Is technology enhanced learning an interdisciplinary activity?

Eileen Scanlon

Regius Professor of Open Education, Institute of Educational Technology, Open University

eileen.scanlon@open.ac.uk

Josie Taylor

Emeritus Professor, Institute of Educational Technology Open University

Josiet7@gmail.com

Abstract

This paper describes an approach to working in educational technology informed by the recognition of the subject as a major current site for interdisciplinary activity. Currently the most popular term for educational technology embraced in the UK and in the EU is Technology Enhanced Learning (TEL). We draw on the literature on interdisciplinary and multi-disciplinary working, contemporary rationales for interdisciplinarity as an imperative for meeting the challenges of knotty real world problems, and the experience of working in interdisciplinary teams in TEL. The purpose is to establish the particular features of this collaborative research effort. This perspective from literature and contemporary rhetoric around practice is supplemented with reference to several interview studies of TEL project teams. These studies outlined the advantages in terms of growth, multiple perspectives and design methodologies but also the challenges in terms of sustainability, career progression and publication, the benefits of technologies for communication within teams and distinctive working practices (Jordan et al. 2012, Conole et al., 2010, Scanlon et al., 2013).

Keywords

Technology enhanced learning, educational technology, working practices, interdisciplinary practices

Research Context

What is interdisciplinarity and why does it matter?

This literature review illustrates the variety of views on what constitutes true interdisciplinary working. These range from the view of interdisciplinary work as parallel-playing in multi-disciplinary teams (cf. Rogers et al., 2005) to the creation of new disciplines (with the learning sciences being cited as a contemporary example which has similar component disciplines see e.g. ISLS). One counterview to the necessity of multi-disciplinary teams is the idea of the TEL professional, who as an individual possesses all the skills and multiple disciplinary expertises necessary to conduct projects. The rationale for interdisciplinary teams include the practicalities of working in design based research, and the fact that problems do not come separated into disciplinary silos.

Increasingly prominence is being given to interdisciplinarity as a means of addressing cross-discipline research challenges, where researchers from two or more disciplines bring their approaches together to find a solution to a new problem. While there is a growing recognition of the need for interdisciplinarity in solving complex research problems in many areas of science, the situation in the multidisciplinary area of Technology Enhanced Learning (TEL) is worthy of exploration. The Joint Research Councils programme on Technology Enhanced Learning commissioned a study of the working practices of academics in TEL. This is also relevant for work in Networked Learning. (See e.g. Jandric (2014) who notes that in Networked Learning a 'wide range of theoretical positions and different aims for conducting Networked Learning research is followed by a set of different methodological approaches.' (p. 47)

Technology enhanced learning provides a rich source of recent experiences of this way of working. In TEL, challenges are not just technological but pedagogical and organisational as well. Tackling these issues requires a multi-faceted approach. Hence, not surprisingly, much research work in this field is interdisciplinary. This is recognised for example, by the Economic and Social Research Council (ESRC) which makes the following statement about its desirability:

> Innovation – The Council is keen to support research which is ambitious (but clearly specified) and has the potential for high scientific impact and/or high user impact. … Interdisciplinarity – As part of its portfolio, the ESRC also expects to support new and exciting research which combines approaches from more than one discipline. (ESRC)

Some problems "fail to fit in with disciplinary boundaries thus falling in the interstices between them" (Huber, 1992, p. 285) and in some areas, interdisciplinary research has long been practised, e.g. materials research or American studies (see e.g. Nissani, 2001 p. 209). There are many different terms used to describe work which involves teams of people from different disciplines working together. Multi-, inter-, cross-, poly- and trans- are all prefixes attached to the word disciplinary (see e.g. Jandric, 2014). Of course understanding what is meant by interdisciplinarity is not straightforward. One definition of a type of interdisciplinarity is given in an OECD report from 1972,

> Interdisciplinary […] an adjective describing the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organising concepts, methodologies, procedures, epistemologies, terminologies, data leading to an organisation of research and education in a fairly large field. An interdisciplinary group consists of persons trained in different fields of knowledge (disciplines) with different concepts, terms, methods and data organised by a common effort working on a common problem with continuous intercommunication (OECD, 1972, p. 25-6)

The International Society of the Learning Sciences defines it as ' interdisciplinary empirical investigation of learning as it exists in real-world settings and to how learning may be facilitated both with and without technology'. The implication is that this work will lead to understanding how to better facilitate learning in designed environments. Influence comes from a variety of theoretical positions on learning including constructivist, social-constructivist, socio-cognitive, and socio-cultural. It is difficult to distinguish between the learning sciences and much work in TEL. Also, we are influenced by the debates and discussions around disciplinary boundaries and knowledge creation (Gibbons et al., 1994). We see the purpose of interdisciplinary working as fostering dialogue between researchers in different disciplines and stakeholders in the research with the effect of creating solutions to problems and with the potential to create new meanings. New disciplines can be created over time by this process. For example, a study by Dogan and Pahre (1990) of changes in disciplines over time focussing on "innovation" in the social sciences suggesting that knowledge accumulation within a discipline can lead to fragmentation. There are subtle and complex epistemological problems raised by the term interdisciplinarity and we do not seek to offer a definition here, but report on the literature pertaining to interdisciplinary working in TEL research and report on some views of researchers in TEL from some interview studies.

Interdisciplinarity in TEL

The people who work in educational technology or networked learning were not 'born' as fully fledged professionals in this area, but have become involved in such work as teachers in their core subject, having an interest in how learning works (e.g. from a background in Psychology) or expertise in technical architectures or infrastructure (e.g. a background in computer science or informatics). Some believe, consequently, that working in TEL research does not require a strong disciplinary perspective, that a plurality of approaches is appropriate, although the question of whether TEL research has particular theoretical allegiances is often discussed (see e.g. Issroff and Scanlon, 2002). This potential lack of a specific theoretical basis for the field is problematic as it means that TEL research can be perceived by those from more traditional disciplines to be under-theorised and hence immature. As Klein notes:

Proceedings of the 10th International Conference
on Networked Learning 2016, Edited by:
Cranmer S, Dohn NB, de Laat M, Ryberg T &
Sime,JA.

ISBN 978-1-86220-324-2

130

Researchers who identify themselves professionally with cross-disciplinary categories face the entire panoply of gatekeeping mechanisms, which by and large favor existing disciplinary categories. (Klein, 1993, p. 193). Quoted in Nissani, 2001.

These gatekeeping mechanisms can present problems for new researchers in the area who may find it difficult to build academic reputations by reference to typical markers for progression used by many universities (i.e. principally publications in high-ranking discipline journals, and successful bids for funding from state funding bodies). Rogers et al. (2005) from the perspective of work on human computer interaction however are equivocal about whether the collaboration needed for interdisciplinary or multidisciplinary working is possible. They write

To achieve this, however, requires the various individuals becoming more open to new ideas and ways of communicating with each other. It also means learning about and accepting the other discipline's way of working. It is becoming increasingly apparent, however, that to enable this kind of mutual understanding to occur also requires some kind of lingua franca … In particular, what is needed is a way of representing and talking about new concepts that can be readily exchanged between the participating disciplines (Rogers et al., 2005, p. 19)

Wang and Hannafin (2005) building on accounts by Collins (1998) describe the design based research methodology that underlies much contemporary work in TEL, which stresses the importance of working in real contexts to inform and improve practice. The term 'design science' was first coined by Collins as: 'a design science of education must determine how different designs of learning environments contribute to learning, cooperation, motivation, etc.' (Collins 1992, p. 24). Barab and Squires (2004) describe how researchers following the design based research paradigm 'systemically adjust various aspects of the designed context so that each adjustment served as a type of experimentation that allowed the researchers to test and generate theory in naturalistic contexts' (Barab and Squire, 2004, p.3). Participatory design is the most recent method which takes this set of principles further by involving and empowering the user in this activity.

So, Technology Enhanced Learning (TEL) as a field is both inherently applied and multidisciplinary. However there are other imperatives for considering interdisciplinarity in TEL.

1   The view that the solution to global problems is multi or interdisciplinary.
2   The product of most TEL research projects incudes an artefact and the range of methods employed typically includes design based research, and participatory design.

View of TEL researchers

This section combines the findings of three projects which conducted interviews with TEL researchers relating to this topic. Two funded by ESRC, focussed on those involved in the Joint Research Council's TEL programme, the other with TEL researchers seeking their views about what factors made TEL innovations sustainable. The latter project conducted by Conole et al. (2010) interviewed 18 TEL researchers from diverse discipline backgrounds. All had experience of interdisciplinary research, involvement in TEL research either as a researcher or at policy level and interviewees from across the HE sector with a mix of old and new universities and different subject disciplines. They concluded that interdisciplinary working in TEL has certain benefits as follows:

capitalising on the breadth of different theoretical and methodological perspectives to address key research challenges, working in interdisciplinary teams results in researchers broadening their research perspectives – helps them become aware of additional literatures to those that they are most familiar with and having others to challenge ideas. (Conole et al. 2010, p.18)

However there was a recognition that there are difficulties in this endeavour. For example they point to the difficulty of develop a shared common language which is necessary for such efforts, and that it can take time and considerable trust to build an effective team.

In the second study, Scanlon et al. 2013 describes an in-depth examination of the processes of innovation in technology-enhanced learning. They define innovation as 'practical implementation of new ideas and technologies with the intention of having an observable impact on teaching and learning (p. 5).' They report on

findings of case studies with a systematic analysis of data collected from in-depth interviews with key figures from research and industry. They describe the complexity of the process and the resultant impact on working practices as follows:

> successful TEL innovators (act) not simply as inventors or as scientists proposing and testing hypotheses but also as bricoleurs who achieve educational goals by bringing together diverse technological elements, frameworks and social practices.
> (Scanlon et al., 2013, p. 32)

A third study, Jordan and Rimpilainen (2012) discuss the views of researchers working on the Ensemble project. They describe the interdisciplinary members of the project team as coming essentially as computer scientists or education professionals working with academic subject specialists in the subjects where teaching environments and resources were developed. They describe the use of a boundary object, a semantic spider diagram which arose out of the everyday practice of diagram sketching used by the computer scientists on the project. This developed further into a thinking tool for other members of the project, an information tool for engaging others with the project. It became an essential tool for communication in the project and had instantiations as a Powerpoint presentation, a doodle, and a participatory design object.

Conclusion

Technology-enhanced learning consists of much more than a set of research-informed products. It is a complex system, which includes communities, technologies and practices that are informed by pedagogy (the theory and practice of teaching, learning and assessment (see also Scanlon et al., 2013). We have identified here how the concept of interdisciplinary working in TEL research has been discussed and the views of those have worked in the area. However, the problems for academic career progression for researchers in the field have been noted. It is interesting that researchers are looking to future developments in the field to continue evaluating interdisciplinary approaches. For example, Veletsianos (2015) writes about the variety of research methods being used to study the recent phenomenon of massive open online courses (MOOCs). These may indeed be the boundary objects where different disciplines come to enact contemporary technology enhanced learning research.

References

Barab, S. and Squires, K. (2004). Design-Based Research: Putting a Stake in the Ground, The Journal of the Learning Sciences, 13(1), 1–14, Lawrence Erlbaum Associates, Inc.

Collins, A. (1992). Towards a Design Science of Education, In Scanlon, E. and O'Shea, T. (eds.) New Directions in Educational Technology, Springer-Verlag, Berlin

Conole, G., Scanlon, E., Mundin, P. and Farrow, R. (2010). Interdisciplinary Research: Findings from the TEL Research Programme. TEL Programme.

Dogan, M., and Pahre, R. (1990). Creative marginality: Innovation at the intersection of social sciences Boulder, CO: Westview

ESRC http://www.esrc.ac.uk/funding/guidance-for-applicants/impact-innovation-and-interdisciplinarity/ last accessed 1 Feb 2016

Goodyear, P. and Zenios, M. (2007). Discussion, collaborative knowledge work and epistemic fluency, British Journal of Educational Studies 55 (4), 351-368.

Gibbons, M. C., Limoges, Nowotny, H., Schwartzman, S., Scott, P. & Trow, M. (1994). The new production of knowledge: the dynamics of science and research in contemporary societies. London: Sage.

Huber, L. (1992) .Towards a New Studium Generale: Some Conclusions. European Journal of Education, 27, 285-301.

ISLS https://www.isls.org/ last accessed 1 Feb 2016

Issroff, K. and Scanlon, E. (2002). Educational Technology: The Influence of Theory, Journal of Interactive Media in Education, 2002 (6). ISSN:1365-893X [www-jime.open.ac.uk/2002/6]

Jandric, P. (2014). Research methods are made by questioning: the postdisciplinary challenge of networked learning, paper 47, Proceedings of the Ninth Networked Learning Conference, Edinburgh.

Jordan, K and Rimpilainen, S. (2012). The many phases and spaces of the semantic spider, Proceedings of the European Association of Studies of Science and Technology. http://easst.net/wp-content/uploads/2012/04/EASST_2010.pdf

Nissani, M. (2001).Ten Cheers for Interdisciplinarity, The Social Science Journal, 34 (2), 201-16

Proceedings of the 10th International Conference on Networked Learning 2016, Edited by: Cranmer S, Dohn NB, de Laat M, Ryberg T & Sime,JA.

ISBN 978-1-86220-324-2

132

Veletsianos, G. (2015). Who studies MOOCs? International Review of Research in Open and Distance Learning 16(3)

Rogers, Y., Scaife, M. and Rizzo, A. (2005). Interdisciplinarity: an Emergent or Engineered Process? In Interdisciplinary Collaboration, Eds S.J. Derry, C.D. Schunn, Mawah, NJ:LEA.

Rydberg, T. (2011). The metaphor of patchworking as a viable concept in developing networked learning? Proceedings of the Sixth Networked learning conference, pp 621-631

Wang, F. & Hannafin, M. (2005). Design-based research and technology-enhanced learning environments. Educational Technology Research and Development, 53(4), 5-23.

Proceedings of the 10th International Conference on Networked Learning 2016, Edited by: Cranmer S, Dohn NB, de Laat M, Ryberg T & Sime,JA.

ISBN 978-1-86220-324-2

133