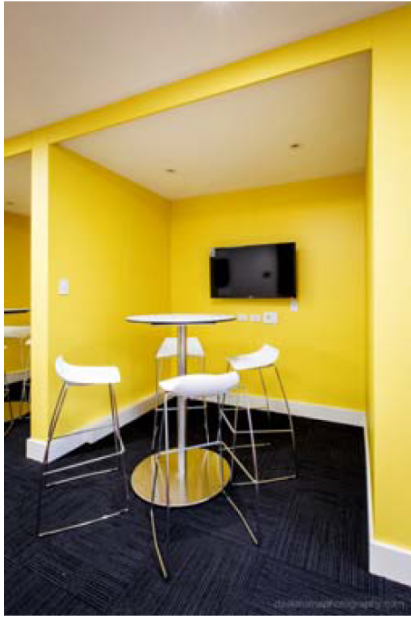## CSU Campus Learning Space Design
Principles & Priorities

Learning spaces at CSU are not defined by walls: they flow seamlessly between formal and informal use as well as including outdoor learning spaces, both formal and informal. Where practical, these principles apply to workplace learning spaces off-campus.

Learning spaces will be regularly evaluated by staff and student users for improvement and enhancement. It is recognised that timetabling practices may also affect usage and uptake and that therefore timetable must form part of any evaluation.

Whilst spaces can themselves be agents for change in teaching practice, culture change cannot be achieved without professional development and relevant policy change. CSU, through the Division of Student Learning in conjunction with other organisational units, will provide professional development for teaching staff and showcase examples of good practice.

Design Principles

Design of Learning Spaces at CSU will be guided by pedagogy and educational research (Appendices A and B).

Whilst bearing in mind CSU's particular need to balance investment in virtual and on-campus environments, campus spaces will be:
- student centred, collaborative and engaging
- varied in terms of busy, quiet, collaborative
- welcoming and appealing for a diverse cohort of students and address accessibility issues
- comfortable, aesthetically pleasing and inherently flexible
- connected with the outdoors ensuring access to light and air and extending the learning experience
- connected, physically and virtually, by harnessing appropriate learning technologies and supported by both academic and technical assistance
- secure for students and staff, especially if used beyond normal business hours.

Objectives

- stimulate active and participatory learning through innovative layout and contemporary, appropriate technologies including support for 'bring your own device'
- promote mutual knowledge creation and sharing, between student peers and with their teachers
- support teaching staff in a range of pedagogies including authentic practice-based learning
- provide facilities for synchronous interaction on-campus, between campuses and between off-campus and on-campus students and teachers
- promote sustainability with reasonable costs, appropriate materials, building practices, and technologies.

Broad Priorities

Lecture spaces

- decommission some theatres and enhance one or two on main theatres on Wagga & Bathurst as flexible, bright, collaborative, connected visible spaces
- technology enabled for high quality resource production (not only CSU Replay)
- access to break out spaces which would also be useful for conferences

Collaborative learning spaces

- increase large flat floor collaborative learning spaces
- connected for multi-campus collaboration as well as collaboration with DE students
- likewise surrounded by smaller collaboration spaces for break out

Videoconference spaces

- since videoconference rooms are currently only used by staff, reshape some rooms for use by students
- enhance effectiveness and comfort of videoconference rooms for both staff and student collaboration
- enhance some videoconference rooms so they approach telepresence quality

Professional spaces

- design some videoconference rooms so they simulate authentic learning spaces e.g. board rooms
- audit laboratory spaces to ensure safety and alignment to professional standards

Maker Spaces /ThinkWorks /Learning Studios

- develop innovative combined staff/student production facilities resourced by staff & students who can help with creative design not just technical production
- enable these for support of Virtual Campus as well as North, South & Central

CSU Learning Environments Committee   Version **5.0** 15th April 2015

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Appendix B: Annotated Bibliography

Bennett (2006). *First Questions for Designing Higher Education Learning Spaces*

- Bennett (2006) suggests that a consideration when designing learning spaces should be the character of the type of learning that is desired to take place. Bennett (2006) proposes six questions which should be asked when designing a learning space and also during the creation of a learning space. These include: "What is it about the learning that will happen in this space that compels us to build a bricks and mortar learning space, rather than rely on a virtual one?"; "How might this space be designed to encourage students to spend more time studying and studying more productively?"; "For what position on the spectrum from isolated study to collaborative study should this learning space be designed?"; "How will claims to authority over knowledge be managed by the design of this space? what will this space affirm about the nature of knowledge?"; "Should this space be designed to encourage student/teacher exchanges outside of the classroom?"; & "How might this space enrich educational experiences?" (Bennett, 2006, pp. 15-21).
- "...design features make certain behaviors likely but not certain...Well designed spaces afford their occupants the opportunity to act in certain ways but do ensure that those activities will happen" (Bennett, 2006, p. 2).

Boys, J. (2011). *Towards creative learning spaces: Re-thinking the architecture of post-compulsory education*. **Retrieved from** http://www.csuau.eblib.com.ezproxy.csu.edu.au/patron/Read.aspx?p=667938

- This book offers new ways of investigating relationships between learning and the spaces in which it takes place. It suggests that we need to understand more about the distinctiveness of teaching and learning in post-compulsory education, and what it is that matters about the design of its spaces. Starting from contemporary educational and architectural theories, it suggests alternative conceptual frameworks and methods that can help map the social and spatial practices of education in universities and colleges; so as to enhance the architecture of post-compulsory education.

Boys, J. (2014). *Building better universities: Strategies, spaces, technologies*. **New York: Routledge [EBOOK in CSU Library].**

Brooks (2012). *Space and Consequences: The Impact of Different Formal Learning Spaces on Instructor and Student Behavior*

- Brooks (2012) investigated the impact of a traditional classroom and a technologically enhanced active learning classroom (ALC) on instructor behavior, classroom activities, and levels of on-task student behaviour at a higher education institution. Results of the study showed that although "traditional classrooms encourage lecture at the expense of active learning techniques while ALCs marginalize the effectiveness of lecture while punctuating the importance of active learning approaches to instruction" both the types of classrooms were "effective at producing high levels of on-task student behaviour" (Brooks, 2012, p. 8).

Carr, N., & Fraser, K. (2014). Factors that shape pedagogical practices in next generation learning spaces. *The future of learning and teaching in next generation learning spaces* **(Vol. 12, pp. 175-198): Emerald Group Publishing Limited.** http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012013

- International figures on university expenditure on the development of next generation learning spaces (NGLS) are not readily available but anecdote suggests that simply retrofitting an existing classroom as an NGLS conservatively costs $AUD200,000, while developing new buildings often cost in the region of 100 million dollars and over the last five years, many universities in Australia, Europe and North America have developed new buildings. Despite this considerable investment, it appears that the full potential of these spaces is not being realised. While researchers argue that a more student centred learning approach to teaching has inspired the design of next generation learning spaces (Tom, Voss, & Scheetz, 2008) and that changed spaces change practice (Joint Information Systems Committee, 2009) when 'confronted' with a next generation learning spaces for the first time, anecdotes suggest that many academics resort to teaching as they have always taught and as they were taught. This chapter highlights factors that influence teaching practices, showing that they are to be found in the external, organisational and personal domains. We argue that in order to fully realise significant improvements in student outcomes through the sector's investment in next generation learning spaces, universities need to provide holistic and systematic support across three domains (the external, the organisational and the personal domains) by changing policies, systems, procedures and localised practices to better facilitate changes in teaching practices that maximise the potential of next generation learning spaces.

Choi, Guerin, Kim, Brigham & Bauer (2013). *Indoor Environmental Quality of Classrooms and Student Outcomes: A Path Analysis Approach.*

- Choi et al. (2013) investigated the effect of indoor environmental quality (IEQ), in particular, the impact of IEQ in terms of students' satisfaction with IEQ, their perceived learning, and course satisfaction. The IEQ of the classrooms included thermal conditions, indoor air quality, acoustic conditions, lighting conditions, furnishings, aesthetics, technology, and view conditions (Choi et al., 2013). Results showed "significant relationships between students' satisfaction with thermal conditions, IAQ, acoustic conditions, lighting conditions, furnishings, aesthetics, technology, and view conditions and their satisfaction with the overall IEQ of classroom environments" (Choi et al., 2013, p. 10).
- Based on the results of the study, Choi et al. (2013), proposes that, "designing a classroom with attention to sustainable IEQ criteria, e.g., thermal conditions, IAQ, acoustic conditions, lighting conditions, furnishings, aesthetics, technology, and view conditions, is associated with positive student outcomes including their overall satisfaction with classroom IEQ and its perceived effect on their learning, that lead to students' satisfaction with courses" (p. 11).

Cleveland, B., & Fisher, K. (2014). The evaluation of physical learning environments: A critical review of the literature. *Learning Environments Research, 17*(1), 1-28. doi: 10.1007/s10984-013-9149-3.
http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1007/s10984-013-9149-3

- This article critically reviews the methodologies and methods that have been used for the evaluation of physical learning environments. To contextualize discussion about the evaluation of learning spaces, we initially chart the development of post-occupancy evaluation (POE) for non-domestic buildings. We then discuss the recent evolution of POE into the broader evaluative framework of building performance evaluation. Subsequently, a selection of approaches used to evaluate higher education and school learning environments are compared and critically analyzed in view of contemporary approaches to teaching and learning. Gaps in these evaluative approaches are identified and an argument is put forward for the evaluation of physical learning environments from a more rigorous pedagogical perspective. © 2013 Springer Science+Business Media Dordrecht.

Dinmore, S. (2013). *Flexibility and function: Universal design for technology enhanced active classrooms.* **Paper presented at the 30th Annual conference on Australian Society for Computers in Learning in Tertiary Education, ASCILITE 2013.** http://www.ascilite.org/conferences/sydney13/program/papers/Dinmore.pdf

- This paper discusses the evolution of pedagogies used in technology enhanced learning spaces and their intersection with the principles of Universal Design for Learning (UDL). It also argues that as the next generation of computer integrated classrooms are built we must not forget to design for inclusion. UDL provides a framework for developing course content that can be effective for all students including those from various equity students in a technology rich environment. This paper discusses these factors and outlines some elements of a pilot project at the University of South Australia as it completes construction of a new seven-storey learning centre – the Jeffrey Smart building. The paper in part explores the linkages between the flipped classroom model and UDL and argues for the principles of universal design as a solution to the current pressures within higher education to teach effectively in technology rich environments and the need to be inclusive.

Elsen, C. H.-v. d., & Palaskas, T. (2014). Transition to next generation learning spaces. In *The future of learning and teaching in next generation learning spaces* **(Vol. 12, pp. 199-218): Emerald Group Publishing Limited.** http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012014

- This chapter takes an implementation case study approach to inform project planners, senior academics, and academic developers about the design and implementation of a professional development (PD) program that prepared 700 faculty in an Australian university to reimagine their teaching practice. The catalyst for this transformation was the move from traditional classrooms to next generation learning spaces (NGLS) in the newly constructed and purpose-built environment of RMIT University's Swanston Academic Building (SAB). The study identifies the challenges and change management issues faced by the project team, faculty, and other stakeholders.
- Default teaching styles for many tertiary teachers can replicate the "best" and "worst" practices from their own student experience. As actors in their own classrooms tertiary teachers autonomously create learning environments that they consider appropriate to communicate the content, context, and culture of their particular discipline. The design and implementation of the PD and transition plan took into account the needs and perceptions of staff from each discipline area, the affordances of the new learning spaces, and their associated technologies.

- This chapter contributes to a growing body of knowledge about the experience of academic and teaching staff during transition from traditional to NGLS, providing a description of the process undertaken in one university, the outcomes achieved, and the lessons learnt.

Fisher, K., & Newton, C. (2014). Transforming the twenty-first-century campus to enhance the net-generation student learning experience: using evidence-based design to determine what works and why in virtual/physical teaching spaces. *Higher Education Research and Development*. **doi: 10.1080/07294360.2014.890566**
http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1080/07294360.2014.890566

- The twenty-first century has seen the rapid emergence of wireless broadband and mobile communications devices which are inexorably changing the way people communicate, collaborate, create and transfer knowledge. Yet many higher education campus learning environments were designed and built in the nineteenth and twentieth centuries prior to wireless broadband networks. Now, new learning environments are being re-engineered to meet these emerging technologies with significant challenges to existing pedagogical practices. However, these next generation learning environments (NGLEs) have not been evaluated thoroughly to see if they actually work as they are scaled up across the higher education system. Whilst there have been a range of NGLEs designed globally - with Australia leading in the past five years or so - it is timely that a more rigorous research methodology drawing from health facility evidence-based design is taken to evaluate their effectiveness in improving the student experience and learning outcomes. © 2014 HERDSA.

Germany, L. (2014). Learning space evaluations ? Timing, team, techniques. *The future of learning and teaching in next generation learning spaces* **(Vol. 12, pp. 267-288): Emerald Group Publishing Limited.**
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- Many universities are currently investing significant sums of money into refurbishing existing learning spaces and/or building further infrastructure (including Next Generation Learning Spaces (NGLS)) to support learning and teaching in the face-to-face context. While this is usually welcome by staff and students, there is often a concern that designs are not informed by input from appropriate stakeholders. This chapter brings together information from a range of sources to provide practical ideas and advice on designing robust, whole-of-lifecycle evaluations for learning space projects. By incorporating pre- and post-occupancy stages, involving a wide array of stakeholders and looking beyond surveys and focus groups as evaluation techniques, universities can ensure that future designs take into consideration the experiences and context of staff and students at the institution as well as lessons learned from previous projects.

Hadgraft, R., & Dane, J. (2014). Spaces for engaging, experiential, collaborative learning in higher education. *The future of learning and teaching in next generation learning spaces* **(Vol. 12, pp. 101-122): Emerald Group Publishing Limited.**
http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012010

- A key challenge for higher education institutions around the world is to provide active and engaging learning encounters for a new generation of students to develop their skills for work in a rapidly changing environment. Typically, these students are accustomed to being digitally connected 24/7 and they have real-time access to truly global learning resources. The challenge facing higher education providers is how to create active and engaging learning encounters within an aging stock of infrastructure by a generation of traditional academics, both of which generally foster teacher-led instruction. In considering this conundrum, this chapter is viewed through two lenses: (1) a teacher practising problem-based learning (PBL) for more than 20 years and (2) an educational planner who designs learning spaces. Together the paper explores the challenges of pedagogy and design, some disruptors that are making change imperative and, specifically, the opportunities available in both pedagogy and design to create new learning activities and spaces. The paper argues that curricula need to be dominated by collaborative investigation and problem solving in spaces that encourage and afford such activity.

Harvey & Kenyon (2013). *Classroom Seating Considerations for 21st Century Students and Faculty.*

- Quantitative, cross-sectional research study that explored students' perceptions of five different seating styles within typical classrooms in an urban public higher education institution. The five seating styles included: modern mobile chairs, tablet arm chairs, fixed tiered seating with tablet arms, rectangle tables with standard chairs, and trapezoid tables with chairs on casters. The Classroom Seating Rating Scale for Students (CSRS-S) was developed from the classroom and seating design literature to measure the dimensions of Comfort & Space, Learning Engagement, and Interactivity.
- Results showed that students preferred the modern mobile chair and trapezoid tables with chairs on casters over the other styles. The characteristics both of these seating styles possess is mobility.
- Recommendation: "Future research may attempt to determine corollaries between movable furniture, in particular the modern mobile chair, and literature about student and faculty satisfaction with learning

environments, some directly related to seating type (tablet arm chairs) and seating arrangements (rows and columns, U-shaped configurations)" (no page numbers).

Henshaw, Edwards & Bagley (2011). *Use of Swivel Desks and Aisle Space to Promote Interaction in Mid-sized College Classrooms.*

- This paper reports on an experimental classroom piloted during Spring Semester 2011 at the University of North Carolina at Chapel Hill which utilised clusters of stationary desks that swivel 360-degrees and aisle space to address the challenges encountered in traditional learning spaces. Henshaw, Edwards & Bagley (2011) state that "traditional designs discourage 1) face-to-face interaction among students, 2) instructor movement in the classroom, and 3) efficient transitions between different kinds of learning activities".
- Recommendations/future research:
  - To what degree can providing more open space in classrooms break down perceived barriers between instructors and students? Future research may seek to better understand how physical spaces might support wider student participation in discussion-based courses, wherein it is typical to observe a few students dominating the conversation.
  - What type of professional development and support is necessary to prepare instructors to be effective in this environment? Future research might consider the degree to which the classroom can encourage incremental experimentation with interactive techniques among instructors with very little experience using them. In other words, if provided a learning space that makes interaction easier, will instructors change their teaching strategies?

Hunley, S., & Schaller, M. (2006). *Assessing learning spaces.* **In D. G. Oblinger (Ed.), Learning spaces: EDUCAUSE. Retrieved from http://www.educause.edu/learningspaces**

Janz, K., Graetz, K., & Kjorlien, C. (2012). *Building collaborative technology learning environments.* **Paper presented at the SIGUCCS'12 - ACM Proceedings of the SIGUCCS Annual Conference. http://dl.acm.org.ezproxy.csu.edu.au/citation.cfm?id=2463195.2463200&coll=DL&dl=ACM&CFID=647945956&CFTOKEN=83460980**

- The rapid advance of technology has enabled students to use powerful technology both inside and outside of the classroom. A major issue facing higher education is whether students truly know how to use this technology, can our learning spaces support it, and can it be integrated with other technologies to extend students' capabilities? This paper focuses on the how Winona State University went about improving learning spaces on campus. It includes six major sections. First, the development of the e-Warrior: Digital Life and Learning Program and Technology Master Plan provided the foundation. Second, quantifying the quality of classroom spaces on campus through the development of an online database and a campus report card provided a common point of reference. Third, faculty members engaged in the design of new learning spaces on campus to align design with pedagogy. Fourth, new technologies supported the online delivery of what used to be classroom lecture, paving the way for classroom flipping. Fifth, the intersection between formal and informal learning spaces played a role in instruction. Sixth, WSU developed two new flipped classrooms; the Math Achievement Center and Visual Media Studio. The Math Achievement Center and Visual Media Studio are collaborative classrooms designed by faculty that demonstrate the potential of mobile computing integration. Finally, recommendations for improving learning spaces found on any campus are offered. This paper provides a replicable roadmap for developing collaborative technology learning environments and highlights the many successes and challenges you may experience along the way. Copyright © 2012 ACM.

Keppell, M. (2014). Personalised learning strategies for higher education. *The future of learning and teaching in next generation learning spaces* **(Vol. 12, pp. 3-21): Emerald Group Publishing Limited. http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012001**

- This chapter will explore how the places of learning might look in next generation learning spaces where learners traverse physical and virtual spaces using personalised learning strategies. It will examine how learning spaces may represent ubiquitous spaces in which the learner undertakes some form of study or learning. Although there has been extensive examination of the design of spaces for knowledge generation (Keppell, Souter, Riddle, Sellers, & Keppell, 2011) there has been little attention given to how learners customise and personalise their own physical and virtual learning spaces as they traverse their learning journey. Seven principles of learning space design will be adapted for use by the personalised learner. Personalised learning strategies encompass a range of knowledge, skills and attitudes that empower the learner to take charge of their learning within next generation learning spaces. Personalised learning consists of six broad concepts: digital citizenship, seamless learning, learner engagement, learning-oriented assessment, lifelong and life-wide learning and desire paths. Teachers will need to assist learners to design their own personalised learning spaces throughout formal

education to encourage learners to be autonomous learners throughout their lifetime. In order to assist learners in developing personalised learning strategies we need to teach them about learning space literacies. We can't assume learners have the knowledge, skills and attitudes to be able to identify and effectively utilise appropriate learning spaces that optimises engagement.

Keppell, M., & Riddle, M. (2011). Distributed learning spaces: Physical, blended and virtual learning spaces in higher education. *Physical and Virtual Learning Spaces in Higher Education: Concepts for the Modern Learning Environment* **(pp. 1-20).** http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.4018/978-1-60960-114-0.ch001

- This chapter examines distributed and personal learning spaces across the spectrum of physical, blended and virtual learning spaces in the higher education context. We suggest that higher education is no longer defined by tangible boundaries of a 'physical campus' but by the entire student experience, whether that involves negotiating the physical corridors of the campus, attending face-to-face classes, participating in fully online courses or a blend of both face-to-face and online courses. In addition the student experience may also involve connecting to virtual environments from home, a local cafe, on the train or participating in professional practice hundreds of kilometers from the physical campus. This chapter attempts to account for the diverse range of spaces that are enriching the learning and teaching experience for both academics and students and suggests the need to recognise the changing nature of learning spaces in higher education. © 2012, IGI Global.

Keppell, M., Souter, K., & Riddle, M. (2012). *Physical and virtual learning spaces in higher education: Concepts for the modern learning environment***. Retrieved from** http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.4018/978-1-60960-114-0

- New technology-enriched learning spaces are a focus of institutional investment to address the identified shortcomings of traditional teaching and learning environments. Academic development, an area that has received little attention in this context, can be designed to provide strong opportunities for university teachers to re-imagine their teaching for these new spaces while also building their leadership capacity. This chapter discusses challenges that teachers face in transforming their teaching practices and proposes a model for academic development to support this. Two case studies demonstrate the flexibility and efficacy of the model and provide pointers for further adoption in the higher education context.

Larkin, H., Nihill, C., & Devlin, M. (2014). Inclusive practices in academia and beyond. *The future of learning and teaching in next generation learning spaces* **(Vol. 12, pp. 147-171): Emerald Group Publishing Limited.** http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012012

- This chapter explores a set of principles that underpin ensuring that the learning needs of all students are addressed in next generation learning spaces. With increasingly diverse higher education environments and populations, higher education needs to move from seeing student diversity as problematic and deficit-based, to welcoming, celebrating and recognising diversity for the contributions it makes to enhancing the experience and learning outcomes for all students. The principles of Universal Design for Learning (CAST, 2011) provide a framework for high-quality university teaching and learning, as well as guidance on the multiple methods and means by which all students can be engaged and learn in ways that best suit their individual styles and needs. An inclusive approach is important pedagogically and applies to both the physical and virtual environments and spaces inhabited by students. When the design of physical environments does not incorporate universal design principles, the result is that some students can be locked out of participating in campus or university life or, for some, the energy required to participate can be substantial. With the digital education frontier expanding at an exponential rate, there is also a need to ensure that online and virtual environments are accessible for all. This chapter draws on the relevant research and the combined experience of the authors to explore an approach to inclusive practices in higher education next generation learning spaces and beyond.

*Learning spaces: The US perspective***. (2015, 15 January). Retrieved 23 March, 2015, from** http://www.jisc.ac.uk/guides/learning-spaces/the-us-perspective

- The EDUCAUSE eBook Chapter on Assessing Learner Spaces looks at feedback on learning spaces in the US. It outlines situations that encourage and discourage students with regard to the use of Learning Space including comment on evidence that academic engagement is encouraged by learning spaces that are 'comfortable, open, flexible and appealing'.
- Engagement for students was found to be higher when the settings and academic activities involved encouraged technology-supported interpersonal interaction. Students described classes in one of the innovative spaces as requiring more accountability on their part because there were few physical barriers between themselves and their tutors. Students were most engaged in settings and in academic activities that encouraged interpersonal interaction and were supported by technology. By comparison, in more traditional classrooms with seats

arranged in rows and the instructor at the front of the room, they felt they had less responsibility for participation.
- Poor air circulation, uncomfortable temperatures, non-interactive pedagogical practices and distractions were also identified as factors that actively discourage student engagement.
- Feedback from staff on spaces can differ significantly. Some staff will embrace the space and be very open about their use of it and its potential, whilst others will endeavour to replicate a traditional lecture theatre feel in the space.

Learning spaces: A guide with associated case studies and a photo library on new build and refurbishment in the sectors including sustainable approaches and business incubation spaces. (2015, 15 January). Retrieved 23 March, 2015, from http://www.jisc.ac.uk/guides/learning-spaces

Ling, P., & Fraser, K. (2014). Pedagogies for next generation learning spaces: Theory, context, action. *The future of learning and teaching in next generation learning spaces* (Vol. 12, pp. 65-84): Emerald Group Publishing Limited. http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012008

- The purpose of this chapter is to provide a framework to guide learning and teaching practice in next generation learning spaces. The framework is informed by both learning and teaching theory and the current context of the sector. The framework provides guidance to those who teach in next generation learning spaces and is illustrated with examples of effective pedagogic practices that use the affordances of spaces while avoiding their limitations. The chapter discusses the tension between next generation learning space design and use. Design is influenced by drivers ranging from a need to accommodate ever-larger student numbers and responding to digital technologies and other developments in educational media, to providing for new approaches to learning. Use is determined by understandings of the teaching task, which can range from presentation by a teacher through to students working individually or in groups to generate meaningful knowledge, useful skills and professional values. In this chapter we identify drivers underpinning the creation and design of next generation learning spaces in universities today and associated expectations of the ways in which the spaces will be used. We reflect on understandings of sound pedagogic practice and work through to implications for learning and teaching in NGLS. In some cases advocated pedagogic practice asks teaching staff to make the most of spaces designed to allow students to engage constructively in their learning. In other cases it involves teaching constructively in spite of the design of the space.

Morrone, A., & Workman, S. B. (2014). Keeping pace with the rapid evolution of learning spaces. *The future of learning and teaching in next generation learning spaces* (Vol. 12, pp. 47-62): Emerald Group Publishing Limited. http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012006

- This chapter focuses on learning space design for students' technology-rich lifestyles, in particular the evolution and future of learning spaces in the United States. JISC design principles' bold, supportive, future proof, creative, and enterprising frame discussion in the chapter's first section, "Planning for the learning spaces of tomorrow". The section begins with pioneering work in the field and follows with recent learning spaces (both classrooms and informal learning environments) that seek new and innovative ways for students to collaborate. Examples clearly point to students' need for continual access to flexible, tech-rich spaces that support their work and study habits. The chapter's second section, "The future of learning spaces: On-demand apps and Bring Your Own Technology (BYOT)," is a case study focused on software virtualization's influence on learning space design at Indiana University. The section brings in examples from the University of South Florida and the University of Iowa, asserting that physical and virtual learning spaces must be designed to come together seamlessly, echoing students' on-the-go lifestyles and constant connectedness. Ultimately, the section makes a bold contention about the evolution of learning spaces: Any space can become a tech-rich learning environment, if students have access to virtualized software. Throughout, the chapter touches on compelling questions about meeting the learning needs of digital natives: How do we challenge traditional educational paradigms? Can we flip the classroom to further the potential of all learners? What is the role of collaboration in learning? Which models will energize and inspire learners and instructors of the future?

Papachristos, Vrellis, Natsis & Mikropoulos (2014). *The role of environment design in an educational Multi-User Virtual Environment*
- In an exploratory study of the partial use of Second Life in a preservice education undergraduate course, Papachristos, Vrellis, Natsis & Mikropoulos (2014) found that "learning outcomes seem to be slightly better in virtual educational settings that replicate traditional educational settings" (p. 1). The study compared the use of traditional method of delivering content with the use of Second Life. Students comments were positive with regard to the use of Second Life, stating "the studied presence dimensions were found medium to strongly correlated with high levels of easiness to attend the lecture, easiness for active participation, pleasurableness of the activity, appropriateness of the virtual environment and realism of the virtual environment in both designs" (Papachristos et al., 2014, p. 645).

Parisio (2013). *Designing learning spaces in higher education for autonomy: Preliminary findings and applications*
- Parisio (2013) explores how innovative learning space design encourages learner autonomy. Discusses high-level design principles in the context of design for learning, including in virtual and hybrid (physical and virtual) spaces.
- Parisio (2013) cites "six design features emerged as contributing to learner autonomy in various ways" (p. 677). These include:
    1. Design for a sense of welcoming and openness while keeping a sense of security
    2. Design for home-like comfort
    3. Design for way-finding
    4. Design to encourage different types of valued behaviour
    5. Design for balance (flexibility vs. fixed)
    6. Design for seamless ubiquitous computing

Riddle & Souter (2012). *Designing informal learning spaces using student perspectives*

Describes the design of informal learning spaces at an Australian university that support students in the generation of knowledge:
- outlines a number of concurrent processes that led to and informed the design of a series of new informal learning spaces at La Trobe University in Victoria, Australia, to support students in generating their own knowledge. These processes include a small research project looking at technologies in students' everyday lives, a national teaching and learning applied research project on learning spaces, a significant institutional curriculum renewal process and a number of projects to build new learning spaces at the Melbourne campus of La Trobe.
- design principles developed in an earlier project (i.e. the SKG Project) were used to assess the new informal learning space. These principles included:
    - comfort
    - aesthetics
    - flow
    - equity
    - blending
    - affordances
    - repurposing
- In the conclusion, Riddle & Souter (2012) acknowledge, "the challenge of designing spaces that are a good fit for the culture of an institution, learner-centered, and informed by sound pedagogy is one that all higher education institutions face" (no page number). They also argue that, "that current practice too often ignores student perspectives and reproduces a physical environment that is familiar but less suitable for active learning, peer learning, and learning supported by technologies that students prefer to use".

Salter, D., Thomson, D. L., Fox, B., & Lam, J. (2013). Use and evaluation of a technology-rich experimental collaborative classroom. *Higher Education Research and Development, 32*(5), 805-819. doi: 10.1080/07294360.2013.777033
http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1080/07294360.2013.777033

- In order to pilot a shift towards greater use of collaborative learning in our higher education programs, the University of Hong Kong has invested in the development of a prototype technology-enhanced collaborative learning space. The space was created by retrofitting a vacant studio, turning it into an innovative classroom space in which collaborative learning is promoted and facilitated both through the provision of technology and by the physical layout of the room. We have used the space to pioneer collaborative learning both by holding professional development workshops for faculty in the room and also by helping academic staff to run experimental courses in the learning space. The opportunity to offer professional development and support for academic staff in this environment is particularly valuable as it ensures they do not simply deliver traditional didactic lectures in a space designed to promote interactive student learning and engagement. By using the space as a 'student' they are able to consider how they may use collaborative learning environments with their students. This paper describes use of the room for professional development of academic staff and also provides

two examples of the use and evaluation of the room by faculty who used the room to teach experimental classes. © 2013 Copyright HERDSA.

Schaik, L. v. (2014). Developing the briefing for the designing of the learning landscape: Reflections on RMIT (Royal Melbourne Institute of Technology) University of Technology & Design's approach to next generation learning spaces. *The future of learning and teaching in next generation learning spaces* **(Vol. 12, pp. 243-266): Emerald Group Publishing Limited. http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012017**

- Designing learning environments is increasingly about mediating between the interactions in real and virtual space of largely self-organising learning communities. Traditional ways of briefing designers are less and less proficient, as the demands made on space become less timetabled, more probabilistic. "learning landscapes" are proposed in which clusters of activity can be seen to be taking place across a field, that activity can be browsed, audited and fully engaged with. Such organic flows of interest and concentration are hindered by traditional demarcated space models, and attempts to enable the flows through "flexible" interlinking of rooms fail. There is evidence 2 that the organic interactions between learners grow exponentially when these learners are connected together as virtual communities in open, robust virtual platforms. But this works best when these interactions are grounded from time to time in real places. How can designers best provide spaces that support learning in real and virtual space? Should design teams be composed of people with skills in devising real and virtual space? Increasingly the answer is 'yes', and this places strains on procurement processes. Built form can take a long time to deliver. So can virtual platforms take time to devise and make operable. Can these processes be aligned? The concepts for RMIT's Design Hub, a physical design research platform, were developed through research conducted twelve years before the building was completed. Many of the gap years were taken up with establishing the financial basis for constructing the Hub. During this time the concepts were validated by testing with various potential user groups, and a further tranche of international investigations validated the level of innovation being sought. The process for RMIT's Swanston Academic Building (SAB) was smoother and shorter, but it involved a year in which a 'learning landscape' concept was moulded through intensive work with user client focus groups. Neither of these projects has a virtual doppelganger, though both have sophisticated and evolvable IT systems. The Hub embeds a process of curating research interaction and dissemination that is hampered by this fact. The mediated learning landscape of the SAB falls short of the originating concepts, because space constraints did not allow for an undivided, flowing landscape. A well designed virtual counterpart could have provided what the insertion of walls has obscured. Should all future innovative learning and researching environments have a virtual counterpart from the outset? There is an emerging trend for such paired environments in creative city thinking and in museums. Surely briefing and procuring real and virtual environments in tandem will enliven future space use in universities?

Steel & Andrews (2010). *Chapter 15 - Re-Imagining Teaching for Technology-Enriched Learning Spaces: An Academic Development Model*

- Steel & Andrews (2010) suggest/propose a model for academic development to support university lecturers to transform their teaching practices in technology enriched learning spaces.
- Steel & Andrews (2010, pp. 243-248) highlight/describe the complexities associated with reimaging teaching. These include:
    - Leadership as a Critical Component
    - The Need for Academic Development for 21st Century Learning
        - Persistent Issues Around Technology Adoption and Integration
        - Academic Development for Learning Spaces
- Steel & Andrews (2010, p. 248) also identify and describe "The Challenges of Teaching in New Learning Spaces", including:
    - Pedagogical Beliefs and Beliefs About Technologies and Spaces
    - Pedagogical Vision for Use of Technology-Enriched Spaces
    - Discipline, Curriculum and Assessment Agendas
    - Student Profiles, Needs and Challenges
- Steel & Andrews (2010) identify the following key areas for future research:
    - Evaluation of the impact of academic development on teacher practices and student learning in technology-enriched learning spaces and,
    - development and testing of models of academic development that support teachers to re-imagine their teaching for these spaces.

Thomas (2010). *Learning spaces, learning environments and the dis'placement' of learning*

- Thomas (2010) argues that "the conceptual 'slippage' that characterises the disappearing differences between 'learning spaces' and 'learning environments', coupled with the further 'displacement' of the learner (turned avatar) in virtual spaces such as *Facebook* and *Second Life,* serves to 'displace' learning itself" (p. 502).
- In order to successfully articulate the nature of learning in the present age, Thomas (2010) proposes that we must articulate both "the nature of the real and virtual spaces and bodies that we inhabit" (p. 502).
- Thomas (2010, p. 509) suggests the following considerations when designing learning spaces:
  - the 'structure of the learning space' has to be a function of the adaptive complex system that it serves.
  - learning spaces need to be adaptive, malleable—almost fluid.
- Thomas (2010) references Kaplan and Kaplan's (cited in Graetz, 2006, p. 73) four cognitive determinants of environmental preference as a useful consideration in the design of learning spaces. These are:
  - coherence, or the ease with which a setting can be organised cognitively;
  - complexity, or the perceived capacity of the setting to occupy interest and stimulate activity;
  - legibility, or perceived ease of use; and
  - mystery, or the perception that entering the setting would lead to increased learning, interaction or interest (Graetz, 2006, pp. 73–74).

White, B., Williams, G., & England, R. (2014). Diverse pictures of learning: The hidden work of shaping next generation learning spaces. *The future of learning and teaching in next generation learning spaces* (Vol. 12, pp. 23-46): Emerald Group Publishing Limited. http://ezproxy.csu.edu.au/login?url=http://dx.doi.org/10.1108/S1479-362820140000012005

- Technology provision and Next Generation Learning Spaces (NGLS) should respond to the active learning needs of twenty-first century learners and privilege multiple "pictures of learning" and associated knowledge work. In this sense it is important for NGLS to be pedagogically agnostic, agile enough to cater for a range of pedagogical approaches within the one physical space. In this chapter, the democratising and potentially disruptive power of new digital technologies to facilitate the privileging of these multiple pictures of learning is explored, recognising the significant rise in student ownership and academic use of mobile technologies. With their escalating ubiquity and their facilitation of active knowledge work, research around considerations for the implementation of mobile digital technologies is canvassed, highlighting a range of issues to be considered. This is part of the "hidden work" of technology implementation. Without this hidden work, the potential of NGLS in facilitating and privileging active learning and multiple pictures of learning is diminished and the potential for reinforcing already powerful and potentially exclusionary modes of knowledge work increases. Finally to assist in articulating the hidden work of digitally enabled NGLS, a model is proposed to help understand how ease of use and confidence impacts on student and academic knowledge work.

Wilson & Randall (2010). *Implementing and evaluating a "Next Generation Learning Space": A pilot study*

- Wilson & Randall report on a pilot study of the use by lecturers and students of a technology rich next generation learning space, titled, the "Pod Room". Participants in the study included both lecturers and students from different disciplines. They were asked to evaluate and provide feedback on the "Pod Room" as learning space via survey and interview. Observation of activities in the room also took place. Both strengths and weaknesses of the room were identified. In particular, students had a positive reaction to "the student-student interaction afforded by the Pod Room" (Wilson & Randall, 2010, p. 1099). Results of the pilot study suggested that more thought is needed to be given to technology and the physical design of future learning spaces.

Wilson, G., & Randall, M. (2012). The implementation and evaluation of a new learning space: A pilot study. *Research in Learning Technology, 20*(2). doi: 10.3402/rlt.v20i0/14431.
http://ezproxy.csu.edu.au/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ehh&AN=86214889&site=ehost-live

- A dramatic, pedagogical shift has occurred in recent years in educational environments in higher education, supported largely by the use of ubiquitous technologies. Increasingly, emphasis is being placed on the design of new learning spaces, often referred to as "Next Generation Learning Spaces" (NGLS) and their impact on pedagogy. The traditional idea of "classroom" now incorporates the use of both physical and virtual space. Increasing availability of digital technologies has enabled access by teachers and students to a wider range of communication and information that can now be incorporated into the formal learning process. This change has meant a greater focus on the design and use of flexible learning spaces, more use of blended learning approaches and more personalised, individualised learning opportunities for students. While many such classrooms have been built and used in universities globally, only a few formal studies have been reported on how these spaces are used by both teachers and students. This article focuses on a pilot study of the use by academic staff and students of a next generation learning space - the Pod Room - and makes recommendations for further research into the effectiveness of new learning spaces in universities. © 2012 G. Wilson and M. Randall.