

Frameworks for the Representation and Analysis of Networked Learning Activity

Erica McAteer and Sally Marsden

University of Glasgow

ABSTRACT

This symposium presentation demonstrates grounded theoretical frameworks for the representation and analysis of networked learning activities and outcomes within their educational context. These frameworks provide for systematic and rigorous analysis of learning behaviours in context from a range of disciplinary perspectives for enquiry. They also allow re-examination of study cases from new enquiry perspectives. Two examples of the frameworks in use are provided, the first concerns the role of gender in networked learning, the second seeks evidence for influences of learning activity for learning outcomes. This paper provides some theoretical background and presents the context frame which situates framework for the representation of interactive learning behaviours.

Keywords

activity theory, asynchronous conferencing, context, gender, learning interactions, learning outcomes

INTRODUCTION

The need for good representational frameworks to support study and analysis of the *contexts* of networked learning is critical. What is being taught, how, through which resources, to whom and why ('why' from all stakeholder perspectives) is necessary knowledge for our understanding of pedagogical impact and our development of models for good educational practice.

Our conceptual framework for representation and analysis of patterns of interaction within collaborative networked learning environments, drew upon a range of cross-disciplinary research: psychological models of peer conflict, educational models of 'expert-novice' scaffolding, and socio-cultural models of community development, (McAteer et al 2002, Chappel et al 2002).

In situating learning interactions within their educational context and marking that context in terms of potential factors of influence, we acknowledge a debt to activity theory (AT) as grounding the development of our context framework. Engestrom, one of the founding fathers of AT, insists that its conceptual tools must be 'concretised' according to the specific study of use (Engestrom 1987, see also Wells 2002). Importantly:

'Considering activity theory as a special kind of tool implies that accepting this perspective does not exclude other approaches and does not reject the usefulness of other conceptual schemes - because no tool, no matter how powerful it is, can serve all needs and help solve all problems.' (Kaptelinin 1996).

A second appropriation, of Moore's theoretical model of 'transactional distance' (Moore 1986) is embedded within our context framework for the marking of pedagogical practices within the learning community of study.

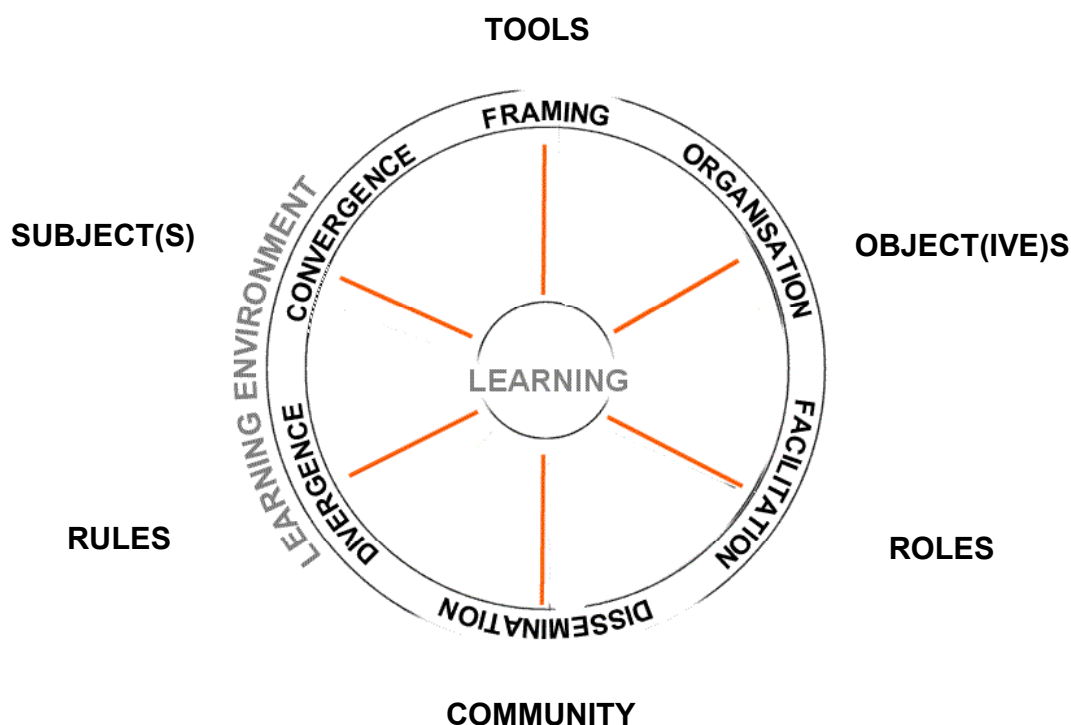
This paper briefly summarises the steps we took to reach the representation of learning interactions in context shown in Figure 1, providing background for the session itself. The context framework is set out as a model, and our symposium presentation demonstrates it through two perspectives of inquiry. One is a study into learning development through outcome texts, over two years of course presentation. The other is a study into the possible influence of gender on learning activity within two different on-line courses. The main emphasis of our presentation will be to provide findings from these studies, using them to illustrate the use of our frameworks 'in anger'. In this way, the presentation aims to link the broad overview of issues provided by paper one with the study focus detailed in paper three.

REPRESENTING LEARNING INTERACTION IN CONTEXT

Figure 1 shows elements of 'learning interaction' as evidenced through study of asynchronous conference archives from episodes of group engagement in set learning tasks (Chappel 2003), centred within a framework of context factors.

All of the outer circle nodes influence (and, with a greater or lesser immediacy, are influenced by) the 'stuff' in the middle – actions and operations toward some (not necessarily common) learning outcome. Whether we think of this middle space as a 'zone of proximal development' or as some sort of conjoint discourse depends upon the questions we are asking. Various aspects of the surrounding context will be more, or less, a focus for study and analysis – again, depending on the questions we are asking.

Figure 1: model for the representation and of learning interactions within educational context



The work presented here is grounded from long-term involvement in and commitment to 'interactive learning' research. There is a strong focus on classroom communication (face to face and virtual) between learner and teacher, between learner and peers and within learning groups, as well as 'within learner' engagement with subject content and with task procedures, and the impact of such interaction upon conceptual change.

The main thrust of our early work sought to characterise participant activity within group learning engagements – seminars, field trips, tutorials, discussion meetings, project collaboration, etc. across a range of learning contexts – school, further and higher education, community education, workplace and home learning.

Members of the SCROLLA research team took this experience into our own e-teaching and learning domains, seeking to represent, and study, what occurs within e-learning environments through the record of interaction so far as this is visible during the collaborative activity – in this case, the conference archive.

Drawing upon established theoretical frameworks, as indicated above, as well as reviewing current and recent work on the coding and analysis of conference interaction archives, we derived a set of concept labels which we felt usefully described behaviours observed:

- *convergence, divergence* (socio-cognitive conflict)
- *framing, scaffolding, dissemination* (expert guidance)
- *facilitation, organization.* (social management)

Chappel (2001) describes their application to one on-line course. Broumley (2002) takes them to another and further field work is in progress across a range of learning environments.

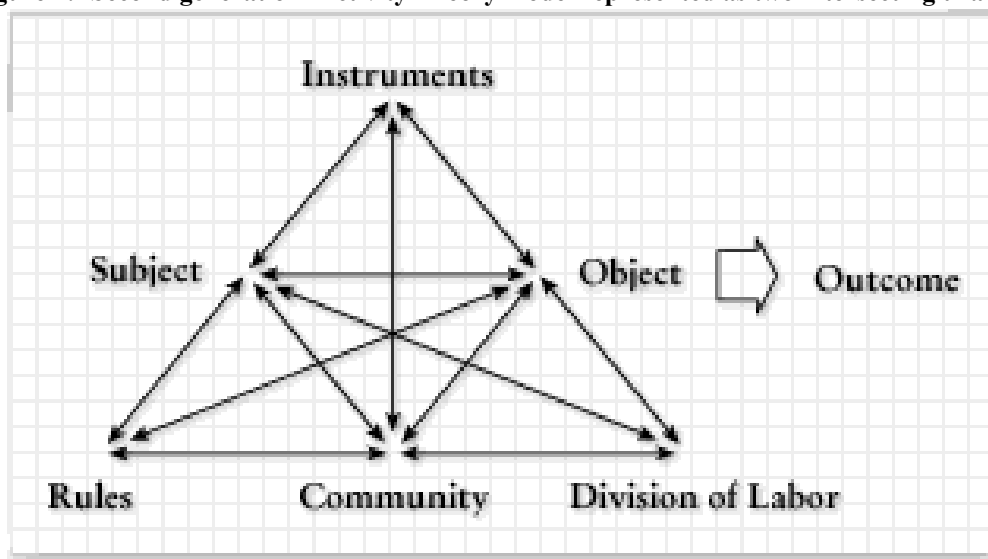
Any sensible test of the value of these generic conceptual labels for application across a diversity of settings requires their use to be situated and related to individual educational contexts. Nardi (1996) set the question

well: “How can we confront the blooming, buzzing confusion that is ‘context’ and still produce generalisable research results?” For a practitioner looking to study provision with her own learning group, for reflection and development of practice, the issue may be less acute. Implicit understanding of context constraints and individual learner issues can inform such reflection. For a wider community of practitioners seeking to inform that practice by research, or for the research community itself, there is a need to identify and mark for context factors that could critically impact on learning behaviours and, through that, on learning outcomes.

Activity Theory

Over the past year we have explored and built from one particular theoretical framework for our development of context representation: *Activity Theory* (Leont’ev, 1981, Engestrom, 1987) For reviews, development work in progress on the AT model itself and reports of its application by researchers from a wide range of research perspectives, Martin Ryder’s website at the University of Denver, Colorado provides a useful portal: http://carbon.cudenver.edu/~mryder/itc_data/activity.html linking to the Centre for Activity Theory and Developmental Work Research at the University of Helsinki, where Engestrom is based <http://www.edu.helsinki.fi/activity/>.

Figure 2: ‘Second generation’ Activity Theory model represented as two intersecting triangles



Yrjö Engeström., [Learning by Expanding](#), 1987 (figure within text translated from the German)

The ‘activity triangle’ representation was originally a Vygotskian model constructed to illuminate relationships between subject and object, mediated through tools. This evolved when Engestrom (1987) added another triangle to represent community, rules and roles and thus represent the more complex *social* mediation of action, as shown in Figure 2. Subsequent representation of activity systems has provoked some criticism and it is important to bear in mind that ‘Although the triangle model may seem somewhat rigid, it is only for the sake of representational simplicity and convenience’ (Kuutti 1996).

AT has been criticised for its inability to cope with multiple perspectives and its unidirectional portrayal of activity. It is less able to portray reciprocal influences and effects across components, especially necessary when the object of study is a ‘learning dialogue’ (Wells 2002). Our representation can perhaps more easily deal with these complexities; for example, polymotivation of ‘subject as collective’, ie the class group, is more easily considered when the outcome (hopefully, ‘learning’) is situated within the middle of the framework and thus more explicitly mediated by many things. It is also easier to widen out the context framework nodes for different study foci. For example, in many learning situations there is an externally imposed objective (assignment, product, performance) which needs to be taken into account as well as any personal objectives of the individual subject. Our framework is also more flexible in dealing with situations where the objective is less concrete and unidirectional (Russell, 2002).

We have taken the ‘nodes’ from Engestrom’s 1987 model and set them in a context framework, each for definition to as fine a level of detail as is sensible for any instance of enquiry. Assuming a group of course participants engaged in a set of learning activities within a on-line, distance taught, degree course programme, Figure 3 identifies possible factors of influence for each node; agreeing measures or setting values will be simple for some factors but far from trivial for others.

Transactional Distance Theory

The second theoretical framework that we are bringing to bear in the effort to characterise context in the study of on-line learning addresses *pedagogical context* – the strategies, tactics, resources, options for engagement we provide for our learners within a given situation of study.

Michael Moore’s theory of *transactional distance* (see Moore and Kearsley 1996 ch. 10 for an overview) offers a useful framework for understanding, which might also support prediction. Broadly, this relates to three aspects of the learning environment:

- **Dialogue** between teacher and learner, between learners and learners, and the extent which this is resourced and supported in a given learning community:
 - What opportunities are there for dialogue within and around coursework?
 - For initiating dialogue?
 - For receiving response?
 - Who can engage in dialogue with whom and how easily?
 - Dialogue opportunities in terms of feedback on actions
- **Structure** - the extent to which the learner is guided, prompted, ‘programmed’ toward the learning goal, the degree to which paths to understanding are prescribed and learning tasks ordered. What elements of the course provide structure? Eg:
 - Aims/ objectives
 - Study guide and assignment guidelines
 - Assessment task requirements and marking criteria
 - Pacing/deadline management -is this by means of prescription, frameworks, suggestion, example, rhetoric...
- **Autonomy** – this aspect interdependent upon the others – the extent to which the participant is free to take responsibility for his or her own learning. How autonomous are participants in terms of:
 - Their objectives/goals?
 - Their study strategies and choice of tools and resources?
 - Assessment and evaluation?

Figure 3: Nodes within interactional learning context framework, with potential factors of influence

Subject	Gender Age Socio-cultural background (course language alignment) Educational background/qualifications Professional background/current workplace Experience with ICTs for knowledge working/leisure/learning Resource access status (eg own equipment, broadband...) Motivation for doing course Level of other commitments Availability for this activity
Tools	Web-based learning environments Web-based learning materials Communication tools (conferences, email, phone, post...) Metacognitive tools Collaborative learning tools

	<p>Assessment tools</p> <p>Other resources offered by the course, including frameworks and models.</p> <p>Resources brought in by participants, including frameworks and models.</p>
Objectives	<p>(a) The group as a subject has an objective for the activity under study - eg “produce a support plan for a learning context”</p> <p>(b) Within the participant group there will be individual objectives which may, or may not, conflict with the assigned objective. Eg:</p> <ul style="list-style-type: none"> - To gain experience in working collaboratively on line - To work gain material/ideas for the subsequent assignment. - To maintain contact with the group - To fulfil course requirements (assessed) - Not to contribute in order to spend time on other things
Community – as people	<p>Learners</p> <p>Teachers and trainers</p> <p>Support staff</p> <p>Subject experts (visiting/available)</p> <p><i>A point here that, particularly in workplace learning situations, ‘the community’ extends to key people around individual subjects...</i></p>
Community – as practice	<p>(<i>Transactional distance</i> as a framework for representation/analysis)</p> <p>Pedagogies: didactic, interactive, ‘discovery’, ‘cooperative’; assessment procedures</p> <p>Opportunities for dialogue (one-to-one, one-to-many, many-to-many)</p> <p>Imposition of structure (open versus closed paths to task process and achievement)</p> <p>Autonomy – degree to which the learner has control/responsibility</p>
Rules	<p>The Institute</p> <p>Educational system/climate</p> <p>Socio-Cultural system/climate</p> <p>Workplace community..?</p>
Roles	<p>Either the formal roles of the community members such as tutor, course chair, student, guest expert.....</p> <p>Or allocation of activity to actor, eg ‘researcher’, ‘scribe’, chair..... or role of actor within task – eg tutor-as-facilitator, tutor-as-assessor, tutor-as-peer.... Student taking moderator role....</p> <p>Deliberate roles – ie by allocation or voluntary selection....</p> <p>Manifest roles, ie emergent within activity</p>

ACKNOWLEDGMENTS

We thank the Institute of Educational Technology at the UK Open University, whose tutors and students participated in our exploratory studies; colleagues across the EQUER network, particularly within SIG2, who critiqued the work in process, and members of the SCROLLA community, who aspects of our work forward in their own research and practice contexts. SCROLLA was initially funded by the Scottish Higher Education Funding Council’s Strategic Research Development Initiative, from March 2001 to July 2004.

REFERENCES

- Broumley L (2002) 'Learning to Learn from Online Dialogue: Are we building Cairns or Dry Stane Dykes?' Improving Student Learning Conference, Brussel Sept 2002
<http://www.learn.uhi.ac.uk/staff/lbroumley.htm> accessed 04.02.04
- Chappel, H., McAteer, E., Harris, R.A., & Marsden, S. (2002) Fast Coding of On-Line Learning Behaviours using an 'Elements' Approach. Proceedings of Networked Learning 2002, University of Sheffield, UK
- Engestrom, Y. (1987) Learning by expanding: An activity-theoretical approach to developmental research. Helsinki, Orienta-Konsultit. Also
<http://communication.ucsd.edu/MCA/Paper/Engestrom/expanding/toc.htm>
- Kaptelinin, V. (1996). Computer-Mediated Activity: Functional Organs in Social and Development Contexts. Context and Consciousness: Activity Theory and Human-Computer Interaction. ed B. A. Nardi. Cambridge, MA, The MIT Press: 45-68.
- Kuutti, K. (1996). Activity Theory as a Potential Framework for Human-Computer Interaction Research. Context and Consciousness: Activity Theory and Human-Computer Interaction. B. A. Nardi. Cambridge, MA, The MIT Press: 17-44.
- Leont'ev, A. N. (1981) Problems of the development of mind. Moscow: Progress Publishers.
- McAteer, E., Tolmie, A., Harris, R.A., Chappel, H., Marsden, S. & Lally, V. (2002) Characterising On-Line Learning Environments. Proceedings of Networked Learning 2002, University of Sheffield, UK
- Moore, M. (1986) Self-directed learning and distance education. Journal of Distance Education, 1 (1) 7-24
- Moore, M. and Kearsley, G. (1996) Distance Education: a systems view. Thomson: Wadsworth Publishing. Ch. 10
- Nardi, B. (1996). Studying Context: A Comparison of Activity Theory, Situated Action Models and Distributed Cognition. Context and Consciousness: Activity Theory and Human-Computer Interaction. B. A. Nardi. Cambridge, MA, The MIT Press: 69-102.
- Piaget, J. (1932). The Moral Development of the Child. London, Routledge & Keegan Paul.
- Russell, D. (2002) Looking beyond the interface: activity theory and distributed learning. In Lea, M. and Nicoll, K. (eds) Distributed Learning: social and cultural approaches to practice.
- Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA, Harvard University Press.
- Wells, G. (2002). "The Role of Dialogue in Activity Theory." Mind, Culture and Activity 9(1): 43-66.