Gaps and priorities in future learning spaces research: A cross-sector Delphi response.

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INNOVATIVE LEARNING ENVIRONMENTS AND STUDENT EXPERIENCE: THE SCOPING STUDY

Gaps and priorities in future learning spaces research: A cross-sector Delphi response.

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Contents

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Executive Summary

The ILE+SE Scoping Study comprised two approaches to determining what ILE research exists, and the priority areas for future research to address. The first approach consisted of cross-sector regional workshop teams, where academic, education and allied industries experts worked together to respond to the study's aims. The second approach, and the content of this report, was a Delphi study with experts nominated by the regional workshop teams.

Three panels (academe, education and allied industries) were constructed, comprising a total of 37 experts across 10 countries. These experts responded to the same study aims, the difference being that they responded through a series of individual surveys that were analysed independently of the other ILE+SE data.

The Delphi results largely mirror the workshop analyses. They identified three consistent areas of need: evaluation of ILEs, academic learning outcomes and assessment, and inclusiveness in ILEs.

Evaluation of ILEs pertained to the need for large-scale, systematic evaluation that would provide strong justification for the investment in ILEs. A need was identified for future research to prove that ILEs do make a difference to students' learning and experience at school.

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Academic learning outcomes and assessment was a priority seen as interconnected to evaluation – a cost/benefit analysis of the impact of the investment in innovative spaces. While academic learning outcomes was also highlighted as being problematic (i.e., potentially measuring the 'wrong' thing in terms of desired outcomes for students), it was seen as a necessary piece of evidence in the evaluation puzzle.

Inclusion was a term widely used among Delphi experts, with inclusiveness being defined as ensuring ILE designs meet the needs of a diverse range of learners. It was closely linked to learner health and wellbeing in ILEs, but also to a need to examine the role of the teacher – specifically in how the teacher can use inclusive practices to benefit *all* learners.

In addition to these priority areas, each panel had unique areas of need that pertain to their specific sector. This highlights a need for future research to use large-scale strategies to collect evidence on areas of consensus across the sectors, but to also explore how research might be developed where sector-specific areas of need have been identified.

In summary, the Delphi results strongly supported the findings from the parallel workshop analysis. Evaluation, academic learning outcomes, and inclusion were the priorities. The common denominator was a need for evidence, with minor variation being identified in terms of which 'student experience' factors should take priority. All three Delphi sectors explained a need for large-scale, systematic, and fine-grained research into 'what works' in ILEs. Evaluation was an umbrella that connected the other research gaps, and a tool to support investment in ILE design and use.

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PART 1
Context, Structure and Procedure

BACKGROUND

The Innovative Learning Environments and Student Experience Scoping Study (hereafter referred to as ILE+SE) is a 1.5 year exploratory study leveraged off more than a decade of findings from a suite of research by the host group, the Learning Environments Applied Research Network (LEaRN) and other key centres, industry R&Ds, and individual researchers around the world. That research has built a body of knowledge concerning the architectural and pedagogic design of innovative learning spaces, how to evaluate their effectiveness, and how to assist teachers to utilise those spaces for positive impact on student learning.

Results from those projects indicate the next logical step is gathering quality data around students' actual experiences in these spaces. However, this assumption requires testing; if we are to continue to build a logical, comprehensive research base that supports ILE design and effective use, the next project must have international relevance, must encompass the needs of education and allied industries, and must create data that directly informs infrastructure development and best practices in learning spaces.

ILE+SE ran two parallel approaches with experts across academia, education and allied industries to answer the following questions: Where has existing international ILE research led us, what is the critical research that now must be done, and how should such research be designed?

The first approach utilised 217 experts in cross-sector regional workshop teams across 19 countries, where teams were guided through a series of workshops to collectively respond to the questions posed by the study. The findings of those workshops can be found at https://ilesescopingstudy.com.au

The second approach, the subject of this report, was a Delphi Study conducted with 37 experts across academia, education and industry. These experts were nominated by the cross-sector teams in their first workshop. A sub-committee was formed to review the nominations prior to the experts being selected, and subsequently, invited to participate through a series of individual surveys.

The Delphi study was designed to elicit individual experts' opinions as leaders in their fields. They participated independently, providing a unique voice to be explored in addition to the cross-sector teams. Figure 1 shows the study method, with the Delphi expert study running in parallel with the regional workshop teams. The same content was captured for both the regional workshop teams and the Delphi experts across each stage of the study; the primary differences between the two approaches were that Delphi experts were nominated by the teams (as opposed to self-selecting into a team) and that Delphi experts' opinions were captured individually rather than through collaborative workshop experiences.

This report outlines the process and results of the Delphi study for each of the three sector panels (academia, education, allied industries). It then explores similarities and differences across the panels (inter-panel analysis) as well as between the Delphi findings and the regional workshop team findings for the study.

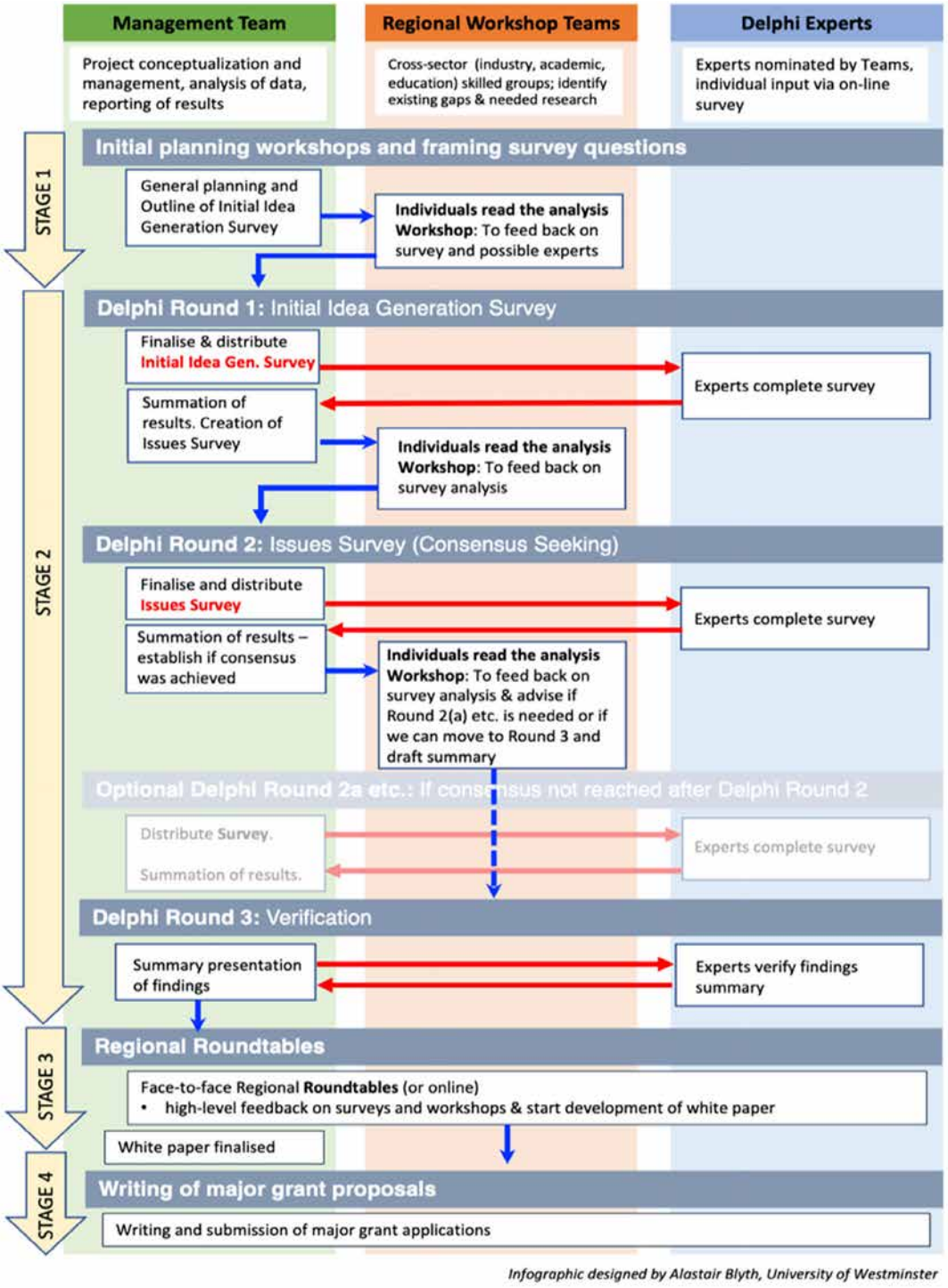

Figure 1. Overview of the study method

THE DELPHI METHOD

A Delphi study is a specific method to elicit insights from a structured group of experts on a particular topic that is largely unknown or has limited availability of information[1]. It is most notably used within the health sciences, but has also been applied to education, business, engineering, social sciences, and technology. The aim of a Delphi study is to reach consensus on the topic under examination within the selected group of experts.

A Delphi study can be conducted through various methods. They may be conducted as a series of interviews or focus groups to get rich data on the topic under examination, they may be conducted through surveys with individual experts, or they may comprise a combination of these methods[1].

A defining characteristic of a Delphi study is its iterative nature; that is, experts will complete rounds of data collection in order to achieve consensus. In a primarily quantitative based Delphi, such as the one used in this study, experts ranked research gaps into priority lists. Experts were assigned to a sector panel (either academia, education or allied industries[2]), and consensus was sought within each sector group. The experts were made aware of convergence (or divergence) in the priority list for their sector panel after each round. This ranking exercise continued until each sector agreed on a top 5 priority list. A final confirmation round was conducted where experts formally agreed that the top 5 cluster of priority research gaps for their sector were valid and could be published.

RECRUITMENT OF EXPERTS

The 217 individuals who participated as part of the ILE+SE teams in Workshop 1 nominated potential Delphi experts across each of the three sectors in September 2021. Over 100 nominations were received, although some individuals were nominated more than once by different workshop participants. A Selection Panel subcommittee was put in place to sort the nominations and review their suitability to participate against the following criteria:

1. Activity in the field of ILEs and student experience
2. Reputation (national)
3. Reputation (international)
4. Perception of impact (citations/references to their work across sources, associations, individuals).

1 Beiderbeck, D., Frevel, N., von der Gracht, H. A., Schmidt, S. L., & Schweitzer, V. M. (2021). Preparing, conducting and analyzing Delphi surveys: Cross-disciplinary practices, new directions, and advancements. MethodsX, 8, https://doi.org/10.1016/j.mex.2021.101401

2 By allied industry, the study is referring to businesses engaged in the procurement of ILEs. These include infrastructure professionals, architects, interior and outdoor designers, acousticians, engineers, furniture providers, professional learning providers, and the myriad of others who collectively construct an ILE.

Potential experts were given a score out of 5 for each of these criteria, to create a score out of 20 for each nomination. In addition to the criteria, the sub-committee noted where a potential expert was nominated by multiple individuals as this information demonstrated the impact of the individual across sectors or geographies. Perception of impact was also addressed individually for each sector, with academic impact being examined through measures such as H-index, and education and allied industries impact being examined through professional platforms such as website and Linkedin profile hits for each individual.

Table 1 shows the breakdown of demographics of potential experts after reviewing all nominations. The table shows a good range of gender and sector representation. Most invited experts were located in Australia, England or the USA but a wide range of countries were represented. The intention was to create sector panels of approximately 20 individuals, with table 1 showing the potential expert pool exceeded our intended panel size for all three sectors. It should be noted the desire for 20 per sector was a nominal goal. The literature fails to rationalise an optimum sample size for Delphi; in fact, panel sizes were argued to be between 7 and 1,000 depending on the type of Delphi study[3]. However, it is commonly argued that the sample should be the minimum number of experts to give power to analysis methods, as the findings can always be verified through follow up research and the quality (in terms of representativeness) of the experts is paramount to their quantity[3].

3 Hsu, C-C. & Sandford, B. A. (2007). The delphi technique: Making sense of consensus. *Practical Assessment, Research and Evaluation, 12*(10), 1-8. https://doi.org/10.7275/pdz9-th90 Powell, C. (2003). The delphi technique: Myths and realities. *Journal of Advanced Nursing, 41*(4), 376-382.

Table 1. Demographic breakdown of invited Delphi experts

		Subtotal	Total nominations
Gender	Female	44	
	Male	48	**92**
Sector	Academe	41	
	Education	23	
	Industry	28	**92**
Country	Australia	26	
	Brazil	4	
	Canada	3	
	Denmark	2	
	England	19	
	Finland	2	
	Germany	1	
	Greece	1	
	India	1	
	Israel	1	
	Italy	5	
	Japan	1	
	New Zealand	7	
	Norway	1	
	Portugal	1	
	Scotland	3	
	Slovenia	1	
	South Africa	1	
	USA	12	**92**

Contact details were sourced for as many of the nominated experts as possible from the shortlist of 92, with email addresses publicly available for 50 experts. An email of invitation that included a plain language statement and a consent form were sent, and a total of 44 out of the 50 contacted experts accepted the invitation to participate. Table 2 shows the demographic data of the experts who then participated in survey 1. We had attrition of 7 experts prior to the first round possibly due to the time of year of the first survey (December 2021-January 2022), as this time is the summer holiday break for experts in the Southern Hemisphere.

Table 2. Demographic data of Delphi experts who participated in survey 1

		Subtotal	Total survey 1 participation
Gender	Female	23	
	Male	14	**37**
Sector	Academe	16	
	Education	13	
	Industry	8	**37**
Country	Note: countries are not reported to maintain expert anonymity. Unlike workshops, the Delphi data were not analysed according to regions.		

As is common with Delphi, attrition was experienced, but its rate was not significant.

Sector	Round 1	Round 2	Round 2a	Consensus
Academe	16	10	8	**8**
Education	13	12	-	**11**
Industry	8	7	7	**6**

THE SURVEYS

As shown in Figure 1, the Delphi study content ran in parallel to the regional workshop teams. Round 1 focused on initial ideas generation, the second round on the issues (consensus ranking) and the final round on verification of the results.

As the workshop activities ran before the Delphi, their outputs were used to design and refine the Delphi surveys. However, great effort was spent on 'quarantining' the Delphi from the project's parallel workshop approach. Workshop analysis was not released until the corresponding Delphi round was completed. All Delphi analysis (this report) was withheld until the three workshops were completed. The identities of the Delphi experts remained anonymous.

The initial ideas generation survey (round 1) was qualitative in nature and was structured in three sections, administered using Qualtrics:

1. Identifying what ILE research currently exists.
   a. What really useful research can you name or do you use? You may wish to include topics, cite specific sources, name researchers/other experts whose information you draw on.
   b. What are the categories of ILE research that you are aware of? *For example, student behaviour, indoor environment etc.*
2. Identifying what gaps exist within ILE research in each sector.
   a. What are the 'obvious' gaps in research in your sector?
   b. Which of these gaps have an effect on student experience?
3. Identifying what research projects are needed in each sector.
   a. List the topics you feel need to be researched and give some explanation about what potential projects you think could address these. You may like to suggest potential research questions, or indicate data sources/methods that could be used, or provide a short explanation of what outcomes you'd like to see from research.
   b. Of the list you made, which topics need to be prioritised?

The data from the first section were used to answer the first research question (what research already exists), while sections two and three were inductively coded to identify research gaps through searching for common themes in what experts identified as the obvious gaps in their sector.

A list of 20 research gaps were identified from the data (consistent with the regional workshop teams' data). These 20 gaps formed the basis of issues (consensus ranking) survey (round 2). The list of 20 gaps with definitions was circulated to the experts. They were then asked to drag and drop the 20 gaps in order to rank a cluster of the top 5 highest priorities as well as the lowest 5 priorities from the list. This gave us quantifiable ranking data where we could begin to explore the degree to which each panel agreed/disagreed on priority areas. We explored this through interquartile ranges to examine the spread of views within each sector panel. Experts also gave a written reason for those gaps they put in the top 5 cluster, and these reasons provided a justification for the priority areas from the Delphi expert perspective.

Education was the only panel to achieve consensus on the first ranking of the 20 gaps. Both the academic and allied industry panels went to round 2a (a second ranking exercise). For both of these panels the second ranking survey comprised a smaller number of gaps, only those that had made it into the top 5 cluster based on their rank number but where there was divergence between the experts (i.e., we couldn't get 75% of the panel to agree on the gap's inclusion in the top 5). Both panels reached consensus in round 2a, with some experts re-ranking the gaps in this round and others choosing to retain their round 2 rank order.

Once the panels had achieved consensus (i.e., 75% agreement on the top 5 cluster of priorities), the third and final round comprised of verification. This survey only had one question – did the expert confirm that consensus had been achieved and the findings were verified, or did they dissent with the results. Again, 75% of the panel had to verify the findings before the research team accepted the final priority areas for each sector panel.

PART 2

Results and Analysis

RESULTS

The first survey examined the research that Delphi experts use. The data were coded into categories:

1. Named researcher or organization, e.g. Kenn Fisher
2. Named research project or paper, e.g. Cleveland, B. & Fisher, K. (2014). The evaluation of physical learning environments: a critical review of the literature. *Learning Environments Research, 17* (1), 1-28. https://doi.org/10.1007/s10984-013-9149-3. (Note, the citation needed to be clear enough to be able to source the paper)

Responses differed widely; from "Am not familiar with any research", through lists of influential researchers and organisations, to extensive citations of specific papers that participants found valuable. The Delphi experts listed 127 named researchers or organisations. Overall LEaRN, the OECD and ILETC were most frequently listed. The more commonly listed names for each panel were:

- Academics: LEaRN, Lesley Gourday, ILETC, Kenn Fisher, Rikki Toft Norgard
- Educators: OECD, Wes Imms, ILETC, Kenn Fisher
- Allied industries: LEaRN, OECD, Herman Hertzberger, Craig Deed

In addition to researchers and organisations, 82 named research projects or papers were referenced by experts. Generally, experts referred to those with 'bodies of work': OECD on ILEs, Imms on evaluation, Byers on measurement, and Barrett on impact of classroom environmental features on student performance. Some of the more commonly cited references were:

- Barrett, P.S., Zhang, Y., Davies, F., & Barrett, L.C. (2015). *Clever classrooms: Summary report of the HEAD project*, Project Report. University of Salford.
- Blackmore, J., Bateman, D., Cloonan, A., Dixon, M., Loughlin, J., O'Mara, J., & Senior, K. (2011). *Innovative Learning Environments Research Study*. Department of Education and Early Childhood Development.
- Bligh, B., & Crook, C. (2017). Learning spaces. In E. Duval, M. Sharples, & R. Sutherland (Eds.), *Technology enhanced learning* (pp. 69-85). Springer International Publishing. https://doi.org/10.1007/978-3-319-02600-8
- Ellis, R. & Goodyear, P. (Eds.) (2018). *Spaces of teaching and learning: Integrating perspectives on research and practice*. Springer Nature.
- Ellis, R. A. & Goodyear, P. (2016). Models for learning space: Integrating research on space, place and learning in higher education. *Review of Education 4*(2), 149-191.
- Imms, W., & Kvan, T. (Eds.) (2021). *Teacher transition into innovative learning environments: A global perspective.* Springer Nature. doi: 10.1007/978-981-15-7497-9
- Imms, W., Cleveland, B. & Fisher, K. (Eds.) (2016). *Evaluating learning environments: Snapshots of emerging issues, methods and knowledge*. Sense Publishers.
- Organization for Economic Co-operation Development. (2017). *The OECD handbook for innovative learning environments*. OECD Publishing.
- Organization Economic Cooperation Development (OECD). (2015). *Schooling Redesigned: Towards innovative learning systems*. OECD Publishing.
- Organization Economic Cooperation Development (OECD). (2013). *Innovative learning environments, education research and innovation.* OECD Publishing.

The Delphi study did not expect to find overall consensus on these research gaps among the experts, as we acknowledged that each sector would have specific priorities that should be clearly identifiable in order to drive future research agendas. Consequently, as we explored the panels' priorities, we looked at each sector separately. Keeping each sector panel independent meant that convergences and divergences between the sectors could be explored at the conclusion of the Delphi analysis. Each of the panel's results are

presented below. They are presented in the order that each panel achieved consensus. An inter-panel analysis is presented after the individual panel results, as well as a summary comparison of the Delphi study and regional workshop team findings.

EDUCATION PANEL PRIORITIES

Education was the first panel to achieve consensus, with 92% of panel members verifying the top 5 priority cluster in October 2022. Education experts felt the following gaps are most needed in future ILE research:

- Evaluation of learning environments (equal first place)
- Teaching (equal first place)
- Academic learning outcomes (third place)
- Student engagement (fourth place)
- Inclusiveness (fifth place)

There was minimal divergence among the 12 panel members who participated in all three rounds, although one panel member noted that it would be preferrable if inclusiveness was ranked higher and another reflected on the potential to make 'student engagement' more active by adding agency to the title of the gap as students' active role in education is central to their engagement. Table 3 shows the data of the 12 panel members across the top 5 identified research gaps. A copy of the results for all 20 gaps can be found in Appendix A: Educational Panel Ranking across 20 Research Gaps.

Table 3. Delphi top 5 ranked results for Education panel

Highest Priorities	Evaluation of Learning Environments	Student Engagement	Academic Learning Outcomes & Assessment	Inclusiveness	Teaching
Education Mentions	8	6	7	5	8
Education %	67%	50%	58%	42%	67%
Education Rank	1	4	3	5	1
IQR Education	4.25	2.25	4.5	2.25	3

In terms of quantitative analysis, there was consensus (as indicated by the interquartile range >5) on all top 5 priorities. There appeared to be a wider range of opinions on student engagement and inclusion, shown by 50% or less experts including each of these gaps in their top 5 cluster. However, as the ranking clearly showed a 'top 5' priority cluster (i.e., differentiation between these 5 gaps and the remaining 15), the panel went to the verification round to confirm if there was agreement for student engagement and inclusion to be listed in the final results. There was 92% agreement for these gaps to be included as part of the educational panel priorities.

ALLIED INDUSTRIES PANEL PRIORITIES

The allied industries panel was the second to achieve consensus, with 86% of panel members verifying the top 5 priority cluster in October 2022. Allied industry experts felt the following gaps are most needed in future ILE research:

- Evaluation of learning environments (first place)
- Design of ILE spaces (second place)
- Hybrid learning environments (third place)
- Academic learning outcomes and assessment (equal fourth place)
- Inclusiveness (equal fourth place)

Table 4 shows the top 5 ranked gaps for the allied industries panel after the first ranking survey (7 panel members). Their ranking of all 20 research gaps can be found at Appendix B: Allied Industry Panel Ranking across 20 Research Gaps (Round 2). After the round 2 ranking survey, the industry panel achieved consensus for the top 2 priorities in their panel: (1) Evaluation of learning environments, and (2) Design of ILE spaces. However, there was some divergence in the panel for the remaining gaps, with the following gaps all achieving equal 3rd:

- Academic learning outcomes and assessment,
- Hybrid learning models,
- Inclusiveness and
- Informal learning environments.

Table 4. Delphi top 5 ranked gaps for allied industries panel (round 2)

Highest priorities	Evaluation of Learning Environments	Hybrid Learning Environments	Academic Learning Outcomes & Assessment	Design Of ILE Spaces	Inclusiveness	Informal Learning Environments
Industry Mentions	7	3	3	6	3	3
Industry %	100%	43%	43%	86%	43%	43%
Industry Rank	1	3	3	2	3	3
IQR Industry	2	2.5	5.5	2	3	2

Based on the divergence, the next survey (round 2a) asked panel members to re-rank from the equal 3rd gaps to determine which gaps would remain in the top 5 priority list. Table 5 shows the outcome of that re-ranking across the 7 panel members who participated. This ranking exercise confirmed that hybrid learning environments, academic learning outcomes and assessment, and inclusiveness were the gaps that allied industry felt needed to be prioritised.

Table 5. Delphi ranking results for allied industries (round 2a)

Highest priorities	Academic Learning Outcomes & Assessment	Hybrid Learning Environments	Inclusiveness	Informal Learning Environments
Industry Mentions	3	4	3	3
Industry %	43%	57%	43%	43%
Industry Rank	2	1	2	2
IQR Industry	1	1.25	1	2

The verification round confirmed these findings, with only one comment that the inclusion gap should be closely linked to the design of ILEs in addition to the use of ILEs by students with diverse needs.

ACADEMIC PANEL PRIORITIES

Academia was the last panel to achieve consensus, with 80% of panel members verifying the top 5 priority cluster in December 2022. Academic experts felt the following gaps are most needed in future ILE research:

- Evaluation of learning environments (first place)
- Design of ILE spaces (second place)
- Hybrid learning environments (third place)
- Academic learning outcomes and assessment (equal fourth place)
- Inclusiveness (equal fourth place)

Table 6 shows the results after the first ranking survey. Like allied industries, the academic panel achieved consensus on Evaluation of learning environments and Design of ILE spaces as being their first two priorities but did not achieve consensus on the remaining priorities. The full rankings across the 20 gaps can be found at Appendix C.

Table 6. Delphi top 5 ranked gaps for academic panel (round 2)

Highest Priorities	Evaluation of Learning Environ-Ments	Hybrid Learning Environ-Ments	Health and Wellbeing	Academic Learning Outcomes & Assessment	Design of ILE Spaces	Inclusive-Ness	Indoor/ Outdoor	Informal Learning Environ-Ments	School Systems	Student Agency/ Voice
Academic Mentions	7	4	3	3	6	4	3	3	3	3
Academic %	70%	40%	30%	30%	60%	40%	30%	30%	30%	30%
Academic Rank	1	3	5	5	2	3	5	5	5	5
IQR	3.5	3.75	3.25	4	1.75	1	2.5	7.25	2	9

The academics were asked to re-rank the priorities shown in Table 6. The results of round 2a are presented in Table 7, with 8 academics participating in this round. Round 2a confirmed hybrid learning environments, academic learning outcomes and assessment, and inclusiveness as the remaining priorities in their top 5 cluster.

Table 7. Delphi ranking results for academic panel (round 2a)

Highest Priorities	Hybrid Learning Environments	Health and Wellbeing	Academic Learning Outcomes & Assessment	Inclusiveness	Informal Learning Environments	Student Agency/Voice
Academic Mentions	5	3	4	4	3	3
Academic %	63%	38%	50%	50%	38%	38%
Academic Rank	1	4	2	2	4	4
IQR	3	0	3.5	4	2.5	-0.75

The verification round confirmed these findings, with none of the round 2a academics who confirmed the findings making additional comments about the top 5.

INTER-PANEL ANALYSIS

Table 8 shows the top 5 priority clusters for all three panels. There was consensus across the panels in terms of the following priority areas:

- Evaluation of learning environments
- Academic learning outcomes and assessment
- Inclusiveness

Table 8. Comparison of Delphi Study Panels

Academic Panel (n=8)	Educational Panel (n=12)	Allied Industries Panel (n=7)
Evaluation of learning environments (first place)	Evaluation of learning environments (equal first place)	Evaluation of learning environments (first place)
Design of ILE spaces (second place)	Teaching (equal first place)	Design of ILE spaces (second place)
Hybrid learning environments (third place)	Academic learning outcomes and assessment (third place)	Hybrid learning environments (third place)
Academic learning outcomes and assessment (equal fourth place)	Impact on student engagement (fourth place)	Academic learning outcomes and assessment (equal fourth place)
Inclusiveness (equal fourth place)	Inclusiveness (fifth place)	Inclusiveness (equal fourth place)

The panels explained a need for large-scale, systematic, and fine-grained research into ‘what works’ in ILEs. Current evaluation of ILEs was seen to often lack consistency in approach, methods or tools.

Evaluation was an umbrella that connected the other research gaps, and a tool for the justification to support investment in ILE design and use.

Evaluation was also evident in qualitative comments for the priority of academic learning outcomes and assessment. Delphi experts wanted to understand the connection between learning outcomes and ILEs, and to understand how equitable outcomes for all learners might be achieved through ILE design. Some of the comments related to a need for broader educational change, for example:

> *"While the educational system could be seen as measuring 'the wrong things' it is important for institutions to have a measure of what the investment would bring. I would hope this research would expand to include 21st Century Learning." (Industry)*

However, feedback on academic learning outcomes and assessment was not only related to how success is measured, but also to how evidence about learning outcomes might motivate teachers to change their practices:

> *"Many teachers do not realize that innovative learning environments influence, improve and promote student learning through new methodologies that can be implemented in flexible environments and that in a welcoming environment the students are more motivated to study, therefore with further research teachers who still use traditional teaching even if they teach in innovative spaces, seeing the positive results of research, will probably be stimulated to change their perspectives." (Education)*

The Delphi experts also consistently agreed we need to better understand the relationship between educational space and learners who have typically been viewed as atypical, in particular those with disabilities and neurodiversity. The experts acknowledged that research to support diverse learners "to engage and flourish" would have wider benefits:

> *"With an increase on diagnosis for disabilities, trauma and other differences, it is crucial to understand how to support these cohorts in all environments. Usually the support they need benefits other students as well." (Academe)*

While evaluation, learning outcomes and inclusiveness were common to all panels, it is interesting to note that all five priorities and exact rank order were shared by the academic and allied industries panels. There is 100% consensus between these panels.

Across the rankings and comments, it appeared that academic and allied industry panels had a greater focus on the types of spaces students experience, evidenced by design and hybrid learning environments being included in their top 5 priorities. The education panel appeared to have a more affective interest in the top 5, shown by the inclusion of teaching and student engagement, which are concerned with the behaviours and actions of students and teachers within ILEs.

PART 3
Implications

The results presented a clear mandate for future research to gather evidence to evaluate the impact of ILEs, link ILEs to academic learning outcomes data, and to ensure ILEs meet the needs of all learners. However, additional implications from this study arise when the Delphi results are compared to the regional workshop team data.

COMPARISON OF DELPHI STUDY AND REGIONAL WORKSHOP TEAMS FINDINGS

As outlined in Part One, the ILE+SE Scoping Study ran two parallel approaches to collecting data. The first was a regional workshop team strategy, where self-selecting teams engaged in cross-sector workshops; while the Delphi study had nominated experts across the three sectors who responded to the same workshop content but via individual online surveys. Despite the differences between these approaches (i.e., collaborative vs. individual, cross-sector vs. independent expert, discussion based vs. written reflection etc.) there was consistency in the results from both approaches. The evidence of this consensus is presented across Tables 9-11, which highlight where priority areas were common across both approaches.

Table 9. Comparison of Academic Workshop Team and Delphi Results

Academic Workshop Teams	Academic Panel (n=8)
Evaluation of learning environments (equal first)	Evaluation of learning environments (first place)
Design of ILEs (equal first)	Design of ILE spaces (second place)
Affective learning outcomes (equal third)	Hybrid learning environments (third place)
Health and wellbeing (equal third)	Academic learning outcomes and assessment (equal fourth place)
Inclusiveness (equal fifth)	Inclusiveness (equal fourth place)
Teaching (equal fifth)	

Table 10. Comparison of Education Workshop Team and Delphi Results

Education Workshop Teams	Educational Panel (n=12)
Academic learning outcomes and assessment (first place)	Evaluation of learning environments (equal first place)
Impact on student engagement (second place)	Teaching (equal first place)
Hybrid learning environments (equal third place)	Academic learning outcomes and assessment (third place)
Child development theory and environment (equal third place)	Impact on student engagement (fourth place)
Inclusiveness (fifth place)	Inclusiveness (fifth place)

Table 11. Comparison of Allied Industries Workshop Team and Delphi Results

Allied Industries Workshop Teams	Allied Industries Panel (n=7)
Affective learning outcomes (equal first place)	Evaluation of learning environments (first place)
Design of ILE spaces (equal first place)	Design of ILE spaces (second place)
Evaluation of learning environments (third place)	Hybrid learning environments (third place)
Health and wellbeing (fourth place)	Academic learning outcomes and assessment (equal fourth place)
Hybrid learning environments (fifth place)	Inclusiveness (equal fourth place)

It is worth noting that where the regional workshop team and Delphi panels had different priorities, there were few that were aberrant from the overall ILE+SE Scoping Study findings. There is a consistent focus on evaluation, inclusiveness, learning outcomes (either affective or academic) and health and wellbeing.

The only emergent areas for investigation that have not been previously identified within the study were:

1. Hybrid learning environments – however, it could be argued that this priority falls under the construct of design of spaces; and,
2. Teaching – this emerged from the education panel noting the role of the teacher as having a direct effect on student outcomes and experience in terms of how they utilise space.

IMPLICATIONS

The Delphi study provides a clear mandate for future research. As a group of experts across academia, education and the allied industries, the Delphi experts have considerable experience in both research and practice that gives authority to their voice in driving the research agenda. The Delphi experts:

1. Provide a clear set of gaps that are consistent areas of needs across all sectors – evaluation of ILEs, design of ILEs and inclusiveness must be addressed.
2. Highlight the priorities that exist for each sector independently, which may drive sector-based research that meets each sector's specific needs.
3. Through triangulation with workshop data, verify our analysis and show robustness of the data.
4. Confirm a need for large-scale, high-impact research that can move the field ahead in order to build irrefutable evidence of the role ILEs play in enhancing student experience.

From a methodological perspective, the Delphi study was intended to be the primary source of data for the ILE+SE Scoping Study. Regional workshop teams were tasked with pooling their extensive, practical knowledge to support a robust Delphi method. However, something of the reverse happened over time. As the workshops occurred ahead of the Delphi surveys, the Delphi results verified the workshop findings. Being run independently, each approach was able to triangulate the findings of the other, constituting significance where the findings overlap.

APPENDIX A: EDUCATIONAL PANEL RANKING ACROSS 20 RESEARCH GAPS

Highest priorities	Evaluation of Learning Environments	Hybrid Learning Environments	Student Engagement	Health and Wellbeing	21st C Learning	Academic learning outcomes & assessment	Child-development theory & environment	COVID	Design of ILE spaces	Inclusiveness	Indoor/outdoor	Informal learning environments	Physical behaviour and safety	School - local level issues	School systems	Student agency/voice	Subject/discipline specific research	Sustainability	Teaching	Technology
Education mentions	8	2	6	2	3	7	0	0	4	5	3	1	0	1	3	2	1	2	8	2
Education %	67%	17%	50%	17%	25%	58%	0%	0%	33%	42%	25%	8%	0%	8%	25%	17%	8%	17%	67%	17%
Education Rank	1	10	4	10	7	3	18	18	6	5	7	15	18	15	7	10	15	10	1	10
IQR	4.25	4.25	2.25	4.5	2.75	4.5	2.25	2.25	2.25	2.25	6	4.25	2.5	11.25	1	3.75	1	2.75	3	0

APPENDIX B: ALLIED INDUSTRY PANEL RANKING ACROSS 20 RESEARCH GAPS (ROUND 2)

Highest priorities	Evaluation of Learning Environments	Hybrid Learning Environments	Student Engagement	Health and Wellbeing	21st C Learning	Academic learning outcomes & assessment	Child-development theory & environment	COVID	Design of ILE spaces	Inclusiveness	Indoor/outdoor	Informal learning environments	Physical behaviour and safety	School - local level issues	School systems	Student agency/voice	Subject/discipline specific research	Sustainability	Teaching	Technology
Industry Mentions	7	3	1	2	1	3	0	0	6	3	1	3	1	0	1	1	0	0	2	0
Industry %	100%	43%	14%	29%	14%	43%	0%	0%	86%	43%	14%	43%	14%	0%	14%	14%	0%	0%	29%	0%
Industry Rank	1	3	9	7	9	3	15	15	2	3	9	3	9	15	9	9	15	15	7	15
IQR	2	2.5	1.5	5	2	5.5	7	0.5	2	3	3	2	9.5	10	2	1.5	6.5	1	1	16.5

APPENDIX C: ACADEMIC PANEL RANKING ACROSS 20 RESEARCH GAPS (ROUND 2)

Highest priorities	Evaluation of Learning Environments	Hybrid Learning Environments	Student Engagement	Health and Wellbeing	21st C Learning	Academic learning outcomes & assessment	Child-development theory & environment	COVID	Design of ILE spaces	Inclusiveness	Indoor/outdoor	Informal learning environments	Physical behaviour and safety	School - local level issues	School systems	Student agency/voice	Subject/discipline specific research	Sustainability	Teaching	Technology
Academic mentions	7	4	2	3	2	3	0	0	6	4	3	3	0	2	3	3	0	2	2	1
Academic %	70%	40%	20%	30%	20%	30%	0%	0%	60%	40%	30%	30%	0%	20%	30%	30%	0%	20%	20%	10%
Academic Rank	1	3	11	5	11	5	17	17	2	3	5	5	17	11	5	5	17	11	11	16
IQR	3.5	3.75	2.5	3.25	1.75	4	5.75	2.5	1.75	1	2.5	7.25	8	13.5	2	9	1.5	0.75	8.75	14.75