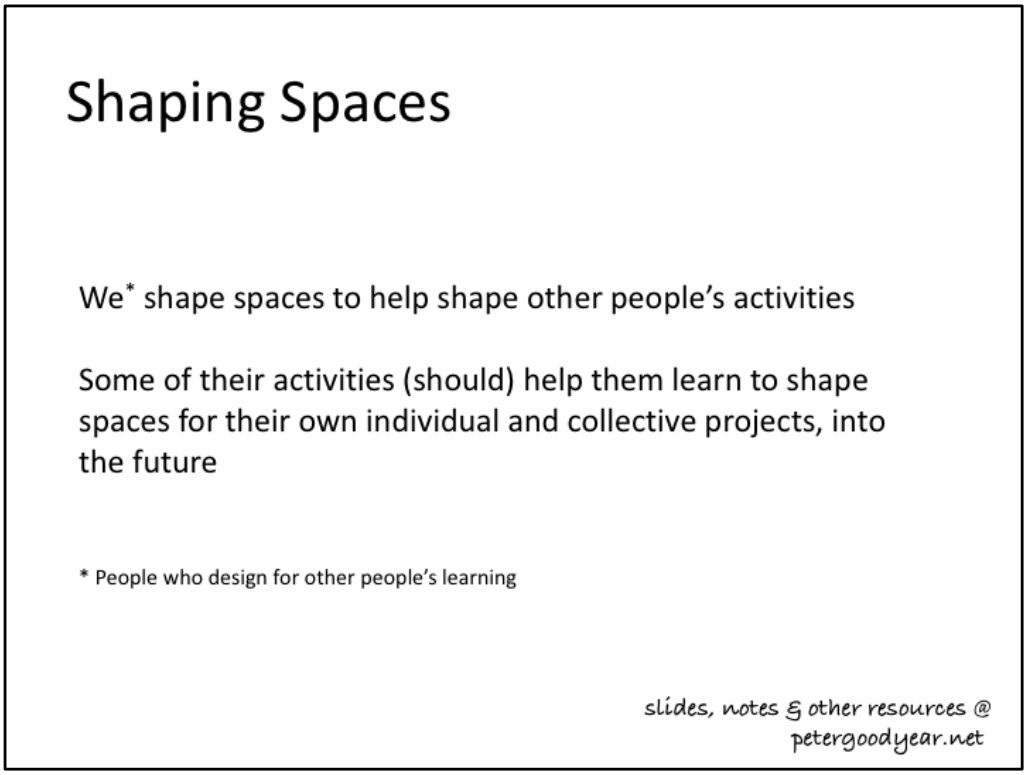
***Shaping Spaces* keynote at the ALT Conference, Liverpool, England, Sept 2017**

Abstract

This talk is about new learning spaces in universities and the scope for learning technologists to help shape better learning spaces. I will focus on *design knowledge*: knowledge that is useful in (educational) design work. Two ideas are core to my argument. The first is that the analysis and design of complex learning spaces – and learning situations more generally – must pay close attention to students' *activity*: what it is they are actually doing. The second is that we need a shared set of *actionable concepts* that can connect human activity to the physical world (material/digital/hybrid), recognising that activity can be influenced, but is rarely determined, by features of its setting. Without such connecting concepts, it becomes very difficult to design, or to explain the rationale for a new design, or to understand how an existing set of learning arrangements actually works. The title of the talk captures the idea that 'we shape our spaces and then our spaces shape us'. When learning spaces work well, students also learn how to shape the spaces they need.



I chose the 'shaping spaces' title for two main reasons:
1) I wanted to focus on the contribution of learning technology to the design and creation of new, complex learning spaces. 'Shaping' has that *active* flavour and it also can imply a kind of informed crafting rather than a rigid determining. I didn't want to talk about 'shapes' – taxonomies of finished spaces, for example.
2) I like the reflexive/recursive nature of the phrase – it's not just that we are shaping spaces but the spaces we shape then influence what students (and teachers and others) do. Ad infinitum/in endless loops.

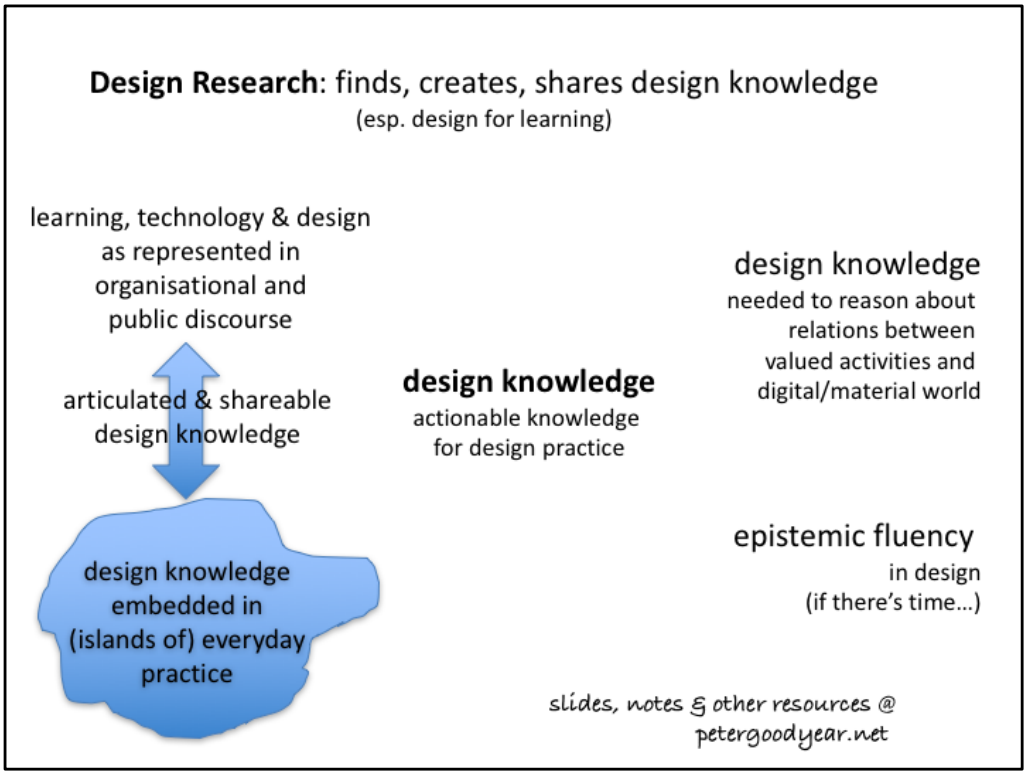
Active learning and learning to change the world are (usually) entangled with complex (re)arrangements of the material, digital, social, epistemic … we tend to exaggerate the power of articulated knowledge and talk in HE and to underestimate the (often subtle) power of the brute physicality of the world

"We shape our buildings; thereafter they shape us" (Winston Churchill)

"We become what we behold. We shape our tools and then our tools shape us" (John Culkin's way of expressing an idea attributed to Marshall McLuhan)

"We never educate directly, but indirectly by means of the environment. Whether we permit chance environments to do the work, or whether we design environments for the purpose makes a great difference."

Dewey, J. (1938). *Democracy and education*.



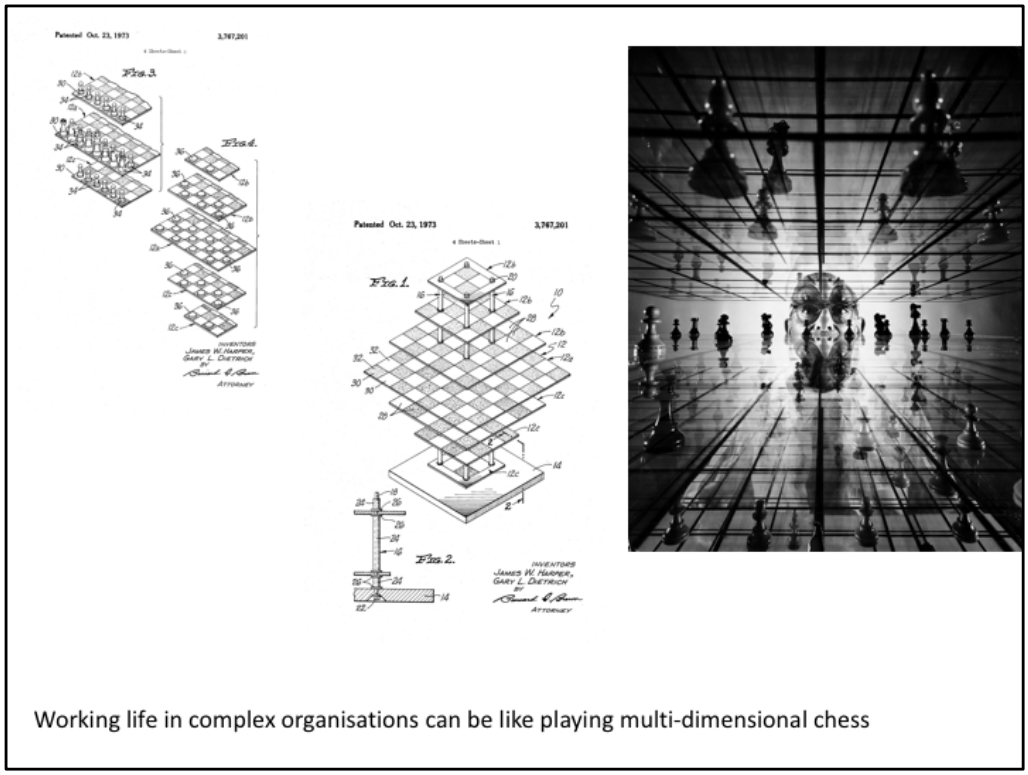
I'm interested in design research and design knowledge.
Following Ezio Manzini, I take design research to be an enterprise that produces knowledge that is useful in/for design work. In my case, it's design for learning, but ideas from other areas of design (research) can be very insightful too.

I'm using 'design knowledge' quite broadly, to include such things as design methods, design tools, design principles, reusable design templates, design patterns, etc.
It also includes 'actionable concepts' that can be used in reasoning about/in design work. For example, concepts that help designers think about relations between things that can be designed and likely human/student responses to what is designed for them.

Thinking about complex learning spaces in particular tightens the focus on a subset of such actionable concepts that can connect qualities of the physical (material, digital) to valued human activities (such as learning activities). [In relation to *social* situations, concepts like anonymity – talked about in Sian Bayne's keynote – would be important]

Design research and design knowledge are vitally involved in connecting the everyday practice of design with the creation of shareable design knowledge with representations of learning, technology & design in organisational, policy & public discourse – fragmentation here is dangerous.

Manzini, E. (2015). *Design, when everybody designs: an introduction to design for social innovation*. Cambridge MA: MIT Press.



Dr. Ervand Kogbetliantz with his three-dimensional chessboard, New York City, 1952.
Yale Joel—The LIFE Picture Collection/Getty Images
And
https://patentimages.storage.googleapis.com/pages/US3767201-1.png

Each game space is a mix of epistemic and productive action (in which one searches for better understanding and tries to make things better)

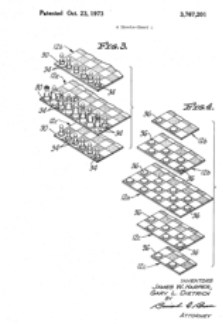
Some of our sharper theoretical ideas about relations between people & technology, individual action and social issues, economy, politics, society, identity etc have been worked out on 'higher planes' – in which our professional agency is often quite limited.

Knowing which planes/games you can play (at any one time; for any one project) is key

Pulling ideas between games can be v useful; mapping connections between game spaces too; spotting moments when one can work in other spaces – all strategically important & part of 'moral know how'

Such fluency is important for ourselves as educational workers but also important as something we want to help our students develop.

But also bear in mind the limits of the metaphor – games spaces & their relations shift; they are undergoing dynamic construction, often by powers outside our control – but not always.



Epistemic fluency

The mix of kinds of useful knowledge and ways of knowing, and relations between knowledge and action varies between spaces

Spaces are dynamic and open to shaping

Epistemic & productive spaces

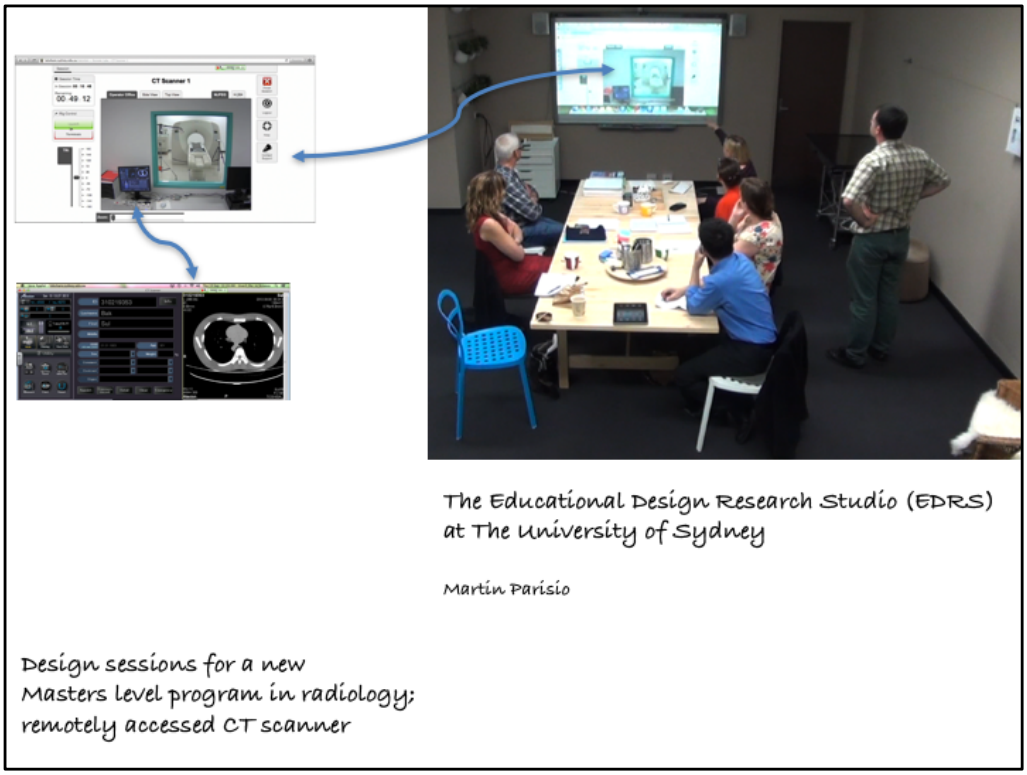
National/political – voting, participation in political parties, movements, campaigning organisations etc

Sectoral – shaping policy for HE

Institutional – shaping own university's mission, policies, strategies, etc

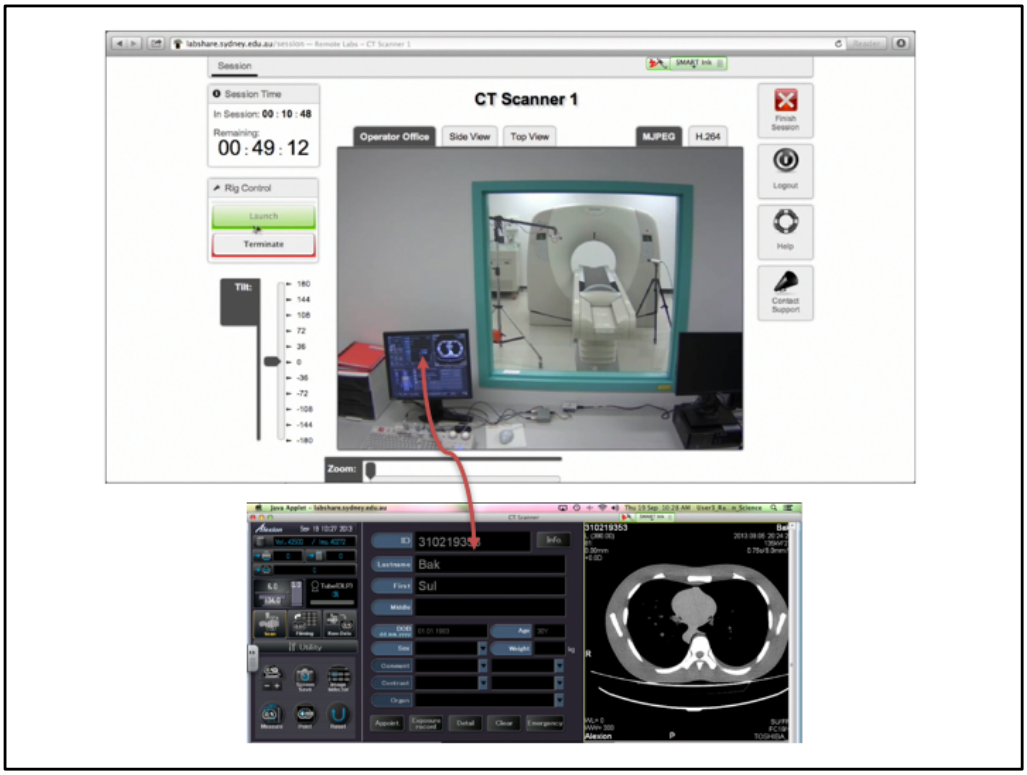
Broad curriculum – (re)shaping courses, curricula, assessment regimes etc

Specific/local (re)design work on tools/spaces; tasks, etc.



The next few slides are from current/recent PhD research in CRLI at Sydney. Collectively, they portray some of the complex meshworks of materials, digital tools, spaces, people, tasks etc that we find in contemporary HE. Each project is concerned with understanding some of this complexity – most projects are also concerned with improving the set-ups that are portrayed.

This slide shows a team of educational designers and academic staff from Health Sciences in the EDRS. The design team are working on a web-based interface that students will use when learning how to remotely control a CT scanner. The real CT scanner appears in the middle of the top left image, seen through a window from a real control room. These appear as video imagery in a web page. The design team are using an interactive whiteboard in the EDRS to view & discuss the student interface. We (as design researchers) are making video recordings of them (and us) – the right hand image is a grab from one of several video streams and time lapse still image streams.



A closer view of (parts of) the setup.

In this image we can see the real CT scanner through the control room window, plus a computer display showing data from and controls for the real scanner, plus a web page that allows (even more) remote control of the scanner.

This is a similar genre to remote access labs (used in science & engineering for example), but is also about learning the professional tools of the trade in a situation made even more realistic by the growing practices of 'e-health', 'remote medicine' etc. (Very important in rural/remote areas of Australia.)

This is from some of Martin Parisio's PhD work. He's a PhD candidate at the University of Sydney, with a 'day job' as an educational designer at the University of New South Wales also in Sydney).

Some of Martin's earlier work is here: Parisio, M. L. (2012). *Enabling student autonomy: Learning spaces and emerging technologies.* Paper presented at the E-Learning in a changing landscape of emerging technologies and pedagogies, Hong Kong.
http://www.academia.edu/download/30978453/parisio_paper_citers_hku_2012_2.pdf

240 seat open plan biosciences lab;
mixing students (all years) and staff from e.g.
biomedical, veterinary and health sciences, and
molecular biosciences; mounted, movable desktop
computers – multiple comms channels;
directional speakers for targetted audio

The X-Lab
Charles Perkins Centre
The University of Sydney

Tina Hinton, Phil Poronnik,
Pippa Yeoman et al

The X-Lab in the Charles Perkins Centre Hub building at Sydney Uni. The CPC is a very large research and education centre, a home for interdisciplinary research focussed on Obsesity, Diabetes & Cardiovascular disease. The X-lab opened three years ago.

Research site for Tina Hinton, who is studying for her *second* PhD. She's an academic who teaches in this space and played a substantial role in its design.

Publsihed studies:

Hinton, T., Yeoman, P., Carvalho, L., Parisio, M., Day, M., Byrne, S., . . . Goodyear, P. (2014). Participating in the communication of science: identifying relationships between laboratory space designs and students' activities. *International Journal of Innovation in Science and Maths Education, 22*(5), 30-42.

Hinton, T., Yeoman, P., Ashor, L., & Poronnik, P. (2016). Spaces enabling change. In L. Carvalho, P. Goodyear, & M. de Laat (Eds.), *Place-Based Spaces for Networked Learning* (pp. 207-224). London: Routledge.

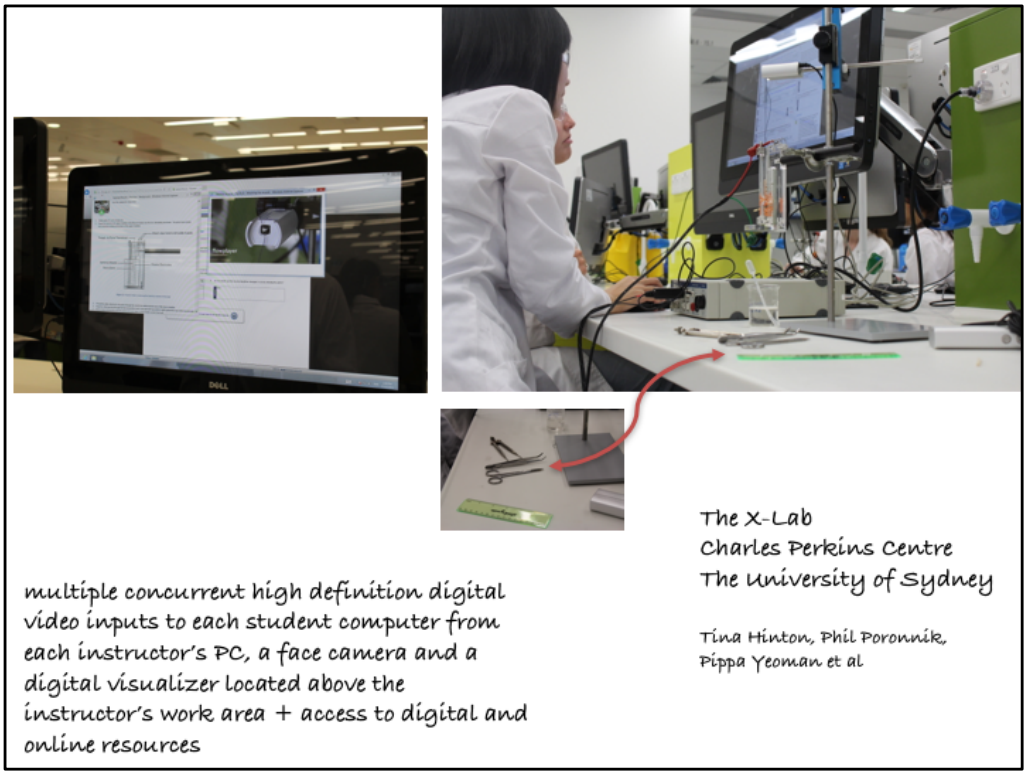
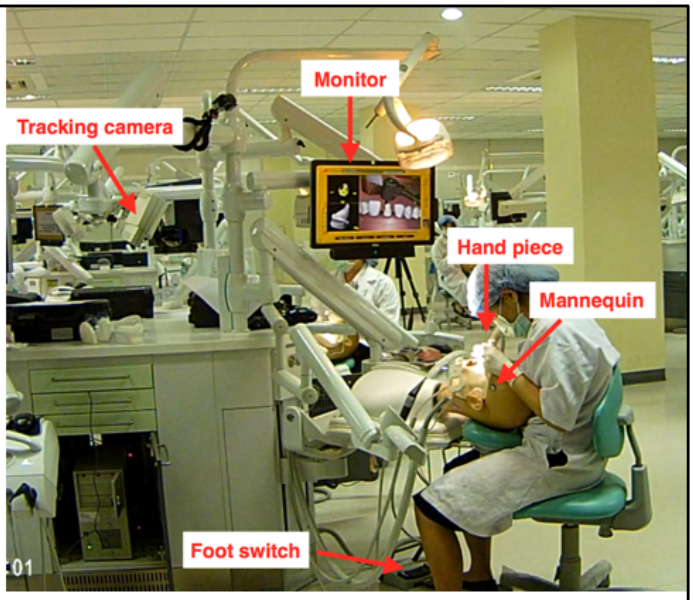


Figure 2. Mounted, moveable desktop computers in the X Lab which allow access to multiple modes of communication, including multiple concurrent high definition digital video inputs to each student computer from the instructor's PC, a face camera and a digital visualizer located above the instructors' work area, alongside access to digital and online resources.

Learning in small and large groups, with cohorts from multiple disciplines (including biomedical, veterinary and health sciences, and molecular biosciences), different years of study, as well as a range of units of study and degree programs. They allow academic, technical and support staff to work side by side.



DentSim Prosthodontics
Simulation Lab
Mahidol University, Bangkok

Punyanit Rungnava (Nat)

Prosthodontics simulation lab at Mahidol University, Bangkok, Thailand.
Research setting for PhD student Punyanit (Nat) Rungnava, who is also an academic teaching in that space.

Students in the pictures are learning to make and fit implants, dentures etc.

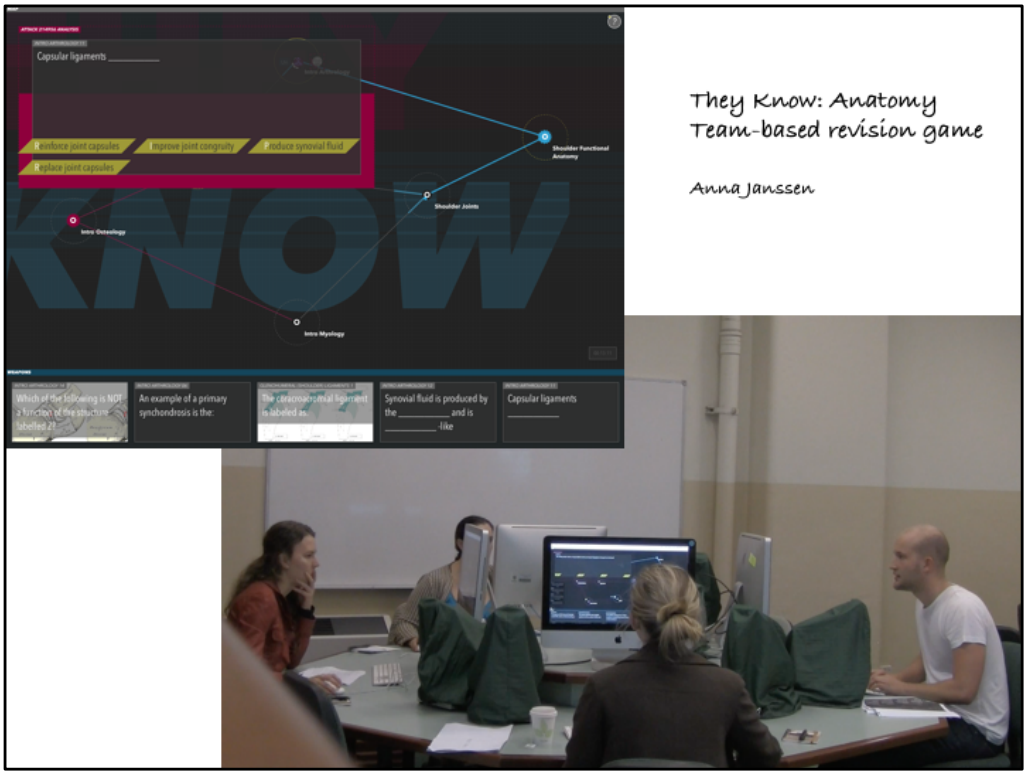
The simulation system gives them live feedback on aspects of their work.
The student-prosthodontist needs to be careful about their positioning, in relation to the work itself, the patient and the monitoring facilities of the simulator.

This is one of the largest DentSim installations in the world.

This gives a sense of the scale of the lab.

We also see an episode in which a member of staff supervising the students has them gathered together to demonstrate a point.

It's important for the design of the space to allow easy circulation of instructors and to allow smooth transitions from individual to whole class activities and back again.



This is from Anna Janssen's PhD research. Anna works as a project manager in the Health Sciences Faculty at the University of Sydney – her 'day job' involves managing a range of online education projects, designed & developed for people working in the health sector.

One of the main elements of her PhD research involved Anna designing a game environment to help medical students revise their anatomical knowledge.

She designed a team-based game in which competing teams of students race each other – aiming to capture territory by answering questions.

The game is therefore using a spatial metaphor in both the organisation of knowledge and the game mechanics.

In the lower picture we see a team of four students playing the game. Location of the team members turned out to be a significant factor – though it wasn't a design issue in the original conception of the software. Placing teams in different rooms, and positioning members of the same team so they can make eye contact and share plans and answers without being overheard by the opposing team, are important in shaping team interaction and strategies.

A publication from early work:
Janssen, A., Shaw, T., Goodyear, P., Kerfoot, B., & Bryce, D. (2015). A little healthy competition: using mixed methods to pilot a team-based digital game for boosting medical student engagement with anatomy and histology content. *BMC Medical Education, 15*(173). doi:10.1186/s12909-015-0455-6

Prototyping the multi-touch design table in the EDRS (Roberto Martinez Maldonado)

I may skip this slide to save time.

The stills are from research by Roberto Martinez-Maldonado while he was still part of the Laureate team at the University of Sydney. It shows the EDRS during a pilot test of the CoCoDes multitouch design table. This is a research tool, not (yet) a serious design tool.

CoCoDes allows designers to work with design patterns to create a sequence of learning activities, and to get realtime displays of such things as the amount of student time being spent on different kinds of activity.

Martinez-Maldonado, R., & Goodyear, P. (2016). *CoCoDeS: Multi-device Support for Collocated Collaborative Learning Design*. Paper presented at the 28th Australian Conference on Human-Computer Interaction (HCI) (OZCHI 2016), Launceston, Tasmania.
Martinez-Maldonado, R., Goodyear, P., Kay, J., Thompson, K., & Carvalho, L. (2016). *An actionable approach to understand group experience in complex, multi-surface spaces*. Paper presented at the CHI'16.
Martinez-Maldonado, R., Goodyear, P., Carvalho, L., Thompson, K., Hernandez-Leo, D., Dimitriadis, Y., . . . Wardak, D. (2017). Supporting collaborative design activity in a multi-user digital design ecology *Computers in Human Behavior, 71*, 327–342.

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ASSOCIATION FOR LEARNING TECHNOLOGY ALT

Why are we talking about learning *spaces* at a learning *technology* conference?

We can rarely design, manage, use, evaluate, analyse or understand:

- 'physical' learning spaces
  without reference to digital technologies
- 'digital' technologies
  without reference to sites of use

https://altc.alt.ac.uk/groups/learning-spaces-sig/ #lssig

It may be that this point doesn't need making, especially now there is an active ALT Learning Spaces SIG.

But this and the next slide help organise the argument about why trying to keep the physical and digital separate is likely to lead to practical problems.

Plus Learning tech isn't (just) about exploring the affordances of new gadgets; it's a professional field and a discipline with useful (and improvable) ideas, methods, experience etc.

Learning tech has ways of using ideas about learning **to design for learning** which is physically/digitally/socially/epistemically situated: but this hasn't always proved easy to share

Most architects, campus infrastructure planners, furniture and interior designers *et al* do not **yet** have this expertise.

https://altc.alt.ac.uk/groups/learning-spaces-sig/ #lssig

A more expansive sense of the problem space of learning technology, reflecting:

The accelerating interpenetration of the physical and digital (Mitchell)

Digital materialities (Pink)

Adaptive sensory environments and sentient cities (Lehman, Shepard)

Heterogeneous learning networks; complex assemblages, meshworks or entanglements of people and things (Carvalho, Goodyear, Yeoman, Knappett, Ingold, Parchoma, Fisher & Dovey et al)

Distributed cognition, extended minds, learning and knowing as collective achievements of whole ecosystems (Salomon, Clark, Damsa & Jornet)

Carvalho, L., & Goodyear, P. (Eds.). (2014). *The architecture of productive learning networks*. New York: Routledge.

Carvalho, L., Goodyear, P., & de Laat, M. (Eds.). (2017). *Place-based spaces for networked learning*. New York: Routledge

Clark, A. (2008). *Supersizing the mind: embodiment, action, and cognitive extension*. Oxford: Oxford University Press.

Damsa, C. I., & Jornet, A. (2017). Revisiting learning in higher education—Framing notions redefined through an ecological perspective. *Frontline Learning Research, 4*(4), 39-47.

Fisher, K., & Dovey, K. (2016). Plans and Pedagogies. In K. Fisher (Ed.), *The Translational Design of Schools* (pp. 159-177): Springer.

Ingold, T. (2011). *Being alive: essays on movement, knowledge and description*. Abingdon: Routledge.

Knappett, C. (2011). Networks of objects, meshworks of things. In T. Ingold (Ed.), *Redrawing Anthropology: Materials, Movements, Lines* (pp. 45-63): Ashgate.

Knappett, C. (Ed.) (2013). *Network analysis in Archaeology: new approaches to regional interaction*. Oxford: Oxford University Press.

Lehman, M. L. (2017). *Adaptive sensory environments: an introduction*. Abingdon: Routledge.

Mitchell, W. J. (1995). *City of bits: space, place, and the infobahn*. Cambridge Mass: MIT Press.

Mitchell, W. J. (2003). *Me++: the cyborg self and the networked city*. Cambridge Mass: MIT Press.

Parchoma, G – papers at the ALTC2017 conference

Pink, S., Ardèvol, E., & Lanzeni, D. (Eds.). (2016). *Digital materialities: design and anthropology*. London: Bloomsbury.

Salomon, G. (Ed.) (1993). *Distributed cognitions: psychological and educational considerations*. Cambridge: Cambridge University Press.

Shepard, M. (Ed.) (2011). *Sentient city: ubiquitous computing, architecture, and the future of urban space*. Cambridge Mass: MIT Press.

Yeoman, P. (2015). *Habits & habitats: an ethnography of learning entanglement.* (PhD), University of Sydney. [open access: http://hdl.handle.net/2123/13982]

Useful design knowledge: from empirical studies

Close observation of people designing (for) these spaces shows them dealing with complex practical problems that normative design models struggle to capture.

Designers reduce the complexity in a number of (often implicit) ways:

Taking learner *activity* as central/foundational
Paying close attention to infrastructure

- Reasoning about relations between tools & other artefacts, such that they work together and come to hand when needed at learntime

This may be easier with (professional/academic) 'apprenticeship' learning?

Having set up complex learning spaces (entangling physical & digital) as an important class of design problem, the talk now turns to 'useful design knowledge'.

In the context of design for learning, what is this?

This is both a descriptive and a normative project – insights from observations of design practice interwoven with theorising and modelling practice; importing ideas from other areas of design research; rational reconstructions of design work, etc.

It's important to note that the kinds of complex spaces illustrated in the earlier slides *are* designable – people find it challenging to design them, and to analyse how they now function (for the purposes of enhancement and/or sharing design ideas). But they do manage to get the job done.

Our ways of theorising how design for learning should be done – normative models of design, design principles etc – struggle to capture this kind of work.

As is often the case on learning tech, practical innovation moves ahead of our abilities to say (in more formal terms) how such practice should proceed. This may not seem to be a problem (it works in practice), but the difficulties of making more abstract representations of what's going on make it difficult to share insights (other than in the most concrete of terms).

Useful design knowledge: theorising the problem space

Attributes/qualities of space do not determine learning outcomes or learning activity

Shaping & influencing

Neither random nor deterministic

Classic models of instructional design tend to assume a compliant learner – they may not be expressed in deterministic language, but they leave little room for learner agency.

The reaction against instructional design in the 1990s (neo-constructivism etc) was partly a response to the need to recognise learner diversity and learner agency, but abandoned the toolkit of instructional design – just at a time when educators became interested in much more complex learning outcomes and learning environments.

Growing interest in design for learning in the last 10-15 years has also seen designers and design theorists navigating waters between highly prescriptive and laissez faire approaches.

Some of my writing on this: see my website or contact me

Goodyear, P. (1997). The ergonomics of learning environments: learner-managed learning and new technology *Creacion de materiales para la innovacion educativa con nuevas tecnologias* (pp. 7-17). Malaga: Instituto de Ciencias de la Educacion, Universidad de Malaga.
Goodyear, P. (1999). Educational technology, virtual learning environments and architectural practice. In D. Ely, L. Odenthal, & T. Plomp (Eds.), *Educational science and technology: perspectives for the future* (pp. 74-91). Enschede: Twente University Press.
Goodyear, P. (1999). New technology in higher education: understanding the innovation process. In A. Eurelings, F. Gastkemper, P. Komers, R. Lewis, R. van Meel, & B. Melief (Eds.), *Integrating Information and Communication Technology in Higher Education* (pp. 107-136). Deventer: Kluwer.
Goodyear, P. (1999). Pedagogical frameworks and action research in open and distance learning. *European Journal of Open and Distance Learning*.

Useful design knowledge

Correlational data may help identify interesting patterns, associations or 'risk factors'

but

there is no substitute for an understanding of causes, mechanisms,

'how things actually work'

One can see the beginnings of a move towards understanding complex learning systems (etc) in 'realist' terms.

In my view, there's been too much research in ed tech (and education more generally) that looks for statistical associations between abstract variables (like 'engagement') and too little that looks closely at the actuality of learning activities and the actual interweaving of activity, tools, language etc. (I count myself among those who've overdone the correlational research.)

Perhaps a better way to put this is to say that now is the time for us all to be examining very closely how current complex sets of learning arrangements actually work.

Goodyear, P., & Ellis, R. (in press). Learning spaces research: framing actionable knowledge. In R. Ellis & P. Goodyear (Eds.), *Spaces of teaching and learning: integrating perspectives on research and practice*. Dordrecht: Springer.

Reimann, P. (2009). Time is precious: Variable- and event-centred approaches to process analysis in CSCL research. *International Journal of Computer-Supported Collaborative Learning, 4*, 239-257.

Useful design knowledge

Correlational data may help identify interesting patterns, associations or 'risk factors'

but

there is no substitute for an understanding of causes, mechanisms,

'how things actually work'

The study reported here in Education Next looked at statistical associations between using laptops in lectures and course grades achieved.

The research design did not try to capture what students were actually doing with/on their laptops during the lectures.

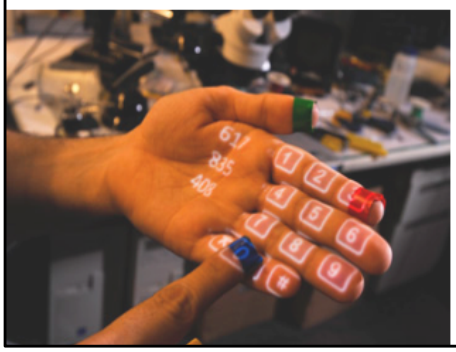
At a minimum, our research needs to focus in on
WHAT STUDENTS ARE ACTUALLY DOING

To be fair, the authors' discussion did mention possibilities that students might be doing different things, but this wasn't part of the research design.

Student activity is real – it has effects.

Useful design knowledge

Explaining the logic of a design can help make the design intentions (etc) more communicable – esp. to students



"... a successful design affords the meanings of all those stakeholders who can move an artifact through its lifecycle, making it part of a social process ... Unlike in highly structured situations, during the industrial era, for example, it is now less likely that projects succeed as intended. The need to enroll stakeholders into a project almost always amounts to delegating parts of a design to be filled in by its participants.

In the end, what an artifact becomes is what its network of stakeholders makes it to be."

Klaus Krippendorff (2006) *The semantic turn: a new foundation for design,* p186

I may also skip this one if time is tight.

Klaus Krippendorff has many interesting things to say about design. He's not writing about educational design, but many of his insights are applicable – some of them apply even more strongly in educational contexts than in the 'mainstream' design contexts he discusses.

My main point here is that we are not in a good position to 'handover' our educational designs to students if we can't articulate to them how they are meant to work.

We can't articulate their logic if we don't understand how the (implemented) design actually works….

NB this is not easy – esp where students take over the design and customise in significant ways; but there should always be the possibility of some account of design logic.

Kashmira Dave's research at Sydney sheds some light on the difficulties academic staff have in articulating the *purposes* of their designs.

Design for *active* learning has a focus on:

- What students (will) actually do – *not designable*
- The set of structuring resources needed to guide and scaffold the intended activity – *designable*

Bearing in mind:

- Many learning activities have light or no direct supervision
- Working memory is limited – understanding what to do (next), and why, can easily produce cognitive overload, esp. with new tasks/environments; e.g. getting lost in the details, surface approaches to task completion, etc
- **Structuring resources** can include task specifications, tools and other artefacts in the learning space, classroom layout, scripts and other ways of allocating roles, dividing labour, choreographing collaboration, etc.

I'm now bringing the storyline to meet some of the propositions that I've shared in earlier work on activity centered analysis and design (ACAD)

Five useful papers on this can be downloaded from my website.

Activity-Centered Analysis and Design (ACAD) framework

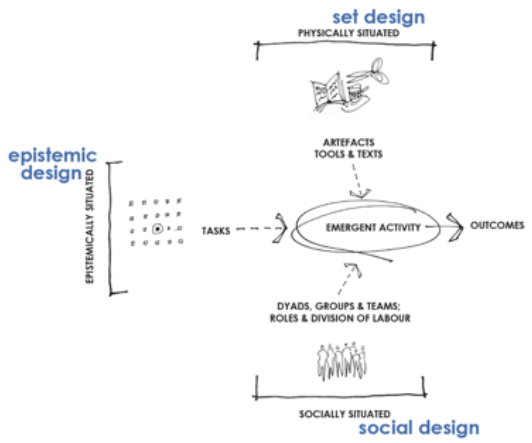


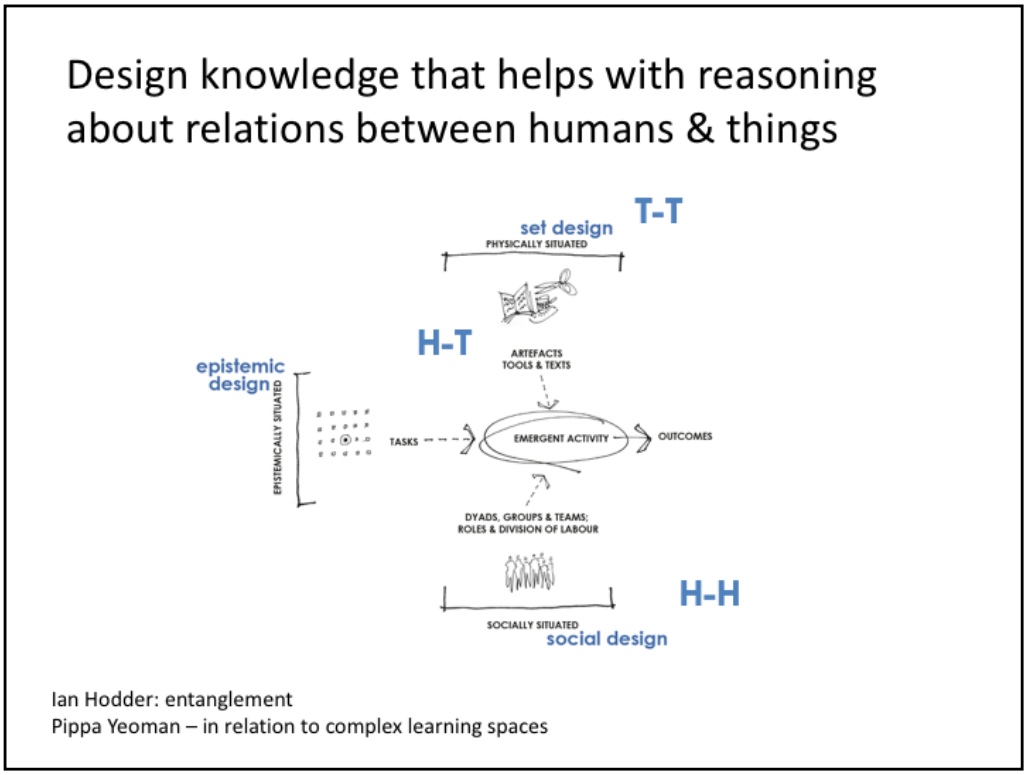
Image: Carvalho & Garduño Freeman, 2016

The ACAD approach is just one way of thinking about design for and analysis of complex learning situations.

The main tenets are in these open-access articles:

Goodyear, P. (2015). Teaching as design. *HERDSA Review of Higher Education, 2*.

Goodyear, P., & Dimitriadis, Y. (2013). In medias res: reframing design for learning. *Research in Learning Technology, 21*. doi:http://dx.doi.org/10.3402/rlt.v21i0.19909



T – 'things' H – 'humans'
Reasoning about the relations between T-T, H-H, & H-T typically draws on a variety of forms of knowledge and ways of knowing. Such reasoning is an example of epistemic fluency – recognising and being able to participate in a range of epistemic games.

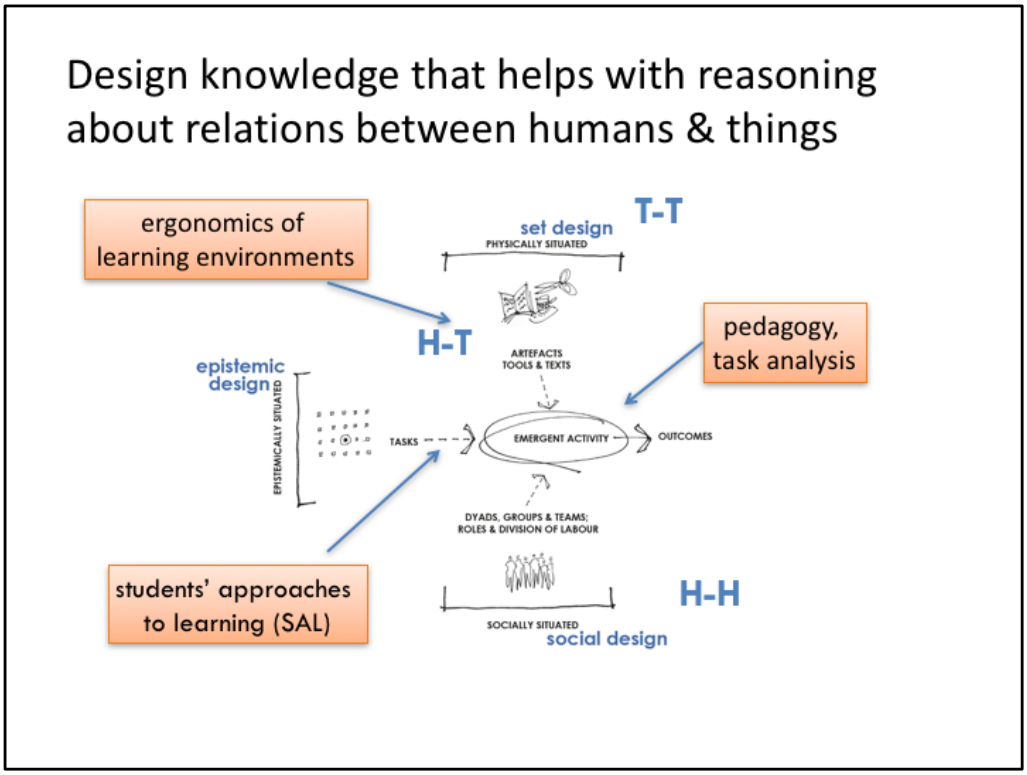
Hodder, I. (2012). Entangled: an archaeology of the relationships between humans and things. Chichester: Wiley-Blackwell.

Yeoman, P. (2015). *Habits & habitats: an ethnography of learning entanglement.* (PhD), University of Sydney. http://hdl.handle.net/2123/13982

Yeoman, P. (2017). A study of correspondence, dissonance, and improvisation in the design and use of a school-based networked learning environment. In L. Carvalho, P. Goodyear, & M. de Laat (Eds.), *Place-Based Spaces for Networked Learning* (New York: Routledge.

https://pippayeoman.wordpress.com

Markauskaite, L., & Goodyear, P. (2017). *Epistemic fluency and professional education: innovation, knowledgeable action and actionable knowledge*. Dordrecht: Springer.

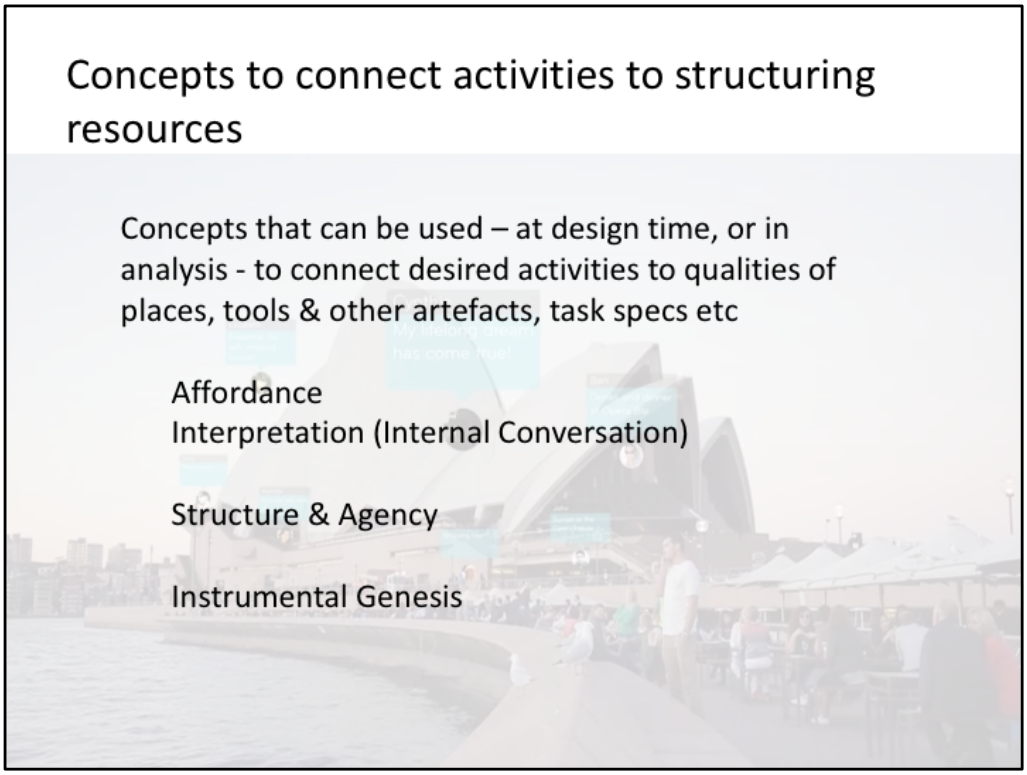


We have some (incomplete but nevertheless useful) bodies of knowledge on which to draw in reasoning about some of these key relationships

For example, what goes on when students interpret task requirements and improvise their own learning activities is a territory that has been studied by researchers interested in 'students approaches to learning' or SAL. This has a long history in HE (deep & surface etc).

One important claim in this diagram is that relationships between 'things' (artefacts, features of learning/work places etc) and activities (H-T) are not *pedagogical* relationships. Areas of R&D like ergonomics may be more appropriate. I conjecture that this could prove useful in convincing campus infrastructure managers, architects, builders & others of the *necessity* of some design elements – offering sharper arguments than we typically find with pedagogical argumentation.

"Students need x to do the job/complete the task"



I may not get through all 3 examples. Each example takes a slightly different perspective on these kinds of relationships.

My argument is that these kinds of actionable concepts should be featuring more frequently in everyday educational design/analysis discussions and that awareness of the relationships they help us speak about would help lift the quality of discussion in educational policy/strategy discourse.

Affordance – our primary design concept

'the terms "afford" and "affordance" are lazy terms … these terms merely paper over deep cracks in our understanding … of why, given the extraordinary interpretive capabilities of humans, anything affords any one interpretation better than any other … something hidden and mysterious is going on whenever the terms "afford" and "affordance" make their appearance' (Harry Collins, 2010, *Tacit and explicit knowledge*, p36)

'the concept has drifted so far from its origins that it is now too ambiguous to be analytically useful' (Martin Oliver, 2005, *The problem with affordance*, p402)

Collins, H. (2010). *Tacit and explicit knowledge*. Chicago: The University of Chicago Press.

Oliver, M. (2005). The problem with affordance. *E-learning, 2*(4). doi:doi: 10.2304/elea.2005.2.4.402

Oliver, M. (2011). Technological determinism in educational technology research: some alternative ways of thinking about the relationship between learning and technology. *Journal of Computer Assisted Learning, 27*, 373–384.

Oliver, M. (2013). Learning technology: Theorising the tools we study. *British Journal of Educational technology, 44*(1), 31–43.

Affordance & Interpretation

FAST	'System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control …	AFFORDANCE low cognitive load
SLOW	System 2 allocates attention to the effortful mental activities that demand it … The operations of System 2 are often associated with the subjective experience of agency, choice and concentration'	INTERPRETATION high cognitive load

Daniel Kahneman, 2011, *Thinking fast and slow*

Lucila Carvalho and I talk about this in:

Goodyear, P., & Carvalho, L. (2013). The analysis of complex learning environments. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: designing and delivering e-learning* (pp. 49-63): RoutledgeFalmer.

See also
Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus and Giroux.

Structure and Agency

Structures – objective, out in the world, constraints **and enablements**

Agency – subjective, personal; needed for those constraints and enablements to have causal powers

- Structures are not just social – but also material ('landscapes') and epistemic ('taskscapes')
- Structures are complex – multilayered + hybrid (mixes/tangles of social, material, epistemic etc)
- Agency is similarly layered and diverse

On structure & agency from a social perspective, see: Archer, M. (2003). *Structure, agency and the internal conversation*. Cambridge: Cambridge University Press.
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Instrumental Genesis

Each **instrument** that we use in our activities is a hybrid of two 'components'

An **object** *plus* one or more **utilisations schemes**

Objects have relatively stable properties

Utilisation schemes – and instruments – evolve over time

Utilisation schemes are personal, but often have social origins

Lonchamp, J. (2012). An instrumental perspective on CSCL systems. *International Journal of Computer-Supported Collaborative Learning, 7*(2), 211-237. doi:10.1007/s11412-012-9141-4
Rabardel, P., & Beguin, P. (2005). Instrument mediated activity: from subject development to anthropocentric design. *Theoretical issues in ergonomic science, 6*(5), 429-461.
Rabardel, P., & Bourmaud, G. (2003). From computer to instrument system: a developmental perspective. *Interacting with Computers, 15*(5), 665-691. doi:10.1016/s0953-5438(03)00058-4
Ritella, G., & Hakkarainen, K. (2012). Instrumental genesis in technology-mediated learning: From double stimulation to expansive knowledge practices. *International Journal of Computer-Supported Collaborative Learning, 7*(2), 239-258. doi:10.1007/s11412-012-9144-1
Verillon, P., & Rabardel, P. (1995). Cognition and artifacts: a contribution to the study of thought in relation to instrumented activity. *European Journal of Psychology of Education, 10*(1).
White, T. (2008). Debugging an Artifact, Instrumenting a Bug: Dialectics of Instrumentation and Design in Technology-Rich Learning Environments. *International Journal of Computers for Mathematical Learning, 13*(1), 1-26. doi:http://dx.doi.org/10.1007/s10758-007-9119-x
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Concepts to connect activities to structuring resources

Concepts that can be used – at design time, or in analysis - to connect desired activities to qualities of places, tools & other artefacts, task specs etc

Affordance
Interpretation (Internal Conversation)

Structure & Agency

Instrumental Genesis

OR OTHERS – but SOME!

See also on this:

Overdijk, M., van Diggelen, W., Kirschner, P., & Baker, M. (2012). Connecting agents and artifacts in CSCL: Towards a rationale of mutual shaping. *International Journal of Computer-Supported Collaborative Learning, 7*(2), 193-210. doi:10.1007/s11412-012-9143-2

Closing points

- Design as reasoning about relations between multiple valued outcomes, valued activities and the mix of tasks, tools, spaces & divisions of labour required to structure/scaffold both task completion and growth (of agency)
- Knowing what our students are actually doing and learning
- Epistemic fluency: knowing what kinds of knowledge are available and what are most appropriate for each piece of the design task at hand

Images: Michael Johnson & Michael Khoo.

Further reading – recommended books. My two favourites in bold:

Boddington, A., & Boys, J. (Eds.). (2011). *Re-shaping learning: a critical reader - the future of learning spaces in post-compulsory education*. Rotterdam: Sense Publishers.
Boys, J. (2011). *Towards creative learning spaces: re-thinking the architecture of post-compulsory education*. New York: Routledge.
Boys, J. (2015). *Building better universities: strategies, spaces, technologies*. New York: Routledge.
Ellis, R & P. Goodyear (Eds.) (In press), *Spaces of teaching and learning: integrating perspectives on research and practice*. Dordrecht: Springer.
Fisher, K. (Ed.) (2016). *The translational design of schools: an evidence-based approach to aligning pedagogy and learning environments*. Rotterdam: Sense.
Imms, W., Cleveland, B., & Fisher, K. (Eds.). (2016). *Evaluating learning environments: snapshots of emerging issues, methods and knowledge*. Rotterdam: Sense.
Temple, P. (Ed.) (2014). *The physical university: contours of space and place in higher education*. Abingdon Routledge.