Makerspaces: Towards new learning environments for UK Higher Education Libraries?

Robert Curry

Introduction

- What is a makerspace?

Key research questions:

- *1) How is learning achieved and supported in Academic Library Makerspaces?*

- *2) What can Academic Library services bring specifically to the effective organisation and support of Makerspaces?*

Research Design

- Exploratory research study for learning, culture and society EdD module

- Detailed literature review

- Online forum

- Template Analysis (King, 2012)

- Discussion

- Conclusion

Literature Review

- Key research literature found:
- Wider Maker movement: Chris Anderson's book "Makers: The new industrial revolution" (2012)
- From Sheridan and Colleagues (2012)- a comparative case study of three makerspaces "informal sites for creative production in art, science, and engineering" (Sheridan and colleagues, 2014, p. 505)
- Constructionism (Harel and Papert 1991), building on Constructivism (Piaget, 1937)
- No established teacher-student relationship
- Maker Movement Manifesto (Hatch 2014)
- Emerging themes:
- Cross disciplinary
- Communities of practice (Lave and Wenger 1991)
- Self-efficacy

Literature Review continued..

- Experiential learning: Schrock (2013) draws on the pragmatic philosopher and educator John Dewey's thoughts on the importance of social experiential learning through observation, problem solving and enquiry in a playful interdisciplinary environment (Dewey 1909). Makerspaces provide "maximizing individualism while encouraging collaboration" (Schrock 2013).

- RSA: Action and Research Centre's research report: "Ours to master: How makerspaces can help us master technology for a more human end" (Dellot 2015): "We argue that the act of making is one means of regaining mastery over technology- not just because it enables us to be more self-reliant but also because it can boost our sense of agency." (Dellot 2015, p.5).

- Issues engaging "with particular demographic groups, notably women." (Dellot 2015, p.7).

- "a new institution through which to reimagine capitalism." (Dellot 2015, p.45)

Literature Review (library focus)

- "Libraries in particular hold promise for democratization, given their history as free, embedded community resources open to all." (Halverson and Sheridan 2014, p.500)

- "The issue for libraries to consider is how makerspaces can be combined with extension initiatives such as learning commons, research commons and embedded librarianship." (Fourie and Meyer 2015, p.523)

- Connecting physical to virtual spaces including relevant information sources: "subtle ways to link this to finding information" (Fourie and Meyer 2015, p.522)

- Kurti, Kurti and Fleming (2014) highlight the pragmatic difficulties of creating a makerspace from scratch: "..some policies will stand in the way, space will be hard to obtain, and the budget for tools will be almost non-existent" (p.7)

Data Collection

- Data was collated from a five day a-synchronous online forum with three participants involved in running makerspaces in three north American higher education institutions where the makerspace is part of the library service.

  Participant information:

- Participant A - Assistant Professor/ Digital Resources Librarian

- Participant B - Library Support Specialist

- Participant C - University Librarian

Results

- <u>Self-directed learning</u> – Academic, personal and entrepreneurial: "students can come and work on whatever they want." (A)

- Participant A: "open maker studios and specific workshops" (3d printing, knitting etc..)

- Participant B described 5 different studio spaces available to students with a valid ID 24/7: Rendering, Audio, Visual, Production and Editing

- Participant C mentioned restrictions to access in terms of available staffing

- Student led classes, clubs, workshops and activities - Participant A described an interesting variety of clubs that use the makerspace including: "Robotics club.., fashion club.., maker club, polynesian club, architecture club, engineering club, computer science club.., and two learning communities including the "Umoja Black Student Union"

Results continued

- <u>Mediated Learning</u> - Staff led courses, staff support available.

- E.g. Participant C described an impressive variety of organised learning including: "American Studies", "Physics", "Freshman Seminar: Makerbots and Mashups" helping "first year students transition into college..through highly interactive projects..demonstrating mastery of a particular skill.."

- "DGST 201: Tinkering, Hacking, and Making in the Digital Age..A project-based course similar to FSEM with a greater emphasis (on) student feedback/ communication through blogging." (C)

- Academic collaboration: Students using "3D design programs to recreate buildings, and .. artifacts .. using our 3D printer. They also scanned themselves in Roman costumes." (C)

- "Theatre" project, "a staged production of Lady Windemere's Fan..The class designed an elaborate chandelier for the set, and we printed various parts of it on the 3D printer." (C)

Results continued

- <u>Cross disciplinary opportunities</u> can be seen in opportunities for anyone to participate - participant A, non-student led sessions: "Engineering.., Technology.., Art.., History.., Anthropology.., Ethnic studies.., Dance."

- Participant: "some of our offerings are more cross disciplinary than others..However, a lot of our students from different backgrounds and with different goals come together to use the 3D printer in particular. Lots of STEAM cross-over there." (STEAM being Science, Technology, Engineering, Art and design and Mathematics)

- Overarching themes:
- <u>Experiential learning</u> (see Dewey 1909, Kolb 1984)
- <u>Self-efficacy</u> (Bandura 1997)
- <u>Communities of practice</u> (Lave, Wenger 1991)

Makerspaces research - Template Analysis from online forum

Overarching themes			
Communities of Practice Experiential Learning Self-efficacy	**1.** Self-directed learning	1.1 Academic, personal and entrepreneurial activities/ learning	1.1.1 Learning achieved through student choices/ agency as well as mediated support 1.1.2 Student led classes, clubs, workshops and activities
	2. Mediated learning	2.1 Staff led classes 2.2 Staff support available	2.1.1 Mastery
	3. Cross disciplinary opportunities	3.1 Liberal arts - STEM/ STEAM	3.1.1 Craftsmanship 3.1.2 Art

Further thoughts..

- "...the science and philosophy of education can and should work together in overcoming the split between knowledge and action, between theory and practice, which now affects both education and society so seriously and harmfully." (Dewey 1964, p. 19)

- The Craftsman (Sennett 2008)- making is thinking, design process and craftsmanship as a form of scientific epistemological knowledge creation: "interplay between tacit knowledge and self conscious awareness"

- Gadamer's thoughts on "historically-effected" consciousness and the fusion of "horizons" of understanding (Gadamer 1975). As learning fields change through time and are stimulated by new cultural perspectives, older technologies (e.g. typewriters, sewing machines) participants might already be familiar with to an extent can, through the interplay with modernity, offer different insights and new creative possibilities: "far more of the old is preserved in the supposed transformation of everything than anyone knows, and it combines with the new to create a new value." (Gadamer 1975, p293).

Conclusion

- Within universities the makerspace can be seen as an opportunity to create an open access, cross disciplinary experiential learning space that fosters innovation and creativity, and allows for self-efficacy to be developed through self-directed learning opportunities in a productive, mutually supportive community environment.

- As a service within a university used to providing support of non formal interdisciplinary learning spaces Academic library services are in a position to incorporate new spaces, providing they can avoid a detrimental impact on existing "traditional" services including the ongoing value of quiet and silent spaces.

- From an Academic Librarian's perspective there is much potentially of interest with regards to providing learning support in makerspaces. Is there an opportunity to interact in a collaborative manner with makerspace users, helping them with their information, digital and media literacy skills?

- "..the makerspace is a safe space to try new things, and a safe place to fail. Failing in the classroom setting does not feel safe for students and sometimes they are afraid to try something new, or fear can prevent them from completing a task. The space of the library is neutral, and if something goes wrong, well that is okay." (A)

References

- Anderson, C. (2012) *Makers: The New Industrial Revolution.* Crown Business: New York.
- Bandura, A. (1997) *Self-efficacy: The exercise of control.* W.H. Freeman and Company: New York.
- Dewey, J. (1909) *How we think & Education and experience* (collector's edition). Frederick Ellis: Denver.
- Dewey, J. (1964) *John Dewey on education: Selected writings.* The University of Chicago Press: Chicago.
- Gadamer, H.G. (1975) *Truth and method.* Bloomsbury: London.
- Halverson, E. & Sheridan, K. (2014) "The maker movement in education", Harvard Educational Review, Vol. 84, No. 4, Winter 2014. Available at: http://hepgjournals.org/doi/pdf/10.17763/haer.84.4.34j1g6814038206 (Accessed 23 Dec 2015)
- Hatch, M. (2014) *The maker movement manifesto.* New York: McGraw-Hill.
- Harel, I., & Papert, S. (1991) *Constructionism.* Norwood: Ablex.
- Horizon Report (NMC) (2015) Makerspaces Wiki. Available at:
- http://library.wiki.nmc.org/Makerspaces
  (Accessed 23/12/15)
- Kolb, D.A. (1984) *Experiential learning: Experience as the source of learning and development.* Prentice-Hall: New Jersey.
- King, N. (2016) *Template Analysis: Overview.* Available at:
- http://www.hud.ac.uk/hhs/research/template-analysis/
  (Accessed 15/03/16)

References continued

- Kurti, R. S., Kurti, D., Fleming, L. (2014) *Educational Makerspaces: The environment and tools of great educational Makerspaces.* Available at: http://www.teacherlibrarian.com/2014/10/13/educational-makerspaces-pt-2/ (Accessed 15/03/16)
- Lave, J. & Wenger, E. (1991) *Situated learning: Legitimate peripheral participation.* New York: Cambridge University Press.
- Papert, S. (1991). Situating constuctionism. In Harel, I. & Papert, S. (Eds.), *Constructionism (pp. 1-11).* Norwood, N.J.: Ablex.
- Piaget, J. (1937) *The essential Piaget.* London: Routledge.
- Schrock, A. R. (2014) "Education in disguise", UCLA Journal of Education and Information Studies. 10 (1). Available at:
- https://www.academia.edu/5948382/_Education_in_Disguise_Culture_of_a_Hacker_and_Maker_space_aka_hack erspaces_ (Accessed 04/01/16)
- Sennett, R. (2008) *The Craftsman.* London: Allen Lane.
- Sheridan, K., Halverson, E.R., Litts, B.K., Brahms, L., Jacobs-Priebe, L., Owens, T. (2014) "Learning in the making: A comparative case study of three Makerspaces", Harvard Educational Review. Vol. 84, No.4 Winter 2014. Available at:
- http://hepgjournals.org/doi/pdf/10.17763/haer.84.4.brr34733723j648u (Accessed 23 Dec 2015)
- Wenger, E. (1998) *Communities of practice: Learning, meaning and identity.* Cambridge University Press: Cambridge.