVID-19 are mixed, hampering planning for the future.
• Hesitancy about teaching or taking courses with some or full online components persists.

What this paper adds

• A strong majority of respondents in higher education foresee the most growth in blended/hybrid forms of digital learning post-COVID-19.
• A solid percentage, between about two-thirds and three-quarters of faculty and students, envision learners and instructors taking or teaching more fully online courses post-pandemic.
• A strong congruency exists between faculty, students, senior administrators, and instructional design professionals in their ranking of scenarios for the future of digital learning.

Implications for practice and/or policy

• Educational technology in higher learning will not return to a pre-COVID-19 normality—if a pre-COVID-19 'normal' could even be defined.
• As post-pandemic institutional planning unfolds, it is important to reflect experiences and incorporate insights of instructors, students, and instructional designers.
• Successfully building on these insights, where more blended/hybrid learning is foreseen, requires a thoughtful integration of face-to-face learning and educational technology.

Keywords: COVID-19, educational technology futures, survey research**,** teaching and learning

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Introduction

Education's emergency pivot to remote instruction at the onset of COVID-19 cut deeply and widely. UNESCO (2020) reported that, as of April 2020, approximately 1.6 billion students in over 190 countries were affected by the pandemic, including at least 100 million teachers. Colleges and universities everywhere shifted to remote instruction (Crawford et al., 2020). Remote instruction meant digital learning. Educational technology usage became ubiquitous, with the potential to foment massive changes in adoption and application.[1]

Among those prophesying sweeping changes, Murphy (2020) describes the pivot as "a pathway to a new normal rather than an emergency response" (p. 500). A new digitised academy awaits, he speculates, reshaped by for-profit educational technology companies and budget-slashing governments. Watermeyer et al. (2020) suggest that COVID-19 has "quickened the inevitability of technological change" (p. 638), a scenario which they imagine has "supercharged a sense of existential panic among academics—many of whom appear now snared in the headlights of digital disruption" (p. 638). They foresee a "quickened" pace producing "inalterable shifts" (p. 625). Most radically, Cesco et al (2021) predict that the pandemic will usher in "University 4.0," a fundamentally new form of "online and digital university" (Strielkowski, 2020; Witze et al., 2020).[2]

Others adopt a less precipitous perspective. Higher education was becoming more digitally-infused prior to the pandemic (Liu et al., 2020), but claims of revolutionary, "supercharged" change following from the pandemic are not for everyone. For example, Hodges et al. (2020) worry that "these hurried moves online … could seal the perception of online learning as a weak option" (para. 4). This suggests less digital upheaval, and perhaps a reinforcement of an older, pre-COVID-19 e-learning paradigm. Eringfeld's (2020) institutional imaginary envisions "a fully online format … as dystopian due to the loss of education as an embodied and communal experience" (p. 147). Here lies a call for resistance to major digital transformation—for the sake of learning (an echo of Cuban, 1993).

Speculation and anecdote pervade the debate. Our quest is to report the views of faculty, students, and other university personnel regarding the post-pandemic future of digital learning. The two paragraphs above highlight contrasting views. Has the pandemic ushered in a new pathway of digital disruption that will inevitably, and unalterably, revolutionise teaching and

[1] We use "educational technology," "digital learning," and "learning technology" to encompass virtual, online, or e-learning approaches. By "emergency remote instruction" we refer to the hasty refashioning of courses at the pandemic's onset, distinguishing these from the well-designed instruction typical of "fully online courses," or "distance courses." Following our data collection vocabulary, we stress "fully online" for distance courses, and "online learning" for other forms of virtual delivery (e.g., blended).

[2] The magnitude of this "4.0" change is captured by comparison to their prior three generations: the medieval university (1.0), the research university (2.0), and the high-tech science and technology university (3.0), all spanning 1000 to 2020.

learning in higher education? Conversely, will the emergency pivot to digital learning be more episodic, with the ultimate imprint on teaching and learning being modest and uneven? Our evidence lands squarely on a modest impact from COVID-19, with substantial agreement among respondents that there will be more courses using blended and hybrid formats, with some slower growth in fully online courses.

Background and expectations

Cogent reasons exist *supporting* a highly impactful prediction. The adoption of educational technology is typically understood as a continuum from simple personal usage, culminating in broad and effective learning application (Ertmer, 2005). The pandemic undermined this step-by-step process. Many educators were pulled out of their comfort zones, required to undertake something new and different, a potentially transformative experience (Riley and Solic, 2017). Faculty hesitancy, often an obstacle to change, was at least partially eroded (Cutri et al., 2020). Furthermore, while many teaching and learning centres spent years patiently nurturing digital adoption (Van de Poel and Verpoorten, 2014), the pandemic jolted everyone into action. In combination, these forces could lead to dramatic change. Greater adoption could bring more instructors to an ideal outlined in innovative teacher development models (e.g., Koehler and Mishra, 2009), where education combines the trilogy of disciplinary knowledge, pedagogical knowledge, *and* technological knowledge. Such a sudden outcome would constitute a paradigm-changing moment.

Conversely, there are potent reasons *to doubt* a highly impactful outcome. Learning technology adoption in the face of COVID-19 was a chaotic, emergency response. Thoughtful incorporation of well-planned e-learning was for most impossible, not just in March/April 2020, but even in the months following as everyone, everywhere adapted to new work routines, environments, and uncertainties. Furthermore, systematic training was impossible (Oliveira et al., 2021). As well, the agility of colleges and universities to adapt may have been an historical anomaly, spurred on by a global emergency, but an unsustainable turn. Under this perspective, it would be harder to see in "emergency remote instruction" the seeds of impactful change. This was thin soil on which to grow University 4.0! Furthermore, events earlier predicted to fundamentally disrupt teaching and learning (e.g., television, "learning objects," MOOCs), had few of the sweeping, revolutionary changes prophesied (Peck et al., 2002).

The history of digital learning is a narrative of change (Nicholson, 2007). No matter the definition, educational technology has, since its inception, seen continuous, accelerating expansion. Bonk and Wiley (2020) capture this accelerating expansion as "waves of learning technology"—some waves extended through time, others interconnected, and yet others repeated. Given this context, how did COVID-19 interact with the already-accelerating expansion of the waves of learning technology? Did the pandemic amplify the waves so that digital learning experienced a paradigm-changing moment or did it create a single large wave, a rogue wave, that had an immediate impact but with less of a lasting signature?

Methodology

In early 2020, a consortium formed around a "multi-institutional and multi-national study on the COVID-19 related transition to online instruction" (see Table 1 and Appendix 1 for more

details). Nine partners responded to this Internet invitation, requiring that they offered bachelor-level courses of instruction and were capable of self-funding their portion of the study.

Table 1

Descriptive Data—Selected Characteristics of the Nine Institutions

	Calculated by institution			*n* of institutions
	Lowest	Average	Highest	reporting
Student characteristics				
n of student respondents	155	423	815	9
Female students	46.8%	62.4%	67.9%	9
International students	3.4%	10.6%	18.5%	9
1st or 2nd year students	45.4%	60.8%	76.4%	9
Institution characteristics				
Tenure stream instructors	22.6%	49.0%	90.9%	8
Male instructors	29.4%	59.5%	84.6%	8
Approx. size undergraduate	7,000	27,000	56,000	9

Note. Internal numerical cells reflect averages and ranges among institutional partners.

In all institutions, student data (n = 4,243) came from self-administered questionnaires. Students were selected from a range of courses. We balanced having comparable courses between institutions while also including a range of disciplines within each institution. In eight institutions we also gathered data from faculty instructors (n = 281). At six of these we used virtual interviews and in two, self-administered questionnaires. Instructors were selected in courses identical with, or similar to, the courses of students.[3] In three institutions we also interviewed senior administrators (n = 15) and instructional design professionals (n = 43).

In several institutions we generated random samples of both students and faculty, with response rates for faculty ranging between 30% and 70%, and student rates between 30% and 50%. In other institutions we used quasi-random samples with ambiguous sampling frames (e.g., broadcast email invitations), where representativeness is unclear. We tested for institutional effects (and found few) by using institutional dummy variables in our multivariable regression analyses to ensure that sampling differences did not influence interpretations. We used purposeful sampling for interviews with senior administrators and instructional design professionals, selecting for key institutional positions (with participation rates over 90%). Most questionnaires and interviews were completed from May to August of 2020. Fuller details of the study are available in Authors (in press-a, in press-b) and the data collection instruments are available here. [Reviewers: please click only under "Data Collection" icon on splash page.]

We use three main indicators to judge perceptions of the future of digital learning:

1. We asked all respondents, "What do you believe will be the future impact, in two or three years, of this transition to online learning?" Seven categories were listed, with a request

[3] To be eligible for selection all faculty members had to be teaching a course, or be about to teach a course (southern hemisphere), in early 2020.

to check or mention all that applied: "negligible impact," "more online teaching (blended/ hybrid courses)," "more courses fully online," "less online teaching," "more avoidance by students of fully online courses," "more avoidance by instructors of full online courses," and "other, please specify."

2. Instructors were asked to rate, on a seven-point Likert scale, their level of agreement with the statement: "I am now more positive about the benefits of teaching online." Students were asked to rate a similar question, also using a seven-point Likert item: "I am now more likely to take a 100% online course."
3. To ascertain whether instructors learned anything new during the pandemic that could be used in the future, we asked, "Did you learn any new teaching skills, strategies, or technologies during the transition to remote instruction," with a follow-up probe asking for examples.

We also asked everyone we interviewed an open-ended question: "Considering everything involved with this learning experience, how has it informed your views about using online teaching and learning in the future?" We make only selective use of this data in this paper, adding interview quotations to highlight key themes. Interview comments were analysed in several ways (for an example, see Braun & Clarke, 2019). Interviewers wrote thematic summaries after completing interviews, focusing on individual questions such as the open-ended question above. At least three other research staff read all interview comments, highlighting major themes. Finally, two of the paper authors also read all the open-ended replies to this question, again highlighting key themes.

Prediction is never easy, especially asking respondents to make forecasts in the midst of a pandemic. The immediacy of any crisis concentrates attention on the present. Being cognizant of the potential frailty of responses given this immediacy focus, we took precautionary steps. Our first question about the future of learning technology urged respondents to look beyond the pandemic and focus on a future "two or three years" away. Questions about the future also occurred toward the end of interviews or questionnaires, at which point respondents had already detailed their use of learning technology before the pandemic and in response to the pandemic. A logical next step for questioning was to concentrate on the future, thus moving respondents' focus from past to present to future.

Analytic Strategy: Our findings are driven exclusively by responses to fixed choice questions from faculty, students, instructional designers, and senior administrators, supplemented with illustrative material from interviews. We present univariate, bivariate, and logistic regression results, starting with the former. We use quotations from the faculty interviews sparingly, and only as supportive, illustrative examples to enrich findings.

Results

In a close-ended question, we asked all respondents—faculty, students, learning design professionals, and senior administrators—about six likely learning technology scenarios, "two or three years" post-pandemic. The response categories appear in the leftmost column of Table 2. We approach this table in two ways. Examining how the orderings rank down each respondent column and then comparing across the columns shows patterns of similarity or difference among

the four respondent groups. Comparing percentages across each individual row shows where there are similarities or differences among groups with respect to each of the future learning technology scenarios.

A first way to read Table 2, therefore, is to compare the rankings of the six future impact scenarios across the four groups. A congruency of views best describes how the four groups rank the future scenarios of educational technology. Spearman's rank-order correlation, a non-parametric measure of association, tests this congruency by comparing the ordering of responses between pairs of respondent groups (e.g., faculty versus students). All correlations are at or above .886, with the lowest level of association occurring between instructional design professionals and both faculty and students. There is relatively little difference in the ordering of beliefs between respondent groups about how digital forms of teaching and learning will be impacted in the future.

Table 2

Views of Four Groups on the Future Impact of Digital Learning Beyond the COVID-19 Pivot

Future impact, in two to three years	Higher Education Groups				Chi-Square Results		
	Faculty	Students	ID P.	Sn Ad.	All Groups	Fac/ID P./Sn Ad.	Stud/Others
	n = 281	*n* =4,243	*n* = 43	*n* = 15	*N* = 4,582	*n* = 339	*n* = 4,582
More online teaching (blended/hybrid)	86.1	71.8	90.1	86.7	34.50**	0.68	34.45**
More fully online courses	52.0	48.9	79.1	53.3	15.61**	11.13**	5.32*
More student avoidance: fully online courses	28.1	33.5	13.9	13.3	13.27**	5.17	8.81**
More instructor avoidance: fully online courses	23.1	21.0	37.2	33.3	8.53*	4.43	3.53
Negligible[¥]	5.7	11.5	2.3	0	12.85**	0.90	13.62**
Less online teaching[¥]	3.6	7.5	7.0	0	6.02*	1.13	6.21*

Note. ID P. = instructional design professionals; Sn Ad. = senior administrators.

Chi-square cells show χ^2 values, with **p < .01 and *p < .05.

[¥]In final two rows, the Pearson chi-square values exclude the Sn Ad. when the cell value is zero (Yates correction produces similar results).

In aggregate, every group of respondents ranked "more online teaching (blended/hybrid)" as the most likely outcome in two to three years. Given that blended learning was trending higher prior to the pandemic (Anthony et al., 2020), this is perhaps unsurprising. Notice too that few respondents felt that the impact of the pandemic on educational technology would be negligible. However, students were more notable than others as sceptics about change in educational technology use in the future (more below).

A second way to read Table 2 highlights differences between groups, and especially students versus others. Although almost everyone agrees about the general ordering of future scenarios, there are some noticeable discrepancies in percentages when comparing across the rows of the table. For example, as just noted, a higher percentage of students (11.5%) believe that only negligible change will occur, a percentage at least double any of the other groups. By comparing the percentages across each individual row, we can ascertain where there are differences between the groups on each specific future scenario. For each row we calculated a Pearson chi-square test as a way of determining this. These tests of independence are captured in the far-right columns of the table.

The first column of chi-square results comes from separate 2 x 4 tables (not shown) *for each of the future scenarios* ("likely" or "not" as two rows, with each of four groups in the columns). Across each row of the table, the chi-square tests for statistically significant differences in the percentage of respondents supporting each future scenario are shown. Significant differences hold for each scenario. For example, 71.8% of students believe there will be more online blended/ hybrid teaching in the future. That percentage is significantly lower than for the other three groups. This latter conclusion follows from the next two columns of chi-square results. First, we created a sub-table (now 2 x 3) for the blended/hybrid scenario, excluding students. The chi-square value ($\chi^2 = 0.68$) is not statistically significant (i.e., the percentages for the other three groups are similar). Second, we created another sub-table for the blended/hybrid scenario, one that contrasts students with the other three groups combined (i.e., a 2 x 2 table). The chi-square value ($\chi^2 = 34.35$) is statistically significant, demonstrating that the 71.8% agreement among students is significantly lower than the percentages for the other three groups.

For four of the six future scenarios this pattern of results holds—student responses are significantly different than the other three groups. As a consequence of the pandemic, students are more likely than others to see negligible change (11.5% vs. 5% for other groups), more likely to think there will be less online teaching (7.5% vs. 3.8% for others), more likely to feel students will avoid fully online courses (33.5% vs. 25.7%), and less likely to think there will be more blended/hybrid teaching in the future (71.8% vs. 86.7%). Each of these contrasts is statistically significant as the rightmost columns of Table 2 show. These patterns suggest that students are more sceptical than other groups about future changes.

With respect to instructors avoiding the teaching of fully online courses, it turns out that instructional design professionals are more likely to think this (37.2%), while in combination only 21.2% of respondents in the other three groups believe this ($\chi^2 = 6.51$, 1 *df*, $p = .011$). This difference perhaps reflects, among other things, a hesitancy which instructional design professionals have encountered in encouraging faculty instructors to teach online (Cutri et al.,

2020). Despite this relative scepticism about who will teach online in the future, instructional design professionals believe there will be more fully online courses in the future (79.1%), a percentage significantly greater than any of the three other groups (49.1% combined; $\chi^2 = 15.28$, 1 *df*, $p < .001$).

Only a small percentage of respondents believe the pandemic's impact on educational technology will be negligible. This echoes Watermeyer et al. (2020) who suggested the COVID-19-pivot represented an "inalterable shift" in virtual learning. In faculty interviews, a female political science instructor summarised one kind of future impact some respondents envisioned when she predicted a "whole landscape of opportunity, more diversity, opened up both for students and faculty about how remote techniques can be used to enhance and supplement different types of course delivery."

Table 2 shows that *among* the four groups, respondents generally agree about the ordering of future educational technology scenarios, although with some notable discrepancies, especially for students. But how much consensus exists *within* respondent groups? For example, while 70% of students foresee more blended/hybrid instruction, are certain groups more or less likely to agree with this (e.g., older vs. younger students, students in different disciplines)? Table 3 reports the results of separate logistic regression models for students and faculty. In each case the model includes individual-level attributes of instructors or students, as well as dummy variable controls for course discipline and institution. The dependent variable is 0 for those who did not foresee more blended/hybrid instruction, and 1 for those who did.

The logistic regression coefficients in Table 3 indicate that faculty subgroups do not differ significantly one from the other. That is, there are no differences in perceptions of the future likelihood of more blended/hybrid instruction by gender, tenure status, years of experience, or self-rated educational technology proficiency.[4] The results for students are slightly different, although here sample size drives much of the apparent differences. For example, among students, and net of other factors, women are more likely than men to expect more blended/hybrid instruction in the future (the gender coefficient, .236, is statistically significant). However, the bivariate difference between women and men is three percentage points (73% vs. 69.7%, respectively). This weak effect is reflected in the pseudo R-squared measure of .06 for students, showing that most of the variation is random as opposed to systematic.

[4] We measured technology proficiency by asking respondents to use a five-point scale (0–4) to rate "how much prior experience would you say you had with web-enabled or technology-mediated course instruction." Including different measures, such as prior experience with online learning, led to similar results.

Table 3

Binary Logistic Regression of Future Likelihood of more Blended/Hybrid Learning on Individual Attributes and Course Discipline, for Faculty and Students

	Faculty Instructors			Students		
Independent variables	Co-eff.	St. error	Sig.	Co-eff.	St. error	Sig.
Individuals						
Gender (F=1)	.455	.419	.277	.236**	.080	.003
Tenure (T=1) /Yr. lev.[¥]	-.205	.485	.672	-.036	.081	.656
Yrs experience /age[¥]	-.014	.026	.594	.003	.007	.717
Prior ed tech proficient	.116	.156	.460	.155***	.033	.000
Disciplines						
Discipline dummies	Yes			Yes		
Institutions						
Institutional dummies	Yes			Yes		
Constant	2.04			.496		
Nagelkerke R-squared	.103			.060		
Degrees of Freedom	15			16		
N	249			3716		

Note. Seven institutional cases for faculty, eight for students. Logistic regression coefficients;

**p < .01, ***p < .001. Co-eff.=logistic regression coefficients; St. error=Standard error; Sig=p value.

[¥]For faculty, the independent variables are tenure (0/1) and years of teaching experience, while for students, course year level (1–5) and age are used. Other variables are equivalent for both faculty and students.

In short, most faculty and students foresee more blended/hybrid courses (Table 2), and this sentiment is widely shared within both groups (Table 3). Put another way, there were no systematic pockets of disagreement about the future scenario of more blended/hybrid courses among faculty and only minor differences among students. The same story applies to the other highly expected future likelihood scenario—more fully online courses (i.e., no pockets of dissensus).

This is not to imply that there were no dissenting views about the future of educational technology. For example, in discussing the future some respondents made little distinction between emergency remote instruction and fully online course instruction (a worry that Hodges et al. identified). Conflating the two led one respondent to argue as follows:

> I think [using more learning technology] will be a major problem. I really hope my colleagues feel similarly. The sooner we get in the classrooms the better. This [COVID-induced pivot] is not a world I want to work in. Any sense that online learning is something other than a contingency plan – that benefits are to be had from it – I really think is garbage. (M, Historian)

While a minority view among respondents, this repeats a view quoted earlier from Watermeyer et al. (2020) about some faculty professing an "existential panic" over the prospect of more digital learning. Other faculty instructors were cognizant that what occurred in teaching and learning at the onset of the pandemic ought not to be equated with robust online teaching:

> It's difficult to extrapolate—did the last four weeks [represent] what online learning is or is it just me not knowing what online learning is. I'm not foreclosing that it could be done to an even better standard than in person if I was educated on the technologies. (F, Chemistry)

Where there was resistance to fully online courses, this view came especially from instructors who reported lower proficiency in their use of learning technology. As noted above, we asked instructors to indicate whether or not they felt there would be more "avoidance of fully online courses" among both students and faculty. Table 4 shows the association between an instructor's self-reported level of learning technology proficiency prior to the pandemic and their perceptions of likely future "avoidance" both by students and their teaching colleagues. Instructors who themselves felt less proficient were more likely to foresee more future avoidance of fully online courses both by instructors (37.0%) and students (43.8%).

Table 4

Association between Faculty Self-Reported Learning Technology Proficiency and the Likelihood of Instructors or Students Avoiding Fully Online Courses in the Future, in %

	Faculty Self-Reported Learning Technology Proficiency		
Future avoidance	Low	Moderate	Proficient
More avoidance by instructors of fully online courses (% yes)	37.0	20.6	15.2
More avoidance by students of fully online courses (% yes)	43.8	24.5	20.3
Column totals (*n*)	(73)	(102)	(79)

Note. Chi-square for instructor avoidance = 10.86, p = .004; chi-square for student avoidance = 11.79, p = .003.

There were some differences among those choosing the avoidance option by discipline of instruction and by institution, but these were weak and varied. Gender, tenure status, and years of experience had no bearing on whether a faculty member selected the avoidance option. We asked the same question of students and again self-reported proficiency had the same pattern of effects, although the association was weaker (not shown in a table). Age and year level had a more pronounced effect for students, with those who were older and in more senior classes less likely to foresee either instructors or students avoiding online courses.

We also asked both students and faculty about their own likelihood of teaching or taking future online courses. As Table 5 shows, 63.3% of instructors from science disciplines agree that they are now more positive about the benefits of teaching online. In contrast, just over 40% of faculty instructors from non-science backgrounds (41.5%) share this sentiment. Disciplinary backgrounds, more than the individual characteristics of instructors (e.g., gender, tenure status, or experience), shape faculty perceptions of the benefits of online teaching.

Table 5

Student and Faculty Sentiments about "Teaching" or "Taking'" Online Courses as a Consequence of Their Experiences During the COVID-19 Pivot, by Academic Discipline

Level of agreement	Instructor views (%)		Student views (%)	
Teaching/taking online courses	Sciences	Arts	Sciences	Arts
Strongly agree to agree	63.3	41.5	42.8	38.7
Neutral	10.0	13.8	17.2	15.8
Strongly disagree to disagree	26.7	44.7	39.9	45.5
Column totals	100% (90)	100% (159)	100% (1,503)	100% (2,685)

Note. Chi-square = 19.12, p =.004 for instructor views; chi-square =12.44, p =.002 for student views. Sciences = physical, natural, and applied sciences; arts = humanities and social sciences, business, other.

Part of the reason for the disciplinary differences might have to do with pedagogical focus and "teaching philosophy" (Trigwell & Prosser, 2004). For example, one respondent articulated frustration as follows:

> The greatest challenge was interacting in an organic and creative way with the students. My teaching style is to try and engage students to give them some initial ideas, get them to process it, interact with them, and then move on and get them to process some more ideas. That whole sense of the process of learning was very difficult to do online. (M, Historian)

Among students, the disciplinary differences exhibited by faculty with respect to fully online courses were almost nonexistent. As Table 5 shows, for students the gap between those in science versus non-science courses was only 4 points (42.8%–38.7%). More generally, students were evenly split on the likelihood of taking more online courses in the future.

Finally, when asked whether they learned anything new about teaching given the transition to remote instruction, the vast majority of instructors said yes, and most of those commented on technology. Among the attributes of instructors that we examined—years of experience, gender, technology proficiency, and tenure status—it was only tenure status that was associated with learning from the pandemic experience. Those who were tenured were more likely than those who were not to report learning something new (87.6% vs. 71.1%). Neither prior proficiency with learning technology nor discipline of instruction was significantly associated with having learned something new. Furthermore, the tenure effect was significant while years of experience was not, perhaps suggesting that newer tenure stream faculty were already more conversant with learning technology.

Discussion

Year upon year new virtual learning initiatives have expanded, from MOOCs to e-textbooks to virtual lab simulations to adaptive learning (Macgilchrist et al., 2020). This will continue. What set the COVID-19 pivot apart was the way it became necessary for everyone in higher education to use educational technology. The choice to use technology was no longer optional. For the

large majority of instructors this presented unexplored terrain. However, with systematic technology training impossible due to the nature of the emergency pivot, creating a foundation for major change was shaky at best. As Oliveira et al. (2021) noted, "teachers did not have the necessary *training* with the remote education environment" (p. 1,367, emphasis in original).

With respect to "waves of learning technology," the metaphor used by Bonk and Wiley (2020), our evidence suggests that COVID-19 will accelerate the adoption of educational technology. This will occur most particularly through digital learning that will augment face-to-face instruction via blended or hybrid modalities, relative to expansion of fully online course delivery. The latter will continue to grow, our respondents suggest, but blended/hybrid teaching will blossom even more. The majority of our respondents would agree that colleges and universities will see more "online and digital" presence post-pandemic, but there is little evidence this will produce a "University 4.0" (Cesco et al., 2021). With respect to educational technology, COVID-19 is less likely to foment a tidal wave of change, and more likely to produce a rogue wave impacting change unevenly across institutions and courses of instruction.

What instructors and students actually did during the pandemic is also likely to condition their views on how the future of learning technology plays out. Although some have argued, with nuances, that "the LMS is dead" (Farrelly et al., 2020; Weller, 2007), Learning Management Systems (LMSs) played a central role during the pandemic by allowing faculty to rapidly transition courses and most students to engage with a common institutional learning platform (Authors, in press-a; Oliveira et al., 2021). While the LMS was a rudimentary enabler of remote instruction, for many academic staff it was a lifesaver. The success of LMS platforms, of course, reinforces an older form of learning technology and is not likely a progenitor of dramatic change.

Rethinking instructional design

From a pedagogical viewpoint, it is critical to remember that course delivery—whether face-to-face, blended/hybrid, or fully online—is not an end in itself. The design of effective learning is the goal. COVID-19 can spur useful change if it prompts instructors to reflect on "why" they teach as they do. By extending the "whole landscape of opportunity" that virtual learning offers, this opens up possibilities for doing things differently and better. The opportunity this affords educators to contemplate possibilities presents a "readiness for application," an integral part of the reflective process necessary for genuine social change (Boud et al., 1985). Our results, foreshadowing an expansion of blended/hybrid teaching models, also harkens back to Garrison and Vaughan (2008) who argued that "blended learning is the thoughtful integration of classroom face-to-face learning experiences with online learning experiences, a design approach whereby both types of learning are made better by the presence of the other" (p. 5).

Rethinking campus communities (moving beyond disciplinary knowledge)

Beyond the individual course and the disciplinary knowledge it nurtures is the college or university immersive experience. One of our respondents labelled this the "social part of learning," referring explicitly to the university as a place "with people present, talking to each other, meeting together, teaching [and learning] together." But this community belonging depends upon what motivates a student to enrol in higher education. For students with specific, often vocational aspirations, an immersive cultural "rite of passage" is less consequential, whereas for others seeking a post-high school liminal experience, the on-campus culture is

imperative. In several of our institutional cases, student ratings of individual course units held up well during the pandemic, sometimes even improving, but the overall ratings of the college or university experience plummeted. One interpretation of this is that many students can learn well online and find this acceptable. What some students missed, however, and why university-wide experience ratings dropped significantly, was a sense of community belonging. This was lost during the COVID pandemic. However, it should be noted that, when well-planned, technology can also facilitate community building, although this is less often recognised than it should be (Tai et al., 2019).

Rethinking instructional delivery modes

Overall respondents were much more likely to acknowledge the virtues of multiple forms of teaching and learning. Certainly, angst was expressed regarding the challenges of remote instruction, but especially among more thoughtful comments, respondents were open to the opportunities that digital learning presented. A complementarity of teaching and learning modalities was stressed, both at the level of instructional design and the diversity of learning needs of students. The expectation going forward is not a return to old practices and preferences, as in all face-to-face teaching, nor was it a complete overhaul of learning delivery with only online options. The debate is not about moving from one to the other, but the ways in which different delivery modes can complement the teaching and learning experiences of students and faculty. Furthermore, while the general trend at a national or global level might be toward more blended or hybrid learning, the modalities used will vary by instructor and institution according to the needs of students. What might be accepted and implemented in a primarily residential campus setting, where online enhancements of conventional teaching may suffice, is quite different from a large commuter university where large numbers of students travel great distances daily and where significant numbers of part-time and older students are enrolled. For students, their preferred mode of instruction is more a function of their personal circumstances (e.g., commuting, paid employment, desire for immersion) than it is a personal view about the merits of fully online or face-to-face learning. The mode of instruction is often chosen, when choice is available, based on their desires and living circumstances.

Conclusion

A few limiting caveats are in order. Earlier we noted the difficulty for respondents to make predictions during the pandemic. Selection bias, both among respondents and institutions, necessitates caution about overgeneralisation. While tempting to speculate about institutional differences, with only nine cases this is impossible. We were also limited in our capacity to explore the full range of transition issues (our main study goal), while simultaneously asking about future scenarios. Rather, our work acts as a baseline from which to track the development of such futures.

In general, our findings show the following: (a) a strong majority of respondents in higher education foresee the most educational technology growth occurring in blended/hybrid courses post-COVID-19; (b) a solid percentage, between two-thirds and three-quarters of faculty and students, envision learners and instructors taking or teaching more fully online courses post-pandemic; and (c) a strong congruency exists between faculty, students, senior administrators, and instructional design professionals in their ranking of future educational technology scenarios. Within this broad level of agreement there are notable discrepancies. Students are more sceptical

about future change than are others, across almost all future scenarios. Compared to other groups, instructional design professionals are seemingly optimistic about more fully online courses but with some pessimism about who might teach them. Overall, respondents anticipate clear changes in digital learning post-pandemic, but few envision dramatic, revolutionary change in either virtual teaching or learning. Nevertheless, plans for moving forward successfully need to be attuned to the views of faculty, students, and instructional designers.

References

Anthony, B., Kamaludin, A., Romli, A., Raffei, A. F .M., Eh Phon, D. N. A. L., Abdullah, A., & Ming, G. L. (2020). Blended learning adoption and implementation in higher education: A theoretical and systematic review. *Technology, Knowledge and Learning*. doi.org/10.1007/s10758-020-09477-z

Bartolic, S., Boud, D., Agapito, J., Verpoorten, D., Williams, S., Lutze-Mann, L., Matzat, U., Moreno, M., Polly, P., Tai, J., Marsh H., Lin, L., Burgess, J-L., Habtu, S., Rodrigo, M., Roth, M., Heap, T. and Guppy, N. (2022). A multi-institutional assessment of changes in higher education teaching and learning in the face of COVID-19, *Educational Review*, 74, 3, 517-533. DOI: 10.1080/00131911.2021.1955830

Bartolic, S., Matzat, U., Burgess, J-L., Boud, D., Craig, H., de Jaeger, A., Kaplan-Rakowski, R., Lutze-Mann, L., Polly, P., Roth, M., Tai, J. and Guppy, N., (2022). Student vulnerabilities and confidence in learning in the context of the COVID-19 pandemic, *Studies in Higher Education*, 47, 12, 2460-2472. DOI: 10.1080/03075079.2022.2081679

Bonk, C., & Wiley, D. (2020). Preface: Reflections on the waves of emerging learning technologies. *Educational Technology Research Development, 68*, 1595–1612. doi.org/10.1007/s11423-020-09809-x

Boud, D., Keogh, R., & Walker, D. (1985). Promoting reflection in learning: A model. In D. Boud, R. Keogh & D. Walker (Eds.), *Reflection: Turning experience into learning* (pp. 18–40). Routledge Falmer.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589–597. http://doi.org/10.1080/2159676X.2019.1628806

Cesco, S., Zara, Z., De Toni, A., Auhli, P., Betta, G., Evancs, A., & Orzes, G. (2021). Higher education in the first year of COVID-19: Thoughts and perspectives for the future. *International Journal of Higher Education, 10*(1), 285–94. http://doi.org/10.5430/ijhe.v10n3p285

Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P., & Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning and Teaching, 3*(1), 1–20.

Cuban, L. (1993). Computers meet classroom—Classroom wins. *Teachers College Record, 95*(2), 185–210.

Cutri, R. M., Mena, J., & Whiting, E. F. (2020). Faculty readiness for online crisis teaching: Transitioning to online teaching during the COVID-19 pandemic. *European Journal of Teacher Education*, *43*(4): 523–541. doi.org/10.1080/02619768.2020.1815702

Eringfeld, S. (2021). Higher education and its post-coronial future: Utopian hopes and dystopian fears at Cambridge University during Covid-19. *Studies in Higher Education*, *46*(1), 146–157. http://doi.org/10.1080/03075079.2020.1859681

Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, *53*(4): 25–39. http://doi.org/10.1007/BF02504683

Farrelly, T., Costello, E., & Donlon, E. (2020) VLEs: A metaphorical history from sharks to limpets. *Journal of Interactive Media in Education*, 2, 1-10. https://jime.open.ac.uk/articles/10.5334/jime.575

Garrison, D.R., & Vaughan, N. D. (2008). *Blended learning in higher education: Framework, principles, and guidelines.* San Francisco, CA: Jossey-Bass.

Guppy, N., Boud, D., Heap, T., Verpoorten, D., Matzat, U., Tai, J., Lutze-Mann, L., Roth, M., Polly, P., Burgess, J-L., Agapito, J., and Bartolic, S. (2022). Teaching and learning under COVID-19 public health edicts: The role of household lockdowns and prior technology usage, 84, 487-504. *Higher Education,* DOI: 10.1007/s10734-021-00781-w

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020, March 27). The difference between emergency remote teaching and online learning. *Educause Review*. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, *9*(1), 60–70.

Liu, Q., Geertshuis, S., & Grainger, R. (2020, July). Understanding academics' adoption of learning technologies: A systematic review. *Computers and Education, 151,* 1–19. https://doi.org/10.1016/j.compedu.2020.103857

Macgilchrist, F., Allert, H., & Bruch, A. (2020). Students and society in the 2020s. Three future 'histories' of education and technology. *Learning, Media and Technology*, *45*(1), 76–89. https://doi.org/10.1080/17439884.2019.1656235

Murphy, M. (2020). COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy, 41*(3), 492–505.

Nicholson P. (2007). A history of e-learning" In B. Fernández-Manjón, J. M. Sánchez-Pérez, J. A. Gómez-Pulido, M. A. Vega-Rodríguez & J. Bravo-Rodríguez (Eds.), *Computers and education* (pp. 1–11). Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-4914-9_1

Oliveira, G., Teixeira, J., Torres, A., & Morais, C. (2021). An exploratory study on the emergency remote education experience of higher education students and teachers during the COVID-19 pandemic. *British Journal of Educational Technology, 52*(4), 1357–76. http://doi.org/10.1111/bjet.13112

Peck, C., Cuban, L., and Kirkpatrick, H. (2002). Techno-promoter dreams, student realities. *Phi Delta Kappan* February, 472-480.

Riley, K., & Solic, K. (2017). "Change happens beyond the comfort zone": Bringing undergraduate teacher-candidates into activist teacher communities. *Journal of Teacher Education*, *68*(2), 179–92. http://doi.org/10.1177/0022487116687738

Strielkowski, W. (2020). *COVID-19 pandemic and the digital revolution in academia and higher education*. Preprints. http://doi.org/10.20944/preprints202004.0290.v1

Tai, J., Bellingham, R., Lang, J., & Dawson, P. (2019). Student perspectives of engagement in learning in contemporary and digital contexts." *Higher Education Research & Development*, *38*(5), 1075–89. http://doi.org/10.1080/07294360.2019.1598338

Trigwell, K., & Prosser, M. (2004). Development and use of the approaches to teaching inventory. *Educational Psychology Review, 16*(4), 409–24.

UNESCO. (2020, December). *Education: From disruption to recovery*. https://en.unesco.org/covid19/educationresponse/

Van de Poel, J.-F., & Verpoorten, D. (2014, décembre). Deux ans de formation et d'accompagnement techno-pédagogique à l'ULg: public, impact et perspectives. *Education et Formation*, e-302. http://revueeducationformation.be/index.php?revue=20&page=3

Witze, A., Subbaraman, N., Viglione, G., Callaway, E., Mallapaty, S., Cyranoski, D., Ledford, H., & Gibney, E. (2020, June). Universities will never be the same after the coronavirus crisis. *Nature*, *582*, 162–164.

Watermeyer, R., Crick, T., Knight, C., & Goodall, J. (2020). COVID-19 and digital disruption in UK universities: Afflictions and affordances of emergency online migration. *Higher Education 81*, 623–41. https://doi.org/10.1007/s10734-020-00561-y

Weller, M. (2007). The VLE/LMS is dead. *The Ed Techie*. November 8. https://nogoodreason.typepad.co.uk/no_good_reason/2007/11/the-vlelms-is-d.html

Appendix A

Table A1

Institutional Contexts – Thumbnail Profiles of Participating Institutions (masked for blinded peer review)

Institution	Key Contextual Factors
Philippines	A private [redacted] university in the Philippines founded in [redacted]. The [redacted] of the university offers arts, social sciences, sciences, and management programs to about 8000 undergraduate and 5000 graduate students, 3.7% of which are international degree students.
Australia 1	A public multi-campus university in [redacted] established in [redacted] as simultaneously a distance education and F2F provider. Among the institutions included here, easily the most e-learning literate. About 45,000 undergraduates, with about one-third being international and one-third enrolled in primarily online programs.
The Netherlands	A technical university offering [redacted] degrees across nine faculties. Founded in [redacted] by the Dutch government, the public university serves about 7,000 undergraduates, about 7% international. The university has a strong emphasis on blended and hybrid teaching.
Canada 1	A public [redacted] offering a range of credentials (degrees, diplomas, certificates) with a strong focus on labour market training. Established in [redacted] nearby to [redacted] Canada. About 40,000 fulltime undergraduates, 25,000 part-time, about 20% international students
Belgium	A French-speaking [redacted] 25,000 students distributed in 11 faculties and 4 campuses. Established in [redacted]. Just under 20,000 undergraduate students with about 15 percent international. Has a relatively smaller online presence than some other partner institutions.
Canada 2	Public university with its main campus in [redacted]. Home to one of the world's first [redacted] About 56,000 undergraduates, about one-quarter international. Small fully online digital learning footprint. Ranked in top 50 world universities (Times HES).
Canada 3	Located in [redacted] Canada, and established in [redacted], a public teaching and research university with two campuses. Approximately 27,000 undergraduates, with just under 20% being international. Relatively small number of fully online courses and only one fully online degree program.
Australia 2	Located in [redacted] the university was established in [redacted], and is among the top ranked universities in the world. [redacted] also has a strong focus on teaching and has about 38,000 undergraduates, 30% of whom are international. Smaller online learning profile than several other institutions included here.
United States	A public research university established in [redacted] has an enrollment of over 40,000 students, 32,000 of

	which are undergraduate. It is one of the few [redacted] in the US. [redacted] currently offers [redacted] online courses and [redacted] online degree program options.