Forward Looking: Predictions for the Future of Hybrid Learning Spaces

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Forward Looking: Predictions for the Future of Hybrid Learning Spaces

Yishay Mor, Einat Gil, Yannis Dimitriadis and Christian Köppe

Abstract The chapters of this book provide a broad and deep perspective of the state of Hybrid Learning Spaces (HLS) and the emerging ethical, pedagogical, administrative, architectural and technological issues. Nevertheless – many readers might find themselves wondering what the concrete implications of these insights are, in the short, medium and long term. In an attempt to answer this question, we have conducted a rapid quasi-Delphi study among the authors of the various chapters. This chapter presents our preliminary findings.

Introduction

The chapters of this book explore the theme of Hybrid Learning Spaces from diverse perspectives: epistemic, pedagogical, technological, architectural, ethical and organisational. They report on state-of-the-art research and practice. As is often the case in such publications, many readers might find themselves wondering what the concrete implications of these insights are, in the short, medium and long term. Are these idiosyncratic exemplars, reflecting radical research agendas, or are they harbingers of the future mainstream reality of education?

This chapter makes an initial attempt to answer this question. Given the short timeframe between the acceptance of the other chapters and the publication of the book, we adopted an agile research methodology. Admittedly, this fact questions the validity of our findings, and calls for further research. Nevertheless, we find the insights garnered in this process interesting – and believe they are worth sharing.

The approach we applied is a "quasi-Delphi study". The Delphi method (Hsu & Sandford, 2007) was developed at the RAND Corporation during the cold war as a method of forecasting technological developments (Rescher, 1998). It has since been used in a wide variety of domains for forecasting, policy and consensus analysis. The Delphi method is designed to elicit sound practical insights by pooling the knowledge of domain experts. In a Delphi study, a panel of experts is selected based on a set of pre-defined criteria. They are presented with a set of statements regarding the future, on which they comment and evaluate their likelihood. The

facilitators define an apriori consensus threshold (typically 75-80%). When the ratio of agreements to a statement is above the threshold, it is accepted as representing the common judgment of the group. When the ratio is below the threshold, the statement is refined in view of the comments and re-evaluated. Further rounds might present the experts with additional statements, elaborating or corollary to the previous round.

Our study adopted the general gist of the Delphi method, but did not follow the protocol strictly due to logistic constraints. As an expert group, we selected the authors of the chapters of this book. We derived a set of predictions from the core claims and insights in the chapters and presented them to the expert group. The responses were interesting – both for the statements for which we achieved consensus, and for those where we did not. We therefore decided to present all these statements and their evaluations here.

Method

The authors of this chapter, who are the editors of this book, reviewed all the other chapters and elicited from them 11 predictive statements. These were presented as a survey to the other authors. An open copy of this survey is available here: https://forms.gle/AM3eGMBw9PGK1o4w5. For each statement, the respondents used a 5 point Likert scale to evaluate its likelihood, impact, timeframe (from near to far future) and their confidence in their responses. They were prompted to suggest references (both book chapters and other publications) which support / relate to the statement and offer any comment and suggestions they might have.

21 authors (61% of all non-editor authors) responded to our survey. Based on the responses, the next step should be a refinement of the statements and circulation of a second round for evaluation by the experts. This remains the subject of future work.

Findings

Our analysis of the chapters yielded 11 predictive statements. When presented for evaluation by the expert panel, 5 of these statements received a likelihood rating of 4/5 from more than 70% of the respondents, and 10 from more than 50%. In terms of impact, only 3 received a rating of 4/5 from more than 70% of the respondents, but 10 received a high rating from 50% (see table 1). Note that we also asked the experts to estimate the timeframe for the realization of the predictions. However, methodologically we found it hard to provide aggregate measures for this variable and thought it would be more reasonable to present its distribution per prediction.

Considering these outcomes, at first we were inclined to present only the statements with a high rating. If we would have applied a full Delphi protocol, we would have tried to refine the other statements and re-evaluate them. However, we see value is sharing not just the conclusive findings but also the points of

controversy. Academic literature is affected by publication bias and a preference for novelty. These can potentially create a tension between the academic discourse and the practical one. Trends and attitudes that might be common among researchers may be less appealing or convincing for practitioners, whether for substantial reasons or for mundane ones. With this in mind, we argue that when reviewing predictions derived from a body of literature (in our case the chapters of this book) it is worthwhile noting not only those that are accepted as high in likelihood and impact, but also those that are perceived as more speculative or esoteric.

Table 1: Summary of expert evaluations. Numbers indicate the ratio of experts who responded 4 or 5.

Prediction	Likelihood	Impact	Confidence
1: The new normal, the new super-normal	0.90	0.71	0.62
2: Synchronous hybrid teaching practices	0.57	0.62	0.43
3: Learning design partnerships	0.62	0.67	0.57
4: Learning Design and Learning Analytics for hybrid learning	0.71	0.62	0.38
5: Design principles for hybrid seamless learning	0.57	0.67	0.71
6: Pedagogical success of hybrid learning will need an enculturation process	0.62	0.76	0.57
7: Design for privacy, safety and identity in hybrid spaces	0.71	0.67	0.67
8: Death of the lecture hall	0.76	0.67	0.71
9: Classroom oriented sensors, digital traces and analytics	0.38	0.43	0.38
10: Adaptive/adaptable Learning Spaces	0.81	0.86	0.67
11: Situational Awareness	0.62	0.52	0.38
> 0.7	5 (/ 11)	3	2
> 0.5	10	10	7
min	0.38	0.43	0.38
max	0.90	0.86	0.71

Prediction 1: The new normal, the new super-normal

Likelihood 0.90, Impact 0.71, Confidence 0.62

Hybridity has become the standard in post-COVID19 educational systems, but in the narrow sense of blended / HyFlex (dual mode, hybrid synchronous instruction) classrooms. As such, it is destined to pass through the usual stages of the Gartner hype cycle: inflated expectations, disillusionment, enlightenment, productivity. Finally, we will stop using the adjective hybrid to describe what we see as obvious and transparent. The normalisation of hybridity in the base sense of blended will open the door to hybridity in the synergetic / merged and the fluid sense - where dichotomies of formal-informal, academic-work etc. are blurred. While these more radical interpretations of hybridity (or hyper-hybridity) will never become mainstream, they will nonetheless become more common and the place for students' motivation might play a more central role in the learning process.

References: Beardsley, Albó, Aragón & Hernández-Leo, 2021; Cook, Mor & Santos 2020; Eyal & Gil, 2021; Fawns, 2019; Fawns, Markauskaite, Carvalho & Goodyear, 2021; Fleischmann, 2020; Moreno-Oliver & Hernández-Leo 2020; Nørgård & Hilli, 2021.
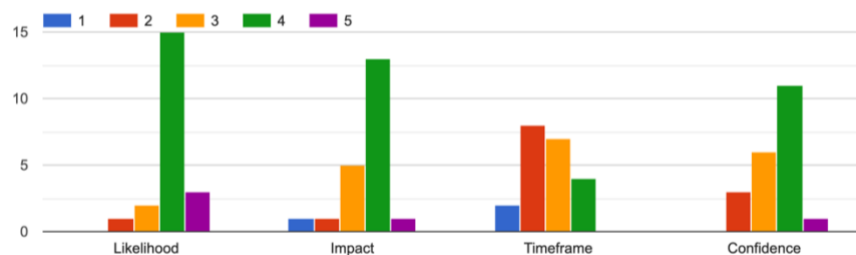
Evaluation

Figure 1: Evaluation for prediction 1: The new normal, the new super-normal

Interpretation and commentary

Support for this prediction is close to unanimous among the experts. Hybridity is here to stay, and not only in the base scenario where students alternately meet at home or on campus or professors open their physical class to distant participants. Rather most experts agree with the multi-faceted hybridity in its future fluid manifestation. In contrast to the 0.91 likelihood estimate – the predicted impact is a bit more moderate (0.71), either reflecting a conviction that the impact is already present ("the new normal") or expressing skepticism regarding the prospect of alternative forms of hybridity.

Some important comments were offered by the experts. The main issue that came up related not to whether the prediction will actually happen (it will), but rather how it will be utilized in academic institutions pedagogically and structurally e.g.: How will it affect teaching and learning? What changes will be held in the micro level, for the one teacher/lecturer/class, who see the changes and might decide to respond by integrating newer method of teaching in her class; and in the macro level – as institutions establishing department for 'teaching innovation' and organizing spaces according to different possibilities (Mor-Avi, Jones & Emmons, 2021). Further to that, two experts related to the motivational aspect, pointing at the balance needed to support the students (and the lecturers) well-being.

Last, one expert pointed at the limitations of Gartner's model of the hype cycle, suggesting looking at additional tools that can support innovation. Such tools might use design methodologies for co-design to support leading a change in teaching and learning in its new hybrid normal.

Prediction 2: Synchronous hybrid teaching practices

Likelihood 0.57, Impact 0.62 Confidence 0.43

Synchronous hybrid teaching practices will evolve to support students and teachers effectively in diverse scenarios. These will be articulated through representations (design patterns, activity recipes, etc.), class management tools, and creative activities that engage both present and remote participants. Educational institutions (schools and higher education) will require a deliberate organisational effort to integrate these practices into their organisational culture - with proper hardware, software, training of academic staff and curriculum adaptation. Once they complete the transition, they will open up opportunities for populations denied access to education, due to geographic or other constraints, in times of crisis (such as the COVID pandemic) as well as in normal times.

References: Bülow (2021); Morris & Stommel (2018); Gupta et al (2021); Cook, Mor & Santos (2020); Gupta et al (2021).

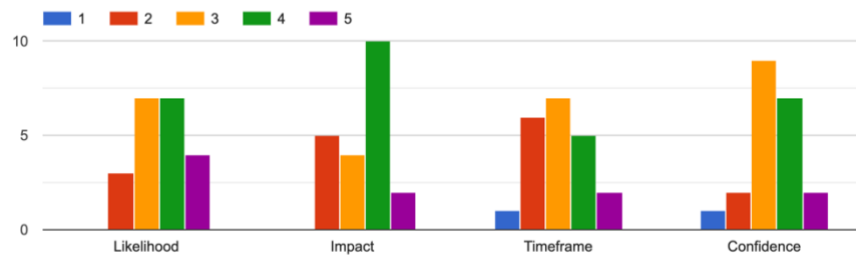**Evaluation**

Your rating (1 = low / near, 5 = high / far)

Figure 2 Evaluation for prediction 2: Synchronous hybrid teaching practices

Interpretation and commentary

The experts' opinions on the likelihood of this prediction were more evenly spread, resulting in an overall score of 0.57. Surprisingly, the estimate of impact was significantly higher - with 12 out of 21 experts assigning a value of 4 or 5 (resulting in an overall score of 0.62).

While some institutions have been successfully incorporating synchronous hybrid teaching and learning for some time, these practices have been mainstreamed globally in the last year due to the COVID pandemic (e.g., academic institutions in Israel, 2021).

However, many of the newcomers appear to be disillusioned, realising that if not implemented properly, synchronous hybrid learning is "the worst of both worlds" - synergising the limitations of both online and onsite teaching; On one hand, the teacher is constrained in utilising collaborative and active learning approaches that utilise the affordances of physical (or virtual) interaction. On the other, the need to be present simultaneously in the classroom and in a virtual environment creates a challenging cognitive load for the teacher. In light of these observations, some experts were adamant that synchronous hybrid teaching will return to its pre-COVID niche.

Nevertheless, other experts noted that this approach is aligned with an Open Education philosophy, and echoes values of equity and increasing access to education. Some suggested linking it to a "University 4.0" framework. This requires institutional, and possibly national, commitment - in terms of infrastructure and resources as well as explicit forefronting of the underlying ethics. At the base level, this depends on the availability of solid infrastructure to ensure connectivity – an issue that might be challenging at times in developed countries, not to mention

underdeveloped. Thus, equality of resources might play a major role at its assimilation.

The experts voiced a strong concern regarding the pedagogical support both lecturers and students need to perform in this environment. Specifically, coherent and rigorous designs for learning in such conditions are essential, but common models are still rare. This is due to the complex, ill-structured and unpredictable conditions that hybrid synchronous teaching & learning present, the variable physical-technological-pedagogical and content knowledge to support the more/less skilled teacher. Lecturers are challenged to orchestrate dual-mode participants (from a distance and in class), and design patterns that work for small classes may be inadequate for larger ones. Finally, one expert noted the need for appropriate techno-physical spaces - and their scarcity in many institutions. Thus, the place of space regains its own importance in this form of teaching.

Prediction 3: Learning design partnerships

Likelihood: 0.62 Impact: 0.67 Confidence: 0.57

The affordances of hybrid learning spaces open up vast possibilities for innovation in teaching and learning. Utilising the full potential of these possibilities requires bold experimentation and collaborative design, evaluation and re-design. Admittedly, the mainstream of any educational system will always be risk-averse and reluctant to experiment, but the margins of innovation will strengthen and in these margins we will see teacher-learner design partnerships exploring the interplay between space, technology, and educational practice.

References: Bøjer & Brøns (2021); Fawns, Markauskaite, Carvalho & Goodyear (2021); Kohls, Dubbert & Münster (2021); Greenhalgh et al. (2005); Greenhalgh et al. (2005b).
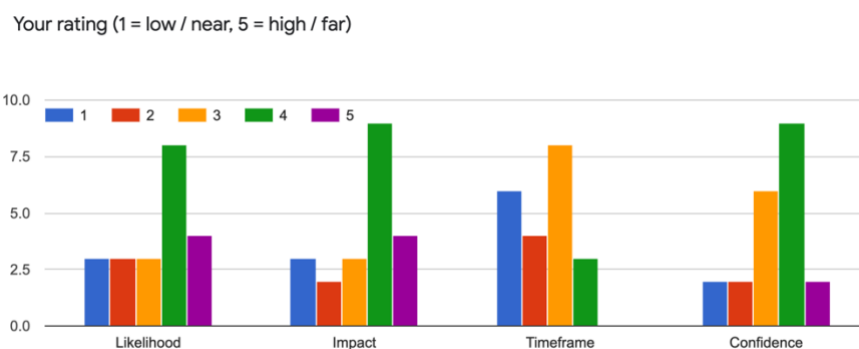
Your rating (1 = low / near, 5 = high / far)

Figure 3 Evaluation for prediction 3: Learning design partnerships

Interpretation and commentary

This prediction scored in the mid-range for both likelihood (0.62) and impact (0.67). While there is no debate regarding the value of learning design partnerships, the experts expressed cautious skepticism as to their viability in the current institutional atmosphere. Among the reasons for these doubts are concerns whether universities will sustain investment in good design(ers) and the fact that higher education had access to distance/hybrid learning for decades and failed to define normative practices or ethos. Some experts recognize the changes driven by the Covid-19 pandemic, raising awareness to the value of design. But these changes were imposed by the circumstances.

Others pointed out growing collaborative design activities involving teachers and students, e.g., in the Scandinavian context. But even if teachers and students acquire new digital competences that enable novel hybrid learning scenarios, there still is doubt if these competences really lead to new social and pedagogical classroom dynamics. Finally, students and teachers are limited in the innovation they can realise without the collaboration of ed-tech providers and researchers.

Prediction 4: Learning Design and Learning Analytics for hybrid learning

Likelihood: 0.71 Impact: 0.62 Confidence: 0.38

Hybrid learning occurs in multiple spaces (digital and physical), settings (formal and informal) or contexts (indoors and outdoor, in-classroom and out-of-classroom), extending the current view of mobile and ubiquitous learning. These emergent new integrated dimensions of hybrid learning pose significant challenges for the involved stakeholders, especially the instructional designers and educators. Collecting learning analytics from multiple spaces, settings and contexts will be especially relevant in order to have an integrated view of the evolution of students' learning. Such analytics may inform the learning (re)design of such complex situations, while the learning design may make the analytics meaningful to the stakeholders. The mutual interdependence and integration of learning analytics and learning design will play a major role in the upcoming hybrid learning environments. On the other hand, the power of such technologies raises complex ethical issues. Thus, academic institutions, researchers and practitioners should enable multimodal learning analytics through multiple spaces, settings and contexts, so that the integrated use of learning design and learning analytics can be made possible and reinforced in the hybrid learning spaces, while maintaining an open conversation on the ethical considerations.

References: Pishtari & Rodríguez-Triana (2021); Beardsley et al (2020); Vujovic et al (2020); Yilmaz & Yilmaz (2020).

Evaluation

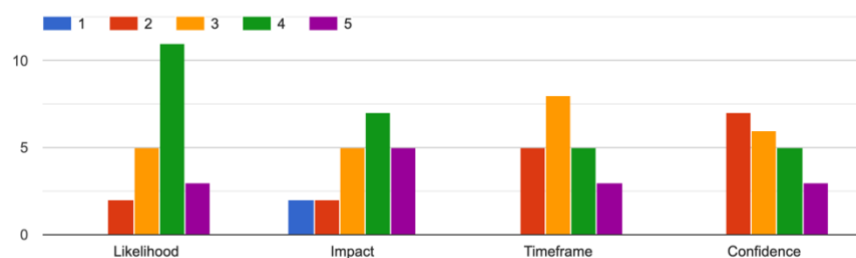Your rating (1 = low / near, 5 = high / far)

Figure 4 Evaluation for prediction 4: Learning design and learning analytics for hybrid learning

Interpretation and commentary

There is a quite high consensus among the experts that a stronger alignment between learning design and learning analytics will be manifested in emerging hybrid learning spaces. Multimodal and multispace data will be collected, analysed an displayed, informing effective (re)design of teaching and learning, while addressing the associated ethical challenges. The expected impact seems to be reasonably high but in a rather long term. That said, it is worth noting the low confidence score for this prediction, suggesting that many of the experts feel less informed on this topic, or that they have a feeling that "the jury is still out on this".

Experts have expressed, as with several other principles, that policy makers and administrators will play a major role in promoting and funding the corresponding initiatives. Although there are some reservations regarding the excessive dependence on technological possibilities and the eventual negative impact to creativity and innovation, there is significant consensus that such evidence-based approaches are both necessary and potentially useful. Notably, one expert suggested that providing data-based metacognitive feedback may be effective in guiding researchers, teachers and instructional designers (Yilmaz & Yilmaz 2020). This suggestion is based on studies that have shown that such feedback results in enhanced transactional distance and motivation of learners.

Finally, several experts pointed out the "bad press" regarding multiple cases of inappropriate use of data analytics, resulting in public sensitivity to threats on privacy in all fields of our hybrid life, including education. This finding is also confirmed by the experts' high acceptance of prediction #7 regarding the need for design for privacy, safety and identity in hybrid learning spaces. However, there are also some hints that top-down policies and effective use of consent forms may enable a safe use of learning analytics.

Prediction 5: Design principles for hybrid seamless learning

Likelihood: 0.60 Impact: 0.76 Confidence: 0.57

Although several research studies have been recently published regarding hybrid seamless learning, both in terms of theory and case studies, robust and evidence-based design principles for implementation in the real world are necessary. Given the complexity of hybrid learning and its multiple dimensions, the research community should formulate such design principles systematically and evaluate them in longitudinal studies in authentic contexts. The trend of a wider adoption of Design-Based Research and the urgent need for dealing with the complexity of hybrid learning will eventually put design evidence-based design principles in the foreground.

References: Cook, Mor & Santos (2020); Cook & Holley (2021); Kohls, Dubbert & Münster (2021); Wong & Looi (2021).

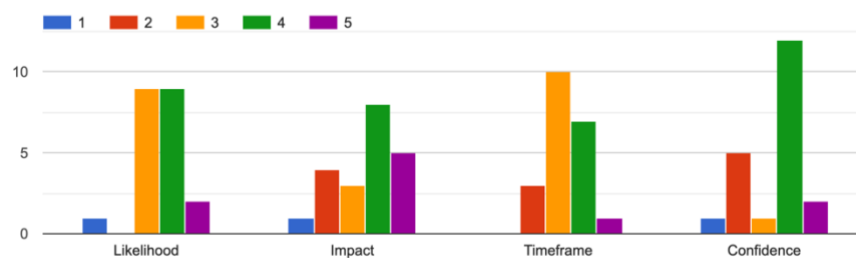### Evaluation

Your rating (1 = low / near, 5 = high / far)

Figure 5 Evaluation for prediction 5: Design principles for hybrid seamless learning

Interpretation and commentary

This prediction was strongly contested by our experts. While there is a general agreement regarding the necessity of evidence-based practice, and the need to share design knowledge, the experts expressed significant skepticism regarding the viability of the above proposal.

Davies (1999) issued a passionate call for evidence-based education over 20 years ago. Indeed, some of our experts have personally been pursuing this goal for as many years and more. And yet it is far from mainstreaming. Some argue that the cause is the nature of professional knowledge in education, which is much more idiosyncratic. Others argue that the evidence needs to be grounded in practitioners'

lived experiences. Yet the barriers may be systemic: educational institutions are perhaps more resistant to change by nature of their structures and cultures.

Regarding design principles and patterns, as encoding of design knowledge, some experts suggested searching outside the educational system. Many systems (work, government, leisure) are undergoing rapid hybridization. Some of these are more flexible and error-tolerant than educational ones. Instead of "growing" their own design knowledge, educational institutions might benefit from adopting patterns and principles from other domains. As an analogy, consider the technological tools most prevalent in education. These are predominantly productivity suites, designed and developed for the corporate world.

Finally, some experts questioned the quest for seamless hybridity. Instead, they argued, we should be candid and "seamfull" (Fawns, Mulherin, Hounsell & Aitken, 2021) about the ways we use technology.

Prediction 6: Pedagogical success of hybrid learning will need an enculturation process

Likelihood: 0.57 Impact: 0.67 Confidence: 0.71

Existing studies in hybrid seamless learning show that adoption and pedagogical success of the new evolving paradigm will need a complex enculturation process for teachers, learners, parents, instructional designers and institutional stakeholders. This process is necessary, since for example, meaningful and effective hybrid learning activities might occur across contexts, not only in a single context; individual, collaborative and community learning should be merged; inquiry and personalized learning should be supported in a rather fluid environment; while activities and resources in informal settings should be strongly reinforced beyond formal education. The recognition of this need is growing, among researchers, practitioners, leaders and policymakers. We expect it to evolve and mature, setting the ground for a wide adoption of hybrid learning.

References: Wong & Looi (2001); Fawns, Mulherin, Hounsell & Aitken (2021).

Evaluation

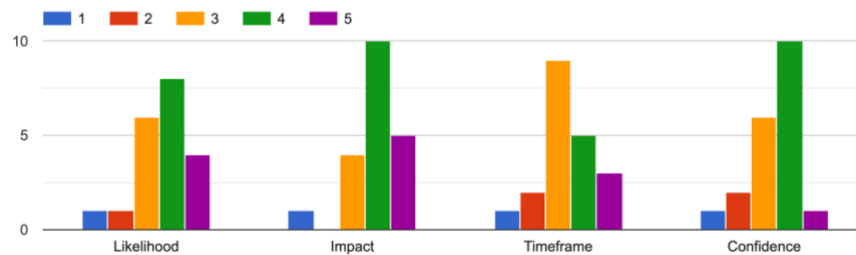Your rating (1 = low / near, 5 = high / far)

Figure 6 Evaluation for prediction 6: Pedagogical success of hybrid learning will need an enculturation process

Interpretation and commentary

The need for the enculturation process regarding effective design an use of hybrid learning spaces was broadly accepted by the experts. They expressed a rather high confidence in this prediction and its eventual high impact. At the same time the experts highlighted the complexity and difficulty of mobilizing such processes.

The experts expect that this process will most probably take some time to bring tangible results, since changes in culture in hybrid contexts are complex and ask for a consensus among multiple agents that even go beyond the direct educational stakeholders (e.g., municipalities).

It is expected that the communities involved will need to find the balance between competing challenges and needs in this new complex context, as e.g., to find out when online learning is necessary, convenient or more effective from a learning point of view. Thus, as one expert suggests, "this prediction is a normalisation of certain kinds of practices & expectations across societies (especially technology-rich segments of such societies)".

Prediction 7: Design for privacy, safety and identity in hybrid spaces

Likelihood: 0.71 Impact: 0.67 Confidence: 0.67

Hybrid learning spaces will progressively involve informal learning and out-of-class activities, thereby integrating multiple facets of the life or learners. However, such a holistic view on the learning trajectory of individuals and groups asks for a shift to a strong attention to a balanced view of effectiveness, efficiency, identity, privacy, safety. This concern has been already expressed and partially addressed by

institutions, legislating bodies and companies. Designing for such a balanced view will become an integral and essential feature of any R&D initiative in hybrid learning spaces.

References: Warburton & Perry (2021); Cook, Mor & Santos, P. (2020). Mor-Avi & Scott-Webber (2021); Hakami & Hernandez-Leo (2021).

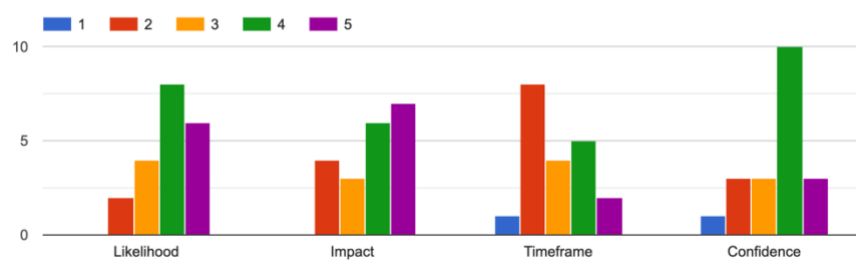## Evaluation

Your rating (1 = low / near, 5 = high / far)

Figure 7 Evaluation for Prediction 7: Design for privacy, safety and identity in hybrid spaces

Interpretation and commentary

Most experts see this prediction as likely happening and having a larger impact. The importance of identity, privacy and safety as well as digital well-being is agreed on and already featured in some R&D initiatives. Including these aspects in design is key, but as these aspects differ they should also be mapped and developed into a framework. There was some disparity regarding the timeframe, potentially because of the difference between the need of addressing these issues now (also triggered by current broader socio-technical trends) and the current difficulties of taking these issues into account when designing hybrid learning spaces. An example given with a project using Google Glass makes this point clear: even though this technology offers nice opportunities for hybrid learning activities, it also was very obvious that too much data was collected without any relation to the actual project, prompting student concerns.

Prediction 8: Death of the lecture hall

Likelihood: 0.76 Impact: 0.67 Confidence: 0.71

Hybrid classrooms, which support remote, synchronous and asynchronous student participation will become the norm. A significant portion of small courses

(under 50 students) will be taught in this format. Large courses (over 200 students) will be taught predominantly online, with a mix of asynchronous content delivery and synchronous interaction, combining different spaces into one larger classroom. Plenary rooms and adjacent side rooms (both physical and digital) are included as well as homes and public spaces, connecting the classrooms also more with the participants' environments. Kohls et al. suggest hybrid connections of navigational-physical-digital-informational-social spaces.

References: Kohls, Dubbert & Münster (2021); Simpson & Goodyear (2021); Zydney, McKimmy, Lindberg & Schmidt (2019); Association for Learning Technology community resources https://www.alt.ac.uk/communityResources.

Evaluation
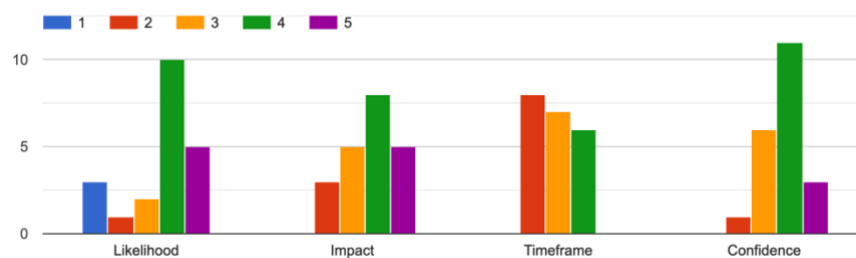
Your rating (1 = low / near, 5 = high / far)

Figure 8 Evaluation for Prediction 8: Death of the lecture hall

Interpretation and commentary

While overall our experts have expressed their support for this prediction, they have also raised some reservations. First, they warn about confusing evidence-based prediction with wishful thinking; many education visionaries have prophesied the death of the lecture hall, and yet new halls are being designed and built as we write this text. Second, the new classrooms we envision are resource intensive, both on the institutional side and on the learners' side. While we can expect to see their proliferation in developed countries with a strong economy and government backed universal education, they will take much longer to arrive in other parts of the world. Finally, we should not discount the social value of meeting fellow students and ensure the new designs (educational and architectural) we promote consider and provision for that.

Prediction 9: Classroom oriented sensors, digital traces and analytics

Likelihood: 0.38 Impact: 0.43 Confidence: 0.38

Classroom face-to-face activities will still play a major role in future hybrid learning spaces. Interactions between students and teachers, and with physical and digital artifacts within a classroom are currently recorded only through observations that are costly, non-scalable, and not easily transferable across contexts. Digital traces of classroom interactions may provide useful analytics to teachers and learners in real-time during the classroom activities, in near-time among activities across spaces and contexts, or in far-time in terms of reshaping the learning designs and spaces. Also, such classroom digital traces and analytics may contribute in bridging different modalities of in-class and out-of-class learning activities. Currently, hybrid classes are instrumented with a wealth of "speaking" and "showing" technology: cameras, microphones and screens which help instructors communicate with participants. In the future, these will be augmented with "listening" and "seeing" technology: sensors and analytical dashboards that help instructors observe learners and adapt to their needs, while taking care of privacy, trust and safety.

References: Martínez-Maldonado et al. (2021); Warburton & Perry (2021); Cook, Mor & Santos (2020); Amarasinghe et al. (2020).

Evaluation

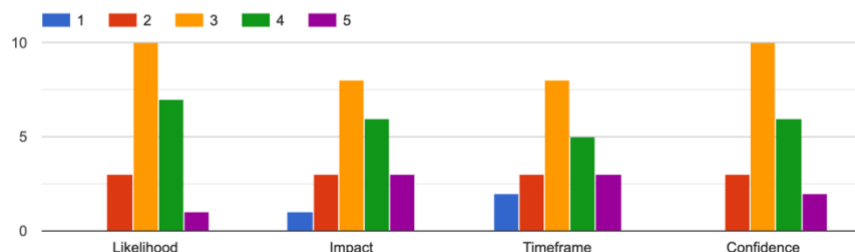Your rating (1 = low / near, 5 = high / far)

Figure 9 Evaluation for Prediction 9: Classroom oriented sensors, digital traces and analytics

Interpretation and commentary

The prediction regarding the use of sensors in a physical classroom has not received a high consensus among the experts. While they consider that it is likely

that sensors will enable the collection of traces and the production of useful indicators, they expect the impact to be realised in the mid-long term. Some noted that health-related sensors are already widespread, and they will be probably relevant for medical education.

A recurring issue raised by experts are privacy concerns due to the increased use of sensors, and the need for a responsible use of learning analytics drawn from sensor data. Several experts expressed concerns regarding overload of technology in the physical classroom and whether these sensors address real needs of teaching and learning practice. Further research is required to reduce the orchestration load (Amarasinghe et al., 2020) of teachers in these overly complex technology-rich ecosystems. Alongside (or perhaps before) the pedagogical challenges, multiple ergonomic and usability issues still need to be resolved.

Despite the low scores for this prediction, we still find it worth consideration. The low confidence score suggests that more research is required in the technical as well as the organisational, ethical and pedagogical aspects of this theme. Theoretically, there is a huge potential for analytics in virtual, classroom and hybrid learning environments. How this potential can be realised is still a tantalising open question.

Prediction 10: Adaptive/adaptable Learning Spaces

Likelihood 0.81, *Impact* 0.86 *Confidence* 0.67

Hybridity also includes a shift from passive to active learners, in order to facilitate active learning in hybrid spaces, a fixed architectural configuration is not appropriate anymore. New learning spaces will therefore offer easy ways of re-designing them and giving the control about these designs to both learners and teachers (as co-configurators) so that they can fit them to their needs and desired conditions.

References: Mor-Avi & Scott-Webber (2021); Kohls, Dubbert & Münster (2021); Martinez-Maldonado et al. (2021); Bøjer & Brøns (2021); WEF (2016); Lackney & Jeffrey (2008); Martin (2009); Kali et al (2019).

Evaluation

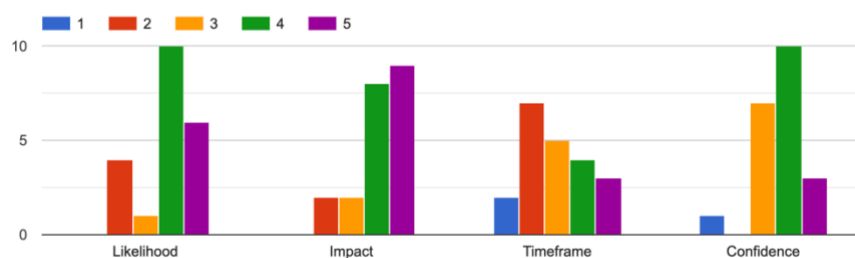Your rating (1 = low / near, 5 = high / far)

Figure 10 Evaluation for prediction 10: Adaptive/adaptable learning spaces

Interpretation and commentary

Alongside prediction 1, this statement received the highest scores for likelihood (0.81), impact (0.86) and confidence (0.67). Awareness and acceptance of Adaptive/adaptable Learning Spaces, akin to Active Learning Classrooms/Future Learning Spaces (ALC/FLS), has been on the rise in the past 20 years. Evidently, space design will need to facilitate active learning in hybrid spaces. New spaces will be flexible, empowering learners and teachers to optimize them for diverse scenarios by re-designing and re-configuring them.

Alongside the consensus regarding the need to establish such flexibility an user control as a standard, the experts stressed the need to promote teachers' ability to utilise this flexibility. Teacher training must emphasise the development of spatial / environmental competences needed for active learning (Bøjer & Brøns, this issue; Martin, 2009; Kali et al. 2019; Lackney, 2008).

Other comments noted the potential, and necessity, of teaching in hybrid spaces to bridge and connect between vocational and more 'academic' studies. Finally, one commentator linked adaptive spaces to adaptive and personalised learning, but warned that such approaches require dedicated attention from a teacher or an AI, both entailing high costs.

Prediction 11: Situational Awareness

Likelihood: 0.62 Impact: 0.52 Confidence: 0.38

…plays an important role in physical/analog environments, it enables us to be aware of what is going on. Virtual meeting platforms (such as Zoom, Google Meet and MS Teams) have become a key component in hybrid learning spaces. Some are

starting to integrate important aspects of situational awareness (like the gallery view or in platforms such as wonder.me or gathertown, where participants also are positioned in space and can move around by themselves), but in order to be valuable alternatives to physical meetings, these will be strengthened in terms of the richness of experience, the associated learning designs, and the utilisation by analytics.

References: Kune & Quillien (2021); Martinez-Maldonado et al. (2021); Bülow (2021)

Evaluation

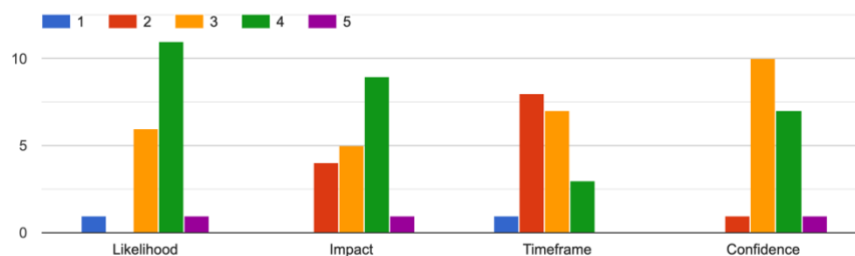Your rating (1 = low / near, 5 = high / far)

Figure 11 Evaluation for prediction 11: Situational awareness

Interpretation and commentary

This prediction was rated in the mid-range in terms of likelihood (0.62) but, alongside prediction 9, received the lowest marks for impact (0.52) and confidence (0.38). Although some experts noted it as "interesting" overall the response was very low: 5 comments compared to 8-12 for all other predictions. One possibility is that this is due to methodological flaws - this prediction was the last in our survey, where experts have already exhausted their time and energy on the previous ones. It is perhaps presented in less detail and clarity. Alternatively, or perhaps complementary, it may be that the concept of Situational Awareness (as also described by Kune & Quillien in their chapter) is new to the discourse on hybrid learning spaces, and more work is required to raise recognition to its importance.

Discussion

The "quasi-Delphi" study we conducted yielded interesting results, some of which surprised even us. This method was born out of pragmatic constraints, but nevertheless deserves some attention. We have been involved in editing collected volumes in the past - journal special issues, books and conference proceedings. We

have often wondered, in retrospect, about the practical implications of such works and the robustness of their messages. Admittedly, the scientific validity of our method is debatable (that is not to say that it is invalid, only that it deserves debate). Nevertheless, it allowed us to give an honest answer to the questions above. In that respect, the expect evaluations should not be seen as a judgment of the truth of the predictions, but rather as a means to differentiate between insights which have clear and immediate practical implications, and those that require further consideration and research. With this in mind, the comments that the experts provided are no less important than the numeric rating. In several cases, they noted that the predictions are more normative than descriptive, i.e. portraying the world as we would like it to be, not as it is. In such cases, the question that transpires is: how do we make this happen? The quintessential design research question. In other cases, they indicated that the prediction itself was too vague or unclear to judge. In such cases, it is clear that further conceptual work is required to enable informed conversation.

Consequently, we identify several directions for further work (practical and research):

- The predictions we identified should be communicated to the professional and research communities. Those with high scores as a basis for decision making, those with lower scores as a research agenda.
- To enhance the validity of our findings, we need to refine the predictions in light of the experts' comments, and submit them to further rounds of evaluation. It might be worthwhile to adopt a dual strategy - on one hand, complete the Delphi protocol. On the other hand - open them for public scrutiny by the wider community.
- Each prediction points at a valuable research direction; The high-scoring ones should be validated by empirical research (i.e., formulating them as hypotheses and collecting data to refute / confirm them). The "aspirational" statements (those which describe reality as we would like it to be) should be rephrased as design research questions, and the "obscure" statements call for conceptual refinement.

Finally, we asked our experts to suggest additional predictions and observations we had overlooked. We briefly note some of the insights they offered.

We need to move beyond the technical focus on hybridity, and ask ourselves: Where does learning occur? And then, how might we best design for those multiple experiences addressing the needs of the layers of players within the academic community? We need to recognize there is a Time/Space Continuum from onsite to online; asynchronous to synchronous. Each area is rich with possible solutions, expectations and experiences. Each can be and should be designed at scale. We need to return to the discussion on situated learning (Brown, Collins. & Duguid, 1989; Lave & Wenger, 1991), situated cognition (Lemke, 1997) and embodiment (Núñez, Edwards & Matos, 1999; Ziemke, 2003) and reconsider the relations between body, self, others, environment and learning. Hybridity is no longer a property of the learning environments we construct, perhaps it has not been for a long time: we have inadvertently become hybrid creatures, cyborgs, operating simultaneously in multiple physical and virtual spaces. We need to re-construct our understanding of

knowledge (ontology) and the ways in which it is constructed and communicated (epistemology) by hybrid creatures in hybrid spaces, and then build design frameworks based on these understandings.

Yet another dimension of hybridity concerns social roles and rules. We are all simultaneously "learners", "teachers", "designers", "audiences", "performers", "workers" and "customers". How do we contain and reconcile these multiple facets? Do we want to reinstate the old structures, establish and consolidate new ones, or learn to accept a fluidity? How do we balance the power of agile and adaptive hybrid structures with the requirements of formal institutional systems? How can we leverage hybridity to open up educational systems, allowing learners (and teachers) more ownership and control, allowing them to become designers of their learning trajectories? The flexibility that starts in enabling learners to join a course "anytime, anywhere" continues in allowing them to combine qualifications and credentials from multiple educational providers and construct "DIY qualifications". Yet despite such ideas circulating for several years, we have yet to see them implemented at scale. Their realisation requires regulatory and organisational innovations, but no less - it relies on providing learners the tools and skills to navigate and plan their paths within such complex landscapes.

Finally, no discussion of techno-pedagogical innovation can avoid the ethical dimension. Increasing learner autonomy raises questions of the prevalence of "bad" learning - misinformation, defamation and hate. If learners are free to set their agenda and form their world view how do we protect them from harmful influences? The power of data science, in the physical as well as the virtual world, raises questions of surveillance cultures, abuse by governments, corporates and institutions, and the biases programmers project into the technologies they create.

The Covid-19 pandemic has pushed the issues explored in this book from the fringes to the mainstream. Will they remain there? Should they? How do we "not waste a good crisis" and leverage the circumstances to emerge with stronger, more effective, equitable and opportune educational systems?

Conclusions

When considering the predictions we formulated, four stand out as conclusive:

- **Hybrid, in the blended sense, is the new normal, and in so it enables richer forms of hybridity to emerge as the new "super-normal"**. Institutions have adapted to provide most of their curriculum in hybrid formats. We will see some retraction, but hybridity is here to stay. The normalisation of base forms of hybridity will enable more complex forms to emerge on the fringes. These forms will not become mainstream, but they will nevertheless have an impact on educational ecosystems.
- **New frameworks for privacy, safety and identity**. In singular (non-hybrid) environments, there is a clear line between "in" and "out" - who has access to what data, content, interactions. The current ethical, logistic, and legal frameworks for protecting participants privacy, safety and

identity rely on these boundaries. Hybridity breaks them down, and new frameworks will need to be developed.

- **Death of the lecture hall**. Conducting courses in large halls is expensive - in real estate, maintenance, transportation, and coordination. In large classes which are predominantly delivery-oriented, co-presence has little or no advantage. Online courses, on the other hand, allow students to set their own pace and see the lecturer up close. The pandemic has made these insights common knowledge, and now there is no going back. Institutions will simply stop building lecture halls.
- **Adaptive / adaptable learning spaces**. This is, in a way, the flip side of the previous observation. If passive learning shifts online, then on-site learning should become more active and diverse. Lecturers will learn to use the physical space in surprising ways, and the space design itself will need to facilitate their freedom to innovate.

Additional issues were identified as having high potential, but requiring regulatory and institutional adaptations to utilise this potential: learning design partnerships, the acculturation of staff to "think hybrid", and the synergy of learning design and learning analytics for hybrid learning spaces.

Alongside these, several themes for future research and development stand out: data collection from physical, hybrid and external spaces to facilitate holistic learning analytics, and understanding and utilising situational awareness in learning design and orchestration.

It is important to note the limitations of this study. Our quasi-Delphi experiment involved a somewhat self-selected sample of experts, and only engaged them in one round of evaluation. Nevertheless, we are confident that the findings have value, if only in identifying hypotheses and questions for future research. Overall, we stipulate the following conclusions:

- Hybrid learning spaces hold a great potential for enhancing and democritising higher education. The understanding of this potential is still in its infancy, and will require continued efforts in research and practice.
- As this understanding evolves, so will the language we use to describe and argue about hybrid learning spaces. This linguistic evolution will clarify the relationships to other conceptualisations (e.g. seamless, connected and networked learning) as well as elucidate the nuances within the hybrid landscape, through concepts such as fluidity, hyper-hybridity and situational awareness.
- The ethical and data security dimensions are still poorly understood and inadequately addressed, and will require careful attention.

Finally, we found the quasi-Delphi methodology useful in consolidating the insights from a large group of experts and distilling from these practical implications and predictions. We highly recommend that others explore this method further.

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