Disciplinary Dilemmas: Learning Spaces as a Discussion between Designers and Educators

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Abstract
As an architect and academic, I have been attempting to engage in conversations outside my discipline around the theme of education with a particular focus on how space can support learning. Currently undertaking a Doctorate of Education as the only non-cognate student, I am struck by the different languages that the disciplines of architecture and education use. We each have our own shorthand for capturing and communicating complex ideas. Architects and educators come from different tribes with different ways of viewing the world. These different languages support effective communication when we are working within an academic discipline but can alienate and confuse when we are attempting to work in interdisciplinary ways.

The context of this paper is a research project called ‘Smart Green Schools’ funded by the Australian Research Council (ARC) as part of their Linkage Grant program. The aim of the Smart Green Schools research is to investigate the relationships between pedagogy, space and sustainability. Our team is supported by nine industry partners including the Department of Education and Early Childhood Development (DEECD) (Victoria), the Government Architect (Victoria) and a range of architecture and design firms which specialise in school design. The five chief investigators come from the diverse fields of architecture, education, educational planning, urban design and sustainability. There are two PhD students: one who was a science teacher prior to accepting the ARC scholarship and the other, an architect.
Drawing on some moments of uncertainty, if not critical moments\(^1\), this paper explores a cross-section of difficulties and opportunities being experienced by various stakeholders working towards the design of new learning spaces. During the research process for Smart Green Schools, we have found that the research focus on space, sustainability and education has needed to expand to include other issues such as leadership, school structure, timetabling and professional development. It is the background to the research proposal and the story of the shift in focus that is presented in this paper as a series of unsettling moments.

The paper does not claim to present a road map for teachers new to thinking about the impact of space. Instead the paper attempts to tease out some issues and discrepancies at play between the disciplines of architecture and education in order to provoke educators to take a stronger interest in the complex relationships between space and learning and to challenge designers to reflect on the impact of their design decisions.

In conclusion, the paper suggests that the design of new learning environments is best considered as the design for new learning experiences within a context of increasingly portable ICT. As such, design is best perceived as a partnership between educators, students, design professionals and ICT experts.

An insight into the tribal nature of disciplines

Some years ago I was with a group of academics from all faculties within the university beginning a Graduate Certificate in University Teaching. The fifteen or so academics were being rapidly introduced to a range of theorists and educational concepts such as Lave and Wenger’s concepts of a ‘community of practice’ and ‘situated learning’, and writings from Paul Friere and John Dewey. Terms such as ‘situated learning’, ‘embedded cognition’, ‘constructivist learning’, ‘praxis-oriented learning’ were being introduced along with concepts such as Gardiner’s

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\(^1\) Critical moments are recognised in education as specific and identifiable moments when transformative learning occurs. These may be related to emotionally difficult issues which might be best understood in retrospect or may not even be recognised as occurring. The moments in this paper are unsettling rather than critical moments and are included as marking points for understanding some of the complexities in the relationships between space and learning.
'multiple intelligences' and 'Bloom's taxonomy'. The terminology was so foreign and being introduced at such rapid pace that the academic class members in a moment of 'fun' replayed the terms back to our educators as jargon. In an unsettling moment, the shock showed on the educators' faces. What we perceived as jargon was the language which defined and supported the discipline of education. It was a useful lesson for later interdisciplinary work between educators and architects. Language helps define outsiders to, and cohorts within, knowledge domains. As different disciplines meet together on a common topic, there is a need for each discipline to respect the 'foreign' language being used but also a need to empathise with others new to the discipline by understanding that language can alienate and confuse and by attempting to modify language into more accessible terms.

An educator and senior research associate with the Smart Green Schools team noted how architects presenting designs for schools are not well understood by all teachers. 'The vocabulary and ways of representation used by architects, facilities experts, acoustic engineers and builders are foreign for teachers and vice versa' (Wilks, 2009, p. 24).² Not only is much of the terminology being used incomprehensible, but the abstract plans and elevations may not be easily understood by those outside the design and construction disciplines.

For a publication co-edited with Dr Kenn Fisher, two glossaries were developed: one educational and one architectural.³ Our aim was not to give comprehensive dictionaries of terms, but to demonstrate an inherent communication difficulty when different tribal languages are in play.

Each discipline sees the world through its own cognitive models or ‘paradigms’. Once university students are inducted into a discipline it can become difficult to see the world outside of their discipline. There is a risk that knowledge outside one's cognate discipline is not valued or even fully perceived as knowledge.

A silence on space
Coming from an architectural discipline where our entire discourse is embedded around issues to do with space, it has been alarming to realise that some teachers do not perceive

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that links may exist between space and effective learning. For example, in the two year program of the Graduate Certificate of University Teaching, the impact of space on learning was not mentioned. More recently, a DEECD (Victoria) document of 64 research priority areas agreed for 2008-11, did not include priorities directly focused on the impact of space even in the midst of this country's largest injection of funding into school infrastructure.\

As offices and hospitals are being transformed in response to new technologies and new understandings of work and health practices, it is curious that the classroom has persisted as the main venue for learning. Kenn Fisher (2002), a learning spaces expert, writes:

...spatiality is not legitimised in pedagogical discourses: it is predominantly dealt with through the unconscious and is accompanied by deep silences. Yet we experience space and place constantly throughout our lives and my instincts tell me that our schools and home-based spatial memories go on to shape our spatial understandings in our adult civic lives. The production of public spaces and the associated lack of critical civic engagement is, in my view, a direct result of our limited level of spatial literacy and vocabulary, as well as a severely lacking focus on critical literature in pedagogy.\

Early school models: Because the classroom has become the main teaching venue, it is useful to look back to the school template designs that arose in England and were adopted within Australian nineteenth century schools. In these layouts the main teaching spaces were called 'school rooms' rather than 'class rooms'. The school design accommodated a monitorial system of education. In the large school room, students sat in orderly groups on tiered seating divided by curtains. Each

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6 Department of Education and Early Childhood Development (2008), Research Priority Areas of Interest 2008-11, Department of Education and Early Childhood Development (Victoria). Research into space was not precluded. For example, Priority 42 - 'resource and equity implications of a more personalised approach to learning' could include the impact of design.

6 Fisher, K. (2002), Schools as 'prisons of learning': A manifesto for a critical psychosocial spatiality of learning, PhD Dissertation submitted to the School of Education, Flinders University of South Australia.
group was just three deep to enable the head teacher and monitors to inspect students' writing slates. The teaching method was based on acquisition of knowledge through instruction, rote learning, repetition, visual surveillance and bodily discipline.\textsuperscript{7} Note in Figure 2, a classroom is an adjunct to the school room where smaller groups could be taken from the larger space for more focused instruction. The window sills were high to prevent distraction. This was a school model developed to train a workforce in which accuracy, repetition and the ability to follow instruction were core skills.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Template design for a nineteenth century school (Source – Burchell, L. (1980), Victorian Schools: A study in colonial government architecture 1837-1900, Melbourne University Press, p. 16.)}
\end{figure}

Following a United Kingdom Act in 1870 legislating compulsory education, the architect E.R. Robson developed a school model for the London School Board in which classrooms were laid around an assembly hall. The school room had evolved into the classroom which is still the predominant model today.

A classroom today
What does a contemporary classroom ‘say’ about the education occurring inside? In a case-study primary school, we walk between existing classrooms with the principal. In this building, the architecture has remained largely unchanged since the 1920s, but the range of furniture layouts and the computers tell us that this is a twenty-first century classroom. The paraphernalia, tools of learning and the children’s displayed work give character to the rooms. One classroom we see is particularly neat with beautiful student work displayed on the walls. The principal quietly states his concern that this classroom says more about the needs of the teacher rather than a classroom where students are encouraged to experiment, take risks and explore. The teachers’ desks play a prominent role in each room taking up to 25% of the classroom floor space. Whiteboards at the ‘front’ of the classroom suggest a particular teacher-focused mode of learning. Outside many of the classrooms are the messy accumulations of work from previous years and discarded furniture. This communal space does not appear to be cared for. There are no direct links between the playground and the classroom. There are also no direct links between different classrooms, although class spaces do open onto a large high-ceilinged common hall. No students are in the hall as we walk through. A useful question for teachers to consider is who owns the learning spaces?8 Who controls movement and behaviour? Are students able to physically adjust their environment to personalise with their work: to open a window; move around; or talk with another? Does control stay with the teacher all day or does it shift between students and the teacher?

A visual reading of the space of the classroom is just one part of a more complex understanding of how space is utilised and what messages students receive about their learning and the value which their community places on education. For example, in this school the students are in uniform and grouped according to age. The principal is male and most of the teachers are female. In an identically-

designed school, the activities and use of space might be very different. Students might be in vertical age groups, they might move between classrooms according to a fifty minute timetable or they might do some of their learning in the community or in a range of support spaces such as libraries and art rooms.

Teachers do have control to adjust classrooms in minor ways, but what does the average current classroom design limit? There is usually no water in the classroom and the space does not suit a range of learning activities. The size of the classroom limits the number of students and does not easily support team teaching and project-based learning. Rarely is there easy access to the exterior.

Does space matter?
Since beginning the Smart Green Schools research, some educators have said that a good teacher can teach anywhere; what matters is the quality of the teacher rather than the space; others have said that a more effective use of limited funds is to improve teacher quality rather than classroom design. Health care research has shown a link between hospital environments and patients' healing time. For example, a patient in a room with an outlook to trees recovered more quickly than those that had no window. Unfortunately, the same level of interrogation has not been undertaken for schools.

Three reasons for many teachers not perceiving space to matter have been presented in this paper. The first is that space is not part of an educational discourse. If something is not spoken about and is not part of the research paradigm, then it is difficult to even realise it exists. The second reason is that the classroom is still largely ubiquitous and therefore remains unseen. The third observation is that teachers do control and adjust the classroom, albeit in minor ways, and therefore may not be aware of the space as restricting their teaching methods.

What does the traditional classroom enable and what does it restrict? To understand this question better, it is useful to see examples of schools where the classrooms have been opened up.

Beginning with one case-study school, we see three traditional classrooms where segments of walls have been opened to allow team teaching with a group of 75 students.
An efficient work space for the three teaches is located in one corner allowing them to collaborate as a team. There is a range of student furniture suggesting different modes of work; sometimes in small groups ranging in size from 2 to 6; sometimes at computer stations or laptops; sometimes on the floor, on couches or on bean bags. Some extra work spaces are 'stolen' from spaces such as the adjacent corridor or the nearby after-school care space. The principal carefully selected the teachers who would teach within this new space as a prototype for more widespread changes within the school. The principal gave the teachers time to construct new ways to deliver content. Feedback from the users of the new spaces, after six months of occupation, is generally positive. In our research we have realised how important it is for culture change to be led by a leadership group in each school with teacher advocates who are early adopters within the new spaces.

Examples where space has been mismatched to teaching and learning methods also help illustrate that space and pedagogy are irrevocably linked. In another case study school, a 'learning hub' space was constructed as an open plan shell the size of four classrooms. After two years of occupation, the staff members are still struggling to use the space effectively. Whenever possible, staff timetabled into the hub try to relocate their student groups into the library spaces or the computer hubs. Acoustic readings show unacceptable reverberation times in the open space. The ICT equipment in the space is insufficient. The furniture does not allow for a range of learning settings. A recent workshop was held in the hub space between educators and the Smart Green School research and partner team. During this workshop, which focused on how the hub space could be improved, there was a growing realisation that the space would not be resolved simply by providing better acoustics, ICT and furniture. For project-based learning to occur, students need more than the standard 50 minute period, three times per week. It was realised that the space might be best 'owned' by specific teachers and student cohorts so they had time to gradually learn to work and behave in new ways. Furniture carefully selected in response to the teaching program would need to be laid out with an understanding of how space might be used over the course of a day, the length of a project and from year to year.
The unsettling moment in this process for teachers was the realisation that this space would not be easily resolved by addressing only the perceived problems of acoustics, poor ICT and inadequate furniture. Even once these were resolved, effective utilisation of the space would need to extend beyond teaching methods. A list of issues raised at the workshop included:

- A reworking of the timetable to allow for more extended learning opportunities;
- The need for teachers to have both physical space and time to collaborate on new programs;
- The need for a teacher group to be spatial advocates for the new space and take 'ownership';
- Time for students to develop new learning modes and behaviours;
- Support and commitment from the school leadership team to support transformation of teaching and learning methods.

The role of FFE - Furniture, Fixtures and Equipment

The following unsettling moment was related by an architect working on a new school model in Australia called a SWIS or Schools Within Schools model. Instead of the more common year-based model, the principal and leadership group decided on smaller Year 7-12 sub-schools forming learning communities in seven matching new buildings. The transformation process was lengthy and complex. The architect described an almost existential moment where, after working for eighteen months, they had an outline of the buildings which could be tendered for construction but only a schematic internal layout which needed a lot more work done before it could be built:

We couldn't draw because we didn't understand the project brief as the school was still going through the machinations within the school, outside the school with the school community, and also at the department level. Across all sorts of levels a lot has to happen before reaching a point where we could say, now we have some clarity to progress as an architectural project. That would have taken at least 18 months before we got to that sort of footing... My gut feeling is that even if
we reached the same design a year earlier, I don't think it would have been successful in the sense that you had to go through the transformational change to reach consensus. (Newton & Fisher, 2009)9

For this case study school, the layout, furniture, fixtures and fittings were resolved over many months after the actual building itself had been resolved. The educational planner and interior architect used prefabricated classrooms as prototype spaces to explore layout and teaching options with fifty Year 7 students:

Design of the physical environments for the new building could then evolve from the 'inside-out', a term also used by the education consultant Julia Atkin, to describe the process of building a learning culture and school ethos based on shared values and beliefs. (Featherston, in press, p. 118)10

Another unsettling moment at another case study school is useful to describe. Teachers had recently moved into a renovated, more open plan space and were working with their students using the furniture from the old spaces. A teacher rang our PhD student to ask for help. The principal had given the teachers a range of catalogues and asked him to select furniture so an order could be placed within a few days. We met with the teacher the next day in a quickly conceived workshop with some Year 5 and 6 students. Within a couple of hours, after talking about all the kinds of activities they might like to do in the spaces, there was some understanding of how the space might be used. The difficulty came with selecting the furniture. We felt the teacher did not have the necessary time and information required to make this major decision on furniture. Our concerns were that:

The catalogue range was limited;
Some learning would be better supported with furniture outside the traditional school's ranges, such as office furniture and domestic furniture;
Without developing an accurate, scaled drawing it was impossible to confidently predict what furniture would fit;
Staff needed time to layout and test how the furniture would work with their students across a day and across a week;
The furniture range did not offer enough opportunities to define and differentiate space;
A good range of seating and desks was available but little for display and storage.

Fortunately the teacher was able to negotiate for more time and was able to source design help from one of the school parents who was an architect and drew up options including a raised platform to differentiate one area.

Much can be done to improve all learning spaces with careful selection of furniture and fittings. Designers can help with furniture layouts by working through options with teachers and students. Too often, furniture selection is an afterthought done in isolation from the design process. Furniture ranges need to be extended to respond to diverse learning modes and more portable ICT. This field should be the topic of useful professional development between teachers and designers. One tool to be considered is software currently being developed in the United Kingdom that will enable teachers and students to play with layouts in an immersive digital environment.11

Research about educational spaces
As I write this paper, I have been in the United States attending a conference on educational facilities.12 In an informal conversation with two facilities managers from different US state education departments, I was confidently told that their schools were designed based on the best

11 Called LEVROS (Learning Environments Virtual Reality Online Simulator), this tool builds on game technology to develop an immersive environment in which furniture layouts can be explored.
available evidence. The evidence they spoke of was focused on issues such as indoor air quality, age of the building, acoustics, moisture levels, thermal comfort, daylight, cleaning methods etc. Indeed, US-based research into the effect of learning spaces has tended to focus on quantifiable issues and their possible effect on test outcomes. For example, research has suggested that spaces kept at 74 degrees Fahrenheit help improve student test scores. This means that spaces are air-conditioned and this tends to restrict good connections between inside and outside as well as learning opportunities through the use of more environmentally sustainable spaces. The positive outcome of the US-based research into physical environments is the focus on learning impact from physical design:

A study of working conditions in urban schools concluded that physical conditions do have direct positive and negative effects on teacher morale, a sense of personal safety, feelings of effectiveness in the classroom and on the general learning environment. Building renovations in one district led teachers to feel a renewed sense of hope, of commitment, and a belief that district officials cared about what went on in that building. An improved physical environment had a positive effect on learning. (Tennessee Advisory Commission on Intergovernmental Relations, 2003, p. 4)\footnote{Tennessee Advisory Commission on Intergovernmental Relations (2003), \textit{Do K-12 School Facilities Affect Education Outcomes?}, Tennessee Advisory Commission on Intergovernmental Relations, Tennessee, p. 4.}

An update on US research into the impact of learning spaces on learning was presented at the conference. The researchers drew on meta-analyses of research done elsewhere in the US as an update to Schneider's overview called 'Does Space Matter?'.\footnote{Schneider, M. (2002). \textit{Do School Facilities Affect Academic Outcomes?}, National Clearinghouse for Educational Facilities, \url{http://www.edfacilities.org/pubs/outcomes.pdf}, accessed September 20, 2009.} It was noted that the research being undertaken in the US was still largely focused on direct relationships between one physical aspect and its impact on test results rather than more complex interrelationships. Missing from the research were questions...
Factors supporting innovation
Submissions into the school awards exhibition at the conference largely repeated the standard school model of air-conditioned classrooms off central corridors with some focus on collaborative social spaces but little on exterior learning spaces. Submissions to the equivalent award system in Australia include a greater diversity of school designs.

If both the US and Australia are calling for research-based decision making, why are school designs in Australia showing more diversity than the US? Australia has been following the UK in terms of government funding initiatives designed to reinvigorate all schools. Some state-based education departments in Australia have established programs which are supporting innovation in school design based on research into effective learning rather than the more limited research available on effective learning environments. The manager of the Leading Practice and Design section of DEECD (Victoria) described key principles which guided the Leading Schools Fund and some are listed below:

- School implementation and reform occurs from the inside out and depends upon teacher effectiveness and school effectiveness;
- In order to improve student outcomes, they must be clearly defined, measured and baseline/benchmarked, then linked to individual teacher’s beliefs, values, skills and behaviours;
- School improvement requires research and evidence-based change. This involves constant collection and analysis of data to track progress and to measure improvement;
- Changes in teacher effectiveness can only occur with the support of world class professional learning and a focused commitment over a number of years;
- Leadership capacity in schools is a key factor in improved school effectiveness;
• A key lever for success is gaining the enthusiasm and the commitment of schools that school improvement comes first...\textsuperscript{15}

Space is one factor supporting effective learning.\textsuperscript{16} The paper in this journal titled 'Spaces for Learning: A Teacher's Perspective' suggests that space does 'enable' new ways of teaching rather than act as a backdrop. New spaces may match innovative teaching, or may prompt teachers to reassess the ways they teach. As the principles listed above suggest, teaching transformation to suit new spaces requires more than just different accommodation. Leadership, professional development and advocacy are required for new teams and methods to be developed and avoid the risk of classroom walls being 'rebuilt' by teachers.\textsuperscript{17}

The design of learning spaces requires a marriage of educators and designers to conceive how space might support new types of learning. A DfES (UK) report concluded that:

\begin{quote}
Putting the user's experience at the heart of all we do...will be critical to the success in delivering on our priorities... Failing to understand users in the way we design and deliver services means that we are less likely to deliver aggregate improvements in outcomes across the system because we are less likely to be meeting the needs of individual service users. (Department for Education and Skills, 2004, pp. 33-36)\textsuperscript{18}
\end{quote}

 ICT supporting learning
As computer technology becomes more portable, there is an opportunity to shift away from the banks of computer tables and projection screens to a more seamless digitally-connected environment. There are learning opportunities

\textsuperscript{16}Hattie, J. (2008), \textit{Visible Learning: A synthesis of over 800 meta-analyses relating to achievement}, Routledge, United Kingdom.
\textsuperscript{17}In one school where open plan spaces had been developed for learning communities, the teachers had rebuilt the classrooms using bookshelves and furniture.
available with Web 2.0 technology and Cloud Computing as students can stay connected within and outside the classroom to each other, adjacent communities and even global communities. Social networks may be multi-national as well as linked into the local community and formal learning activities may more easily extend into the home environment beyond the normal school hours. Likewise, effective learning may increasingly occur in informal ways through learning games and collaborative partnerships. Students may increasingly attend schools and universities, not just to learn but to talk about what they have been learning in a range of informal environments and non-classroom based environments.

As information becomes available from many locations, libraries will shift from being containers of resources, and library walls will break open to ensure useful resources are available to students and educators in both physical and digital formats. For classroom-based teachers, a useful starting point is to think about what use could be made of the hallways outside the classroom if they were designed with nooks for tiny meetings or individual work, tables for eating and learning, readily available resources through WiFi or physical resources etc.

Just 21 years ago, the Internet existed as just 60,000 interlinked computers. Since that time, computers have invaded learning spaces turning some classrooms into computer labs while filling the walls of other classrooms with heavy hardware. We are at another tipping point as digital technology becomes more seamless and, in some ways, more invisible. Hand-held computers loaded with Kindle Books and location-specific information using GPS will become increasingly powerful learning tools.

The increased portability of ICT requires us to ask whether the physical environment of the school will continue to remain important. Physical space and proximity communicates community values about education and creates possibilities through associations. We will no longer have to perceive space as simply a container for activity but rather a lever that helps students work in ways that digital environments do not support. Designing spaces, therefore, can be considered to be a process of designing experiences. This shift in thinking should enable teachers to realise they are key to the design process. If space is about the design of
experiences, that is also the role of teachers. Schools no longer need to be a suite of containers for learning but become journeys and systems where objects, students, expertise, visual information and digital information come together. Places of intersecting paths between teachers, learners and the community become particularly interesting for learning opportunities. In this new environment for learning, the focus will be less on flexibility to adjust space but more on a range of specialised spaces which students and educators can move between.

Is a great school always a great school?
This paper has attempted to outline, through unsettling moments, some of the difficulties and complexities around the provision of space (both traditional and innovative) to support learning and learners. The following final ‘moment’ is a personal anecdote which raises a dilemma about the provision of space for different learners. Does each pedagogical and spatial decision, by necessity, favour particular types of learners?

As a parent of three high school students, I am interested in understanding how education helps equip students to live effectively in a twenty-first century world. Living near a newly opened high school, we were attracted to their learner-centred approach to education. At this school, students agree on ‘personal learning plans’ within ‘three-way conferences’ between educator, student and parents. Also, learning at the school is not structured into fifty minute subjects. Instead, students work on interdisciplinary projects of their own choosing over an extended time. There is no textbook list to be purchased. The teachers team teach and classroom walls are opened up. Students are encouraged to have USB drives instead of transporting laptops from home to school each day. They use the resources both within the school and from a range of virtual and community sources. My Year 7 daughter came home the other day enthusing how much she loved the school, her teachers and her friends. This style of education did not suit our son as well. After two years, he chose to go to a more conservative, subject-based, select entry school.

For others, this scenario may hold no unsettling content. As an education outsider, I am unsettled by a dawning recognition that even the best learner-centred
approach may not suit all students. Can schools be designed both physically and pedagogically to allow enough learning variations and settings to suit all students? What are the implications for school designers? Ideally, the school design needs to accommodate the pedagogy rather than visa versa. A school designed for a largely didactic pedagogy may thrive best in a traditional classroom, whereas a school for project-based team teaching may include a range of interlinked open-plan spaces where students can move between activity areas.

In conclusion, does space 'enable' learning? Using a series of unsettling moments, this paper attempted to provoke educators to consider the complex relationships between space and learning and to challenge designers to reflect on the impact of their design decisions. Because educational knowledge is part of a distinctly different discourse to architecture, particular care is needed by both educators and designers to ensure effective communication. As the impact of space is not commonly included in education discourse, the potential of space to support (and hinder) learning tends to be overlooked and assumptions made that the classroom model will always be the most effective learning environment. To show that the classroom is just a construct, its precursor in early template designs as a large school room was illustrated. Some successful and less successful case studies were presented to show that space does impact on learning. The particular importance of the furniture, fitout and equipment was described. Some of the
issues to do with research-led decision making were included with snapshots of current research and support for innovative learning spaces in the United States and Australia. Finally, this paper focused on the need for teaching and learning transformation if innovative spaces are to be effective. New spaces need to support the range of today's learners while predicting the possibilities that will arise for future learners.

As we enter a time of more portable and more ubiquitous ICT, the design of learning environments need no longer be about designing containers for teaching but rather about the design of learning experiences. If we think about design of schools in this way, it is useful to understand that educators, as designers of learning experiences, will increasingly need to be the key instigators of future designs. New technology and new understanding about learning are likely to require transformation away from the classroom environment to environments which provide a larger range of learning experiences that promote the best learning outcomes. At that point, it should be educators who are demanding changes in the school environment with support from a range of design professionals and ICT experts.

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