

*Learning and Socio-cultural Theory:
Exploring Modern Vygotskian
Perspectives International Workshop
2007*

Volume 1, Issue 1

2007

Article 5

LEARNING AND SOCIO-CULTURAL THEORY: EXPLORING
MODERN VYGOTSKIAN PERSPECTIVES

E-Learning Practices: Exploring the Potential
of Pedagogic Space, Activity Theory and the
Pedagogic Device

I. Robertson*

*Royal Melbourne Institute of Technology

Copyright ©2007 by the authors. *Learning and Socio-cultural Theory: Exploring Modern Vygotskian Perspectives International Workshop 2007*. <http://ro.uow.edu.au/llrg>

E-Learning Practices: Exploring the Potential of Pedagogic Space, Activity Theory and the Pedagogic Device

I. Robertson

Abstract

In conceptualising e-learning as a new pedagogic space, this paper builds on work which argues that the theoretical frameworks of Activity Theory and Bernstein can be brought into a productive relationship (Daniels, 2001a, 2001b, 2004). Using Activity Theory (Engestrom, 1999, 2001; Engestrom, Mietinen, & Punamaki, 1999) and Basil Bernstein's pedagogic device (Bernstein, 1996, 2000), an examination of the dynamics that shape practice when e-learning technology is introduced into face-to-face teaching practice is undertaken. Activity Theory is shown to be successful in identifying the tensions/contradictions that emerge when the two activity systems of face-to-face teaching and e-learning technologies come into juxtaposition. The possibility for expansionist learning through reflection, discussion and critical analysis is examined. Bernstein's pedagogic device is found to be useful in examining the means through which pedagogic discourse is established and maintained. Specifically, the notion of recontextualisation is shown to provide the opportunity to operationalise the mechanics that shape pedagogic practice when e-learning is integrated into teaching. It is concluded that the two frameworks provide different lenses for research that are complementary in examining the dynamics that shape teaching practice.

E-LEARNING PRACTICES: EXPLORING THE POTENTIAL OF PEDAGOGIC SPACE, ACTIVITY THEORY AND THE PEDAGOGIC DEVICE

IAN ROBERTSON
RMIT

Abstract

In conceptualising e-learning as a new pedagogic space, this paper builds on work which argues that the theoretical frameworks of Activity Theory and Bernstein can be brought into a productive relationship (Daniels, 2001a, 2001b, 2004). Using Activity Theory (Engestrom, 1999, 2001; Engestrom, Mietinen, & Punamaki, 1999) and Basil Bernstein's pedagogic device (Bernstein, 1996, 2000), an examination of the dynamics that shape practice when e-learning technology is introduced into face-to-face teaching practice is undertaken.

Activity Theory is shown to be successful in identifying the tensions/contradictions that emerge when the two activity systems of face-to-face teaching and e-learning technologies come into juxtaposition. The possibility for expansionist learning through reflection, discussion and critical analysis is examined. Bernstein's pedagogic device is found to be useful in examining the means through which pedagogic discourse is established and maintained. Specifically, the notion of recontextualisation is shown to provide the opportunity to operationalise the mechanics that shape pedagogic practice when e-learning is integrated into teaching.

It is concluded that the two frameworks provide different lenses for research that are complementary in examining the dynamics that shape teaching practice.

Introduction

The use of digital technologies to support teaching and learning has been promoted and supported in education for more than a decade. Under the generic label of e-learning the use of networked computers and mobile devices is becoming more common. The introduction of these devices is often treated as unproblematic.

In this paper, e-learning is broadly defined as the use of digital and networked technologies to support teaching and learning. These technologies support a range of functions that include the distribution of resources, communications and assessment. What differentiates networked from stand-alone digital technology is the capacity of networks to cause us to rethink our conceptions of pedagogy in terms of space, time and interconnections. This paper examines the reconceptualisation of teaching and learning in the presence of e-learning. In describing the

use of e-learning as the emergence of a new pedagogic space, the paper explores the usefulness of the notions of the pedagogic device (Bernstein, 1996, 2000) and Activity Theory (Engestrom, 1999, 2001; Engestrom et al., 1999) as complementary frameworks in examining the dynamics that shape practice when e-learning technology is integrated into a face-to-face teaching.

E-learning as Pedagogic Space

Pedagogic space has been defined as ‘The spaces, norms and pedagogical scaffolds, that emerge around shared [teaching] practices’ (Brown, 2004, pp.1-2). In the context of a discussion of globalisation, Edwards and Usher (2000, p.7) suggest that spatial metaphors, such as ‘border crossing (Giroux, 1992), border pedagogy (Study Group in Education and Training, 1997), speaking from the margins (Spivak, 1993), spanning the abyss (Elam, 1994), occupying in-between spaces (Bhabha, 1994) and legitimate peripheral participation (Lave and Wenger, 1991)’ play an important part in the framing of political and pedagogical questions that have emerged to characterise educational and other cultural practices.

Under the general descriptor of ‘cyberspace’ (Edwards & Usher, 2000, p.33) the role of information technologies and computer-mediated communication in constructing a new and different relationships between space and time has been noted. Through ‘space-time compression ... the world feels smaller, and in a sense is smaller, as more people, goods and services are now able to travel around it and communicate across great distances much more quickly and easily than was previously the case’ (Edwards & Usher, 2000, p.24). The use of information technologies transcends ‘both clock time and physical space’ (Edwards & Usher, 2000, p.33).

Beyond the notion of the bounded container, Edwards (2005, p.1) reviews ‘what constitutes a learning context and how the relationship between learning and context can be conceptualised’. He examines the contexts of domains, sites and space. Domains such as work, leisure, community, education and home are defined as ‘areas of social life within which learning can occur’ (Edwards, 2005, p.2). Sites such as the TAFE college, the Adult and Community Education centre, and specific work environments are ‘particular material spaces and times within which people engage in learning’ (Edwards, 2005, p.2). With the emergence of information technology, the distinction between the contexts of domains and sites has become blurred such that they might be considered to be a more fluid and relational set of practices that find expression in ‘theories of learning that emphasise activity and draw upon concepts of communities and networks rather than context’ (Edwards, 2005, p.2).

Castells (1996, p.500) conceptualises the capacity of information technology to support a society constructed of ‘a network of interconnected nodes’. That is, sites of intersection through which information flows and where nodes operate as switches with the capacity for control of the flow of information (Castells, 1996). In Bernstein’s terms, the node can be conceived as a pedagogic device, and those who control the pedagogic device have the capacity to enable or suppress what constitutes legitimate pedagogic discourse. The emergence of the internet has enabled a recontextualisation and produced a struggle for control. For example, in a detailed analysis of the impact of information technologies on market economies it is concluded that changes brought about by the networked information environment go to the ‘very foundations of how liberal markets and liberal democracies have coevolved for almost two centuries [bringing with it] great promise, and great uncertainty (Benkler, 2006, pp.1, 472).

Access to the social space of digital networks is premised upon the ability of ‘space-users [to] perceive, decode and make sense of or read – different locations and places that have been historically produced and have acquired cultural-semiotic meaning’ (Kostogriz & Peeler, 2004, p.3). Here we see a second link to Bernstein’s (1996, 2000) work which posits that people require access to recognition rules in order to make sense of pedagogic discourse, and realisation rules in order to produce legitimate pedagogic discourse.

Building on the ideas of Daniels (2001a, 2001b, 2004) who argues that the theoretical frameworks of Bernstein and Activity Theory can be productively brought into relation with each other, the current paper uses these theories to examine the dynamics that shape teachers practice when the pedagogic spaces of e-learning and face-to-face teaching are brought into juxtaposition.

Basil Bernstein: Pedagogic Device and Recontextualisation

Basil Bernstein’s theoretical corpus (Bernstein, 1996, 2000) was developed over a period of more than 40 years. His early work is grounded in the field of socio-linguistics where a concern for the lack of success of working class children in schools led to the development of the ideas of restricted and elaborated codes. Moving from specific concern for educational failure to developing a larger sociological theory led to the publication of work on classification and framing (Christie, 1999) as a means to theorise pedagogic communication in terms of power and control respectively.

While classification and framing provided a means to analyse language codes, they do not assist in understanding how those codes was established and maintained. Addressing this shortcoming, Bernstein developed the idea of the pedagogic device that regulates the pedagogic communication that is possible. Here, discourse is defined as an institutionalised system of meaning making comprised of language and social forms of gestures and postures. The pedagogic device enables and legitimises ‘the potential discourse that is available to be pedagogised’ (Bernstein, 2000, p.27).

Through distribution rules, recontextualisation rules and evaluation rules those who control the pedagogic device have the capacity to control what counts as legitimate discourse. Distribution rules distribute different forms of knowledge to different social groups thus determining who has access to what knowledge and under what conditions. They establish the limits of thinkable and unthinkable knowledge and thus the limits of legitimate discourse.

Recontextualisation rules construct the thinkable, official knowledge and the ‘what’ and ‘how’ of pedagogic discourse. They give rise to evaluation rules that condense the meaning of the whole pedagogic device by providing the criteria that establish what counts as legitimate knowledge. In education this is largely achieved through assessment processes.

Recontextualisation is influenced by two recontextualising fields. Through the official recontextualising field (ORF) the state and its delegates operate at a generative level to legitimise official pedagogic discourse. This undergoes further recontextualisation through the pedagogic recontextualising field (PRF) when policy is interpreted and implemented by those who are

directly involved in teaching. Whilst the state legitimises the principles of distribution of social power and control which are incorporated into the official pedagogic discourse these principles undergo further recontextualisation at the level of the transmitters' discourse and then at the level of acquisition (Soloman & Tsatsaroni, 2001).

The PRF is represented in the espoused pedagogic principles of those who influence the pedagogic transaction. In the case of traditional classroom-based teaching, agents of the PRF include teachers and authors of texts that are used by students. In the case of the use of technology, the PRF is also influenced by the assumptions embedded in the technology used and the digital resources that are provided for teaching.

Through Bernstein (1996, 2000) the pedagogic device provides a means to theorise pedagogic space and the emergent pedagogic discourse. His theoretical corpus provides a language to describe and examine the contest for control of pedagogic discourse at the interface between the ORF and PRF.

As an example, Robertson (2006) uses Bernstein's pedagogic device as the basis to develop a model that represents the dynamics that shape vocational education teachers practice when they integrate online technology (see Figure 1).

The outer sphere of the model represents the ORF. The ORF is dominated by the state and legitimises a pool of teaching approaches that are officially sanctioned. Official influences are identified as: national/state, regional/local and organisational policy; curriculum; external agencies; and, endorsed software.

The inner sphere represents the influence of teachers as part of the PRF. With the exception of 'radical teachers' who ignore official policy, teachers are able to draw their specific instructional practices from a pool of legitimised pedagogic possibilities. Within the field of pedagogic influences, teachers preferred teaching principles are informed by deep-seated notions of what constitutes good teaching (Errington, 2004; Marland, 1998). Mediated through a lens of disposition teachers adopt specific instructional practices from the legitimised pedagogic pool. This is achieved through variation in the e-learning functionalities that are adopted, variation in their application to teaching and/or assessment practices, and variation in the level of integration into existing practice. Based on feedback from the teacher's experience with the use of e-learning technology the teacher's level of disposition towards its use is maintained, increased or decreased. These experiences contribute to future use of technology within practice (Robertson, 2006).

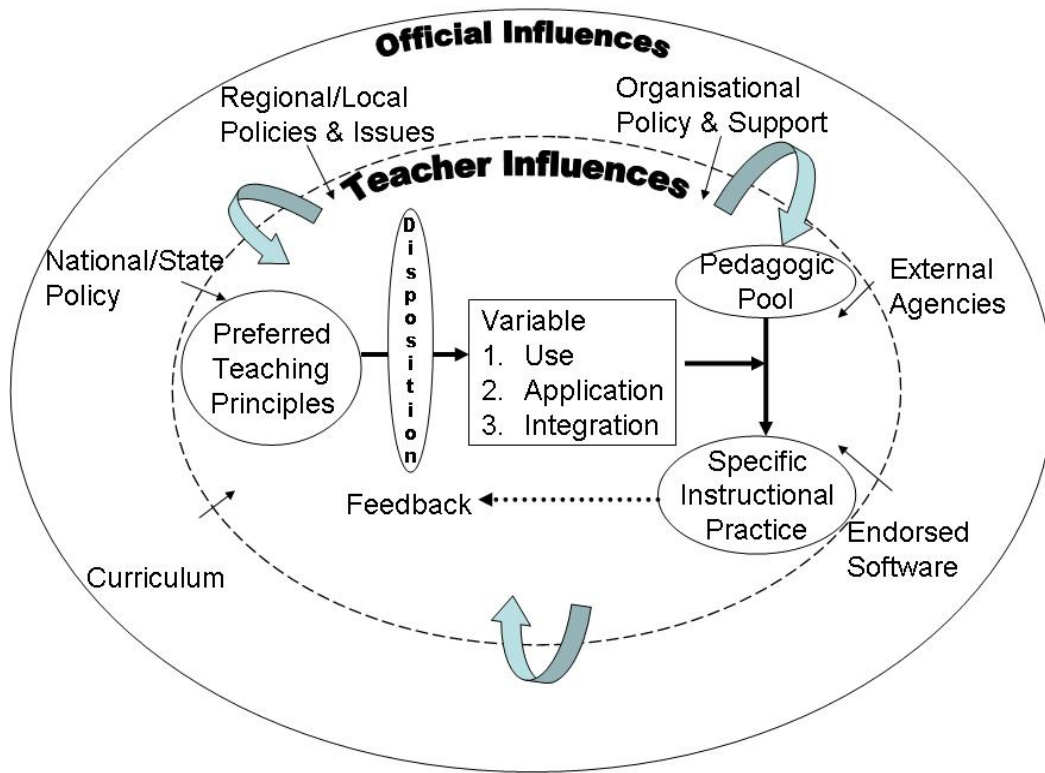


Figure 1: The dynamics of official and teacher influences (Source: Robertson, 2006, p.177)

The broken line between the outer and inner spheres and the curved arrows represent the dynamic nature of the relationship between official and teacher influences. Teacher’s pedagogic influences operate against a background of official influences and a struggle for control of teacher’s pedagogic practices occurs at this interface.

Activity Theory

Activity Theory is a powerful descriptive rather than predictive tool that provides a language as well as conceptual tools to examine activity where mediation between a subject and object are central (Engestrom et al., 1999; Nardi, 1996). Activity is seen as dynamic, contextually bound and the basic unit of analysis. Activities are distinguished from one another by the tangible or intangible objects achieved. If the object changes then so does the activity. Tools (artifacts) mediate between the subject and the object. These tools (artifacts) such as physical tools, language and symbols are created and/or transformed in the course of an activity. They embed and carry with them historical residue and specific cultural characteristics (Kuutti, 1996) which are simultaneously enabling and limiting.

First generation Activity Theory represents activity at the individual level. The relationship between the subject and object is mediated through tools. When the object is transformed the outcome is achieved as depicted in Figure 2.

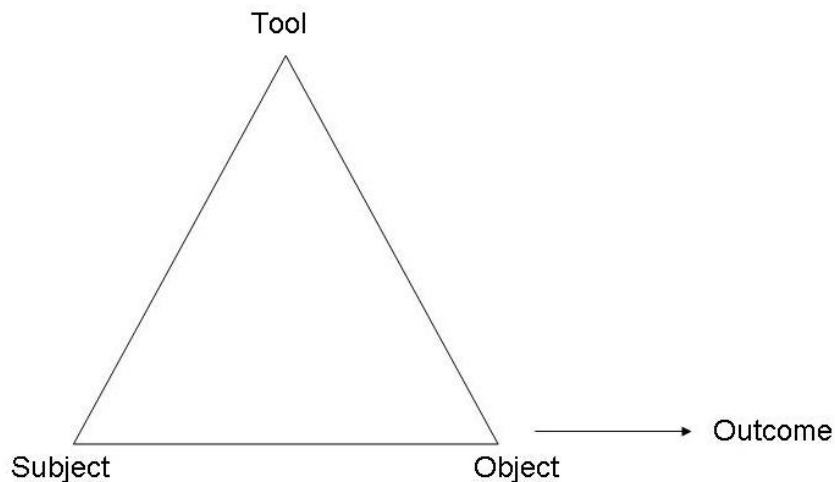


Figure 2: First generation Activity Theory

Second generation Activity Theory represents activity at a collective level. Rules may be explicit and implicit. Division of labour refers to the explicit and implicit organisation of the community as depicted in Figure 3.

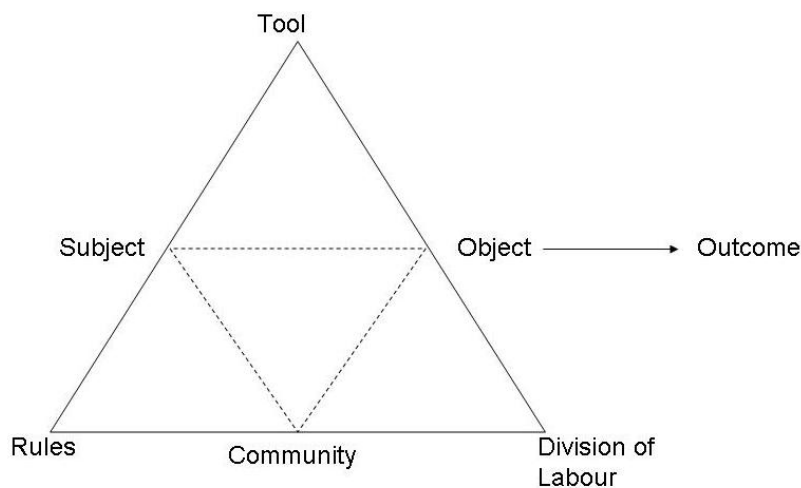


Figure 3: Generation two Activity Theory

Third generation Activity Theory represents networked activity and incorporates the idea of boundary objects as depicted in Figure 4. That is, objects that operate at the interface of many contexts (Edwards, 2005). Where two (or more) activity systems come into contact there may be contradictions and tensions through which expansive learning is possible through questioning, analysis, reflection and debate (Russell, 2002).

If practitioners engage in discussion, debate and reflection then learning beyond what was possible within a single activity system becomes possible. A third, modified or recontextualised object that incorporates the socio-cultural elements of the boundary objects associated with the two initial activity systems emerges.

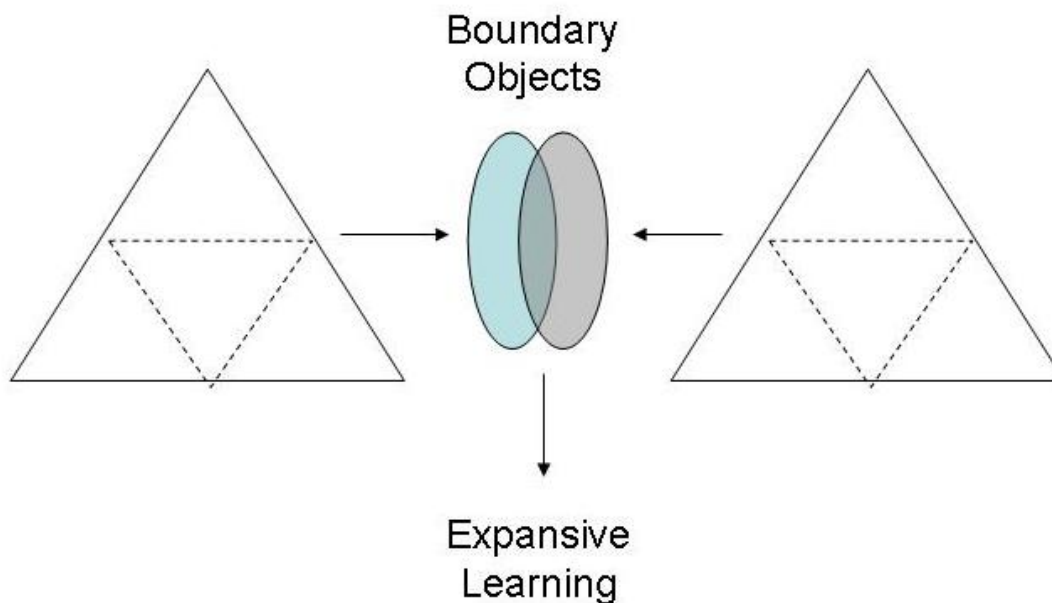


Figure 4: Generation three Activity Theory

If the ORF and PRF as represented in the Robertson (2006) model (see Figure 1) are conceptualised as activity systems that are brought into contact then it is possible to see similarities between Bernstein's pedagogic device and Activity Theory's boundary objects. In

Activity Theory terms the interaction between the ORF and PRF can be conceptualised as the coming together of two activity systems. That is the activity system of policy and the activity system of teaching. Through an application of Activity Theory and the pedagogic device to an examination of the dynamics that shape practice when e-learning is integrated into face-to-face teaching the next section shows that the two frameworks can be brought into a productive relationship (Daniels, 2004).

Applying Activity Theory to E-learning

Based on the elements of generation two Activity Theory (see Figure 3) Mwanza and Engestrom (2003) describe an eight step model to guide researchers using Activity Theory. In this section of the paper I apply Mwanza and Engestrom's (2003) eight step model to the activity systems of face-to-face teaching and e-learning technology.

1. Activity: What sort of activity am I interested in?
2. Object(ive): Why is the activity taking place?
3. Subjects: Who is involved in carrying out the activity?
4. Tools: By what means are the subjects performing the activity?
5. Rules and regulations: Are there any cultural norms, rules or regulations governing the performance of the activity?
6. Division of labour: Who are responsible for what, when carrying out activity and how are those roles organised?
7. Community: What is the environment in which this activity is being carried out?
8. Outcomes: What is the desired outcome from carrying out this activity? (Mwanza & Engestrom, 2003)

Others have used Activity Theory as a means to examine human-computer interaction, rejecting the cognitive science approach that is based on an input-output model (Kaptelinin, 1996; McMichael, 1999; Nardi, 1996; Verenikina & Gould, 1997). There are also examples of the use of Activity Theory to underpin decisions about instructional design of learning programs (Morrison, 2003; Russell, 2002).

Here, the focus is on teaching. Therefore, the subject (who is involved in carrying out the activity?) is the teacher in both cases. I assume that the object (why is the activity taking place?) is to facilitate learning in both cases. Whilst I acknowledge that there are a range of definitions of learning, and that the particular definition applied will influence the desired outcome of the activity, this issue is not pursued in the current paper.

The activity system of face-to-face teaching and e-learning technology are described individually. Using generation three Activity Theory, the activity systems are then juxtaposed to reveal tensions between the systems and the potential for expansive learning. Bernstein's (1996, 2000) work is used to complement the activity systems analysis.

Face-to-Face Teaching Activity System

In the case of conventional face-to-face classroom-based practice the teacher is responsible for the development and delivery of the teaching program. Whilst it is reasonable to suggest that the program may be adapted in a dynamic fashion in response to learners' behaviours, attitudes and needs this adaption is under the control of the teacher. Within this environment, the community includes the teacher and learners. The influence of authors of pre-prepared materials and textbooks is present through their use to support teaching. In Bernstein's terms, the influence of these authors is part of the pedagogic recontextualising field (PRF) (Bernstein, 1996, 2000). In addition to the cultural norms, rules and regulations associated with the institution in which the teacher works, the practitioner is also influenced by the norms of the cultural discipline in which they operate (John & Baggott la Velle, 2005). The face-to-face activity system is depicted in Figure 4.

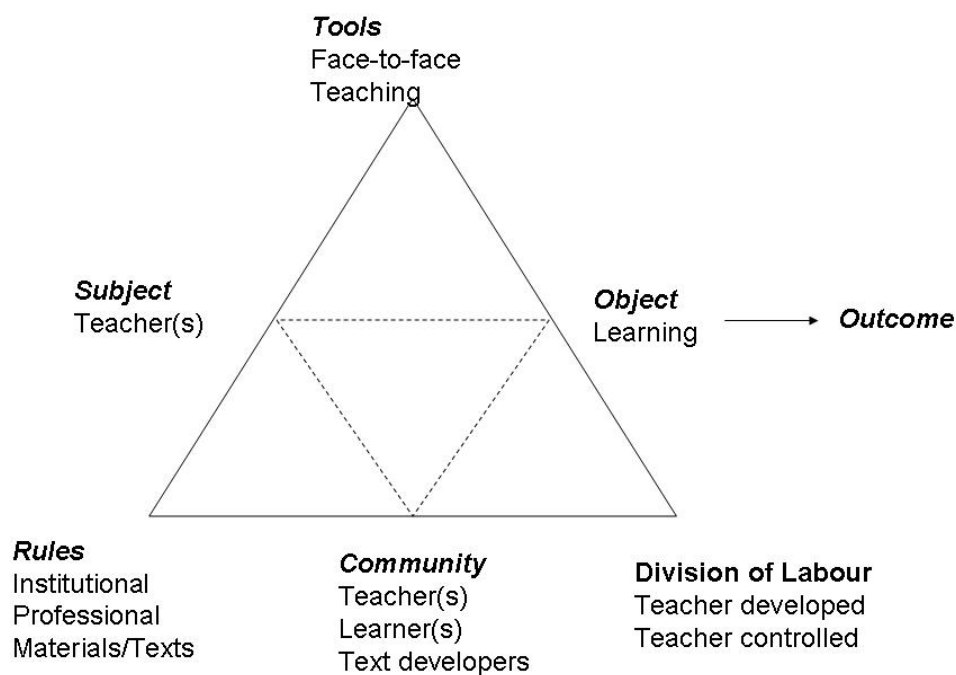


Figure 5: Activity system for synchronous face-to-face teaching and learning

E-Learning Activity System

In this paper, e-learning is defined as the use of digital and networked technologies to support teaching and learning. These technologies support a number of functions including the distribution of resources in a range of forms, communications and assessment. E-learning includes teaching models that use one or more functionality to support part or all of a teaching program.

Here, I assume that e-learning is used in a face-to-face environment rather than as a tool for distance education. It is assumed that the teacher has primary responsibility for the direct facilitation of learning.

Where e-learning technology is used, the norms and rules designed into the software by technical/software developers are influential (Bowers, 1988; Lamnias & Kamarianos, 2002). Where the online content and interactions that are loaded onto e-learning technology are not developed by the teacher, and this is often the case, the influence of content developers is also present. Hence the division of labour associated with e-learning technology is divided between the technical/software developers and content developers. The e-learning technology activity system is depicted in Figure 6.

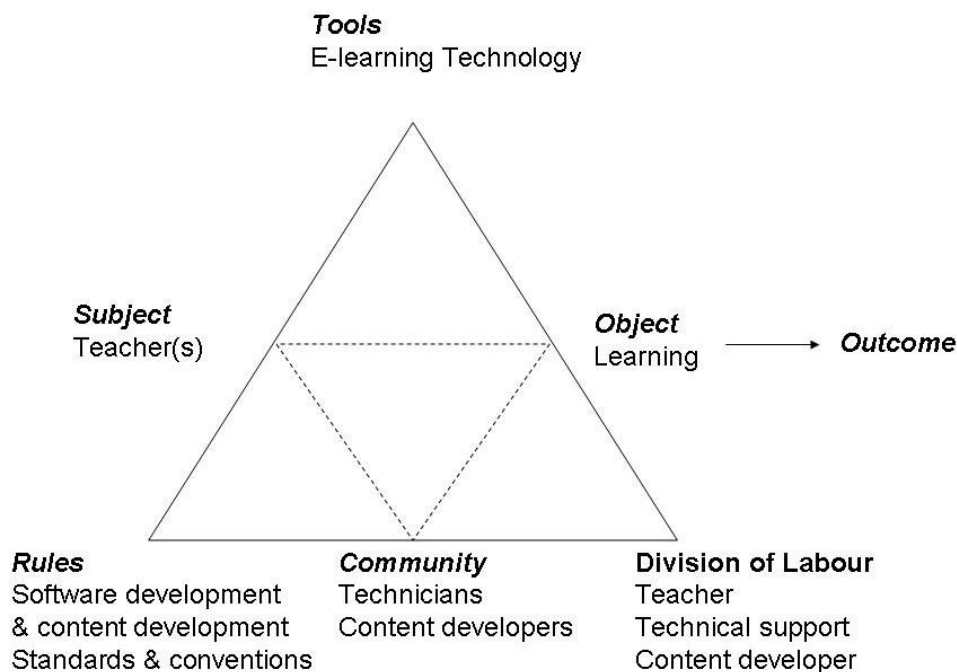


Figure 6: Activity System for e-Learning technology

Using Activity Systems to Reveal the Potential for Expansionist Learning and Recontextualisation

This section of the paper turns to the application of generation three Activity Theory to explore the usefulness of the notions of boundary objects and expansionist learning (see Figure 7) in exploring the dynamics that occur when e-learning is introduced into face-to-face teaching. Bernstein's notions of the pedagogic device and recontextualisation are also introduced to examine the proposed complementary nature of Activity Theory and Bernstein's theoretical framework.

In many cases, the assumptions that underpin the activities of teachers, software developers and content developers who work in the activity systems of face-to-face teaching and e-learning differ. Where these differences occur, tensions and contradictions may appear between the activity systems, some of these are now discussed. Russell (2002, pp.71-73) also describes an example of the introduction of such contradictions into a teacher-developed web-supported system which is shifted to an organisational learning management system.

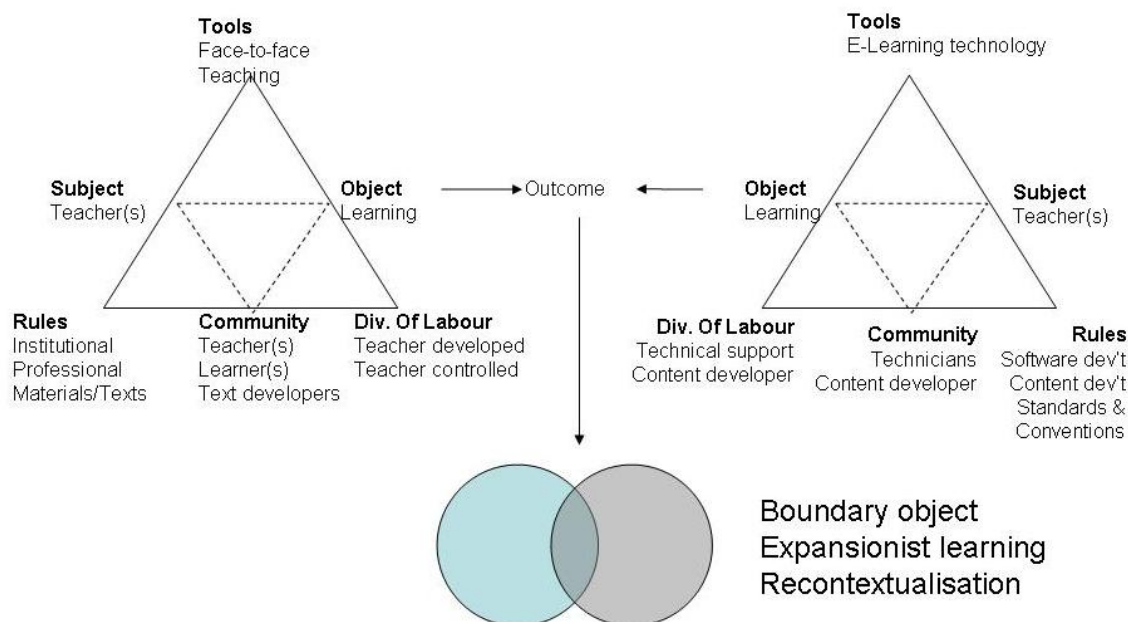


Figure 7: Activity system for face-to-face teaching with e-learning technology

Assumption Related to Excellence in Teaching Practice

In face-to-face practice, teachers have significant control over what represents excellence in teaching practice in their own classroom. It is reasonable to propose that the outcome of the activity system is a change in the learner which is associated with the process of learning.

In the case of e-learning technology, it would be uncharitable to suggest that software developers do not consider what they believe to be excellence in teaching practices, at least tacitly. These beliefs are embedded into the software and reflected in the norms and rules through which the software operates.

Where assumptions about the nature of good teaching practice vary between the teacher and the software developer a potential tension arises. There is a contradiction between the desired outcomes of the two activity systems.

Technical Requirements of E-learning Software

It is also reasonable to propose that software developers are concerned with the technical aspects of the software. They will aim to design software that is technically excellent in terms of stability, reliability and scalability. They will also design software according to the conventions of development to ensure compatibility with other software systems and transferability of data. The norms and rules associated with such considerations will be embedded into the software and its operation. Where these technical considerations embed norms and rules into software that are different from those of the face-to-face teacher potential tensions arises.

Assumptions Associated with Content Development

When content developers become involved in the development of teaching and learning materials that are placed on e-learning software a further set of norms and rules is introduced. Depending on the instructional design model that the content developer adopts these will be reflected in the norms and rules that the teacher must adopt in their teaching practice if they use pre-prepared e-learning content. Again potential tension arises between the activity systems of face-to-face teaching and e-learning technology.

The Potential for Expansionist Learning

The juxtaposition of the activity systems of face-to-face teaching and e-learning technology shows the potential for differences in the objects of the two systems. Here, there is potential for expansionist learning where ‘the object or the motive of the activity are reconceptualised to embrace a radically wider horizon of possibilities than in the previous mode of activity’ (Engestrom, 2001, p.7). The object created as a result of the interaction of the activity systems is a reconceptualised object which is built on recontextualised historically embedded cultural concerns that are derived from the original objects. The usefulness of this approach has been demonstrated in respect to children’s health care in the Helsinki area (Engestrom, 2001, pp.3-27). The *Center for Activity Theory and Developmental Work Research* at Helsinki University (<http://www.edu.helsinki.fi/activity/> accessed 15 March 2007) also reports on the use of Activity Theory to examine: new forms of work and learning; innovation processes; the network collaboration of research groups; co-operative, expansive learning and change processes in work organisations; and, knowledge transfer between school and work.

Through discussion, reflection and critical analysis, the Activity Theory approach provides the opportunity to make explicit, and hence to better understand what happens when activity systems come into contact. In Bernstein’s terms, this constitutes a recontextualisation of discourse. It is in this regard that Bernstein’s pedagogic device, and particularly his notion of recontextualisation becomes useful in analysis. As Robertson (2006) demonstrates, a detailed analysis of the official recontextualising field (ORF) and pedagogic recontextualising field (PRF) makes it possible to uncover the influences that are at play in a struggle for control over the emerging pedagogic device. When the ORF and PFR are conceived as activity systems it is possible to examine the pedagogic device that emerges when the objects of the two activity systems come into contact. Here, there is a possibility of expansionist learning.

Conclusion

This discussion demonstrates that Activity Theory and Bernstein’s notion of the pedagogic device are complementary in examining the dynamics that shape practice when e-learning technology is introduced into face-to-face teaching. Activity Theory has been successful in identifying the tensions/contradictions that emerge when the two activity systems come into juxtaposition. The possibility for expansionist learning through reflection, discussion and critical analysis is also discussed. Bernstein’s pedagogic device is, in a general sense, useful as a notion for considering the means through which pedagogic discourse is established and maintained. More specifically, when the notion of recontextualisation is examined, the potential for consideration of official and pedagogic recontextualisation fields provides the opportunity to operationalise the mechanics that shape pedagogic practice when e-learning is integrated into teaching.

Whilst, there is more work to be done in exploring the application of Activity Theory and Bernstein to teacher's practice, this examination of the dynamics that shape teaching when e-learning technology is integrated into face-to-face teacher's practice shows that the use of these two approaches is complementary.

References

- Benkler, Y. (2006). *The wealth of networks. How social production transforms markets and freedoms*. New Haven: Yale University Press.
- Bernstein, B. (1996). *Pedagogy, symbolic control and identity. Theory, research, critique*. London: Taylor and Francis.
- Bernstein, B. (2000). *Pedagogy, symbolic control and identity: Theory, research, critique* (Rev. ed.). Lanham, Maryland: Rowman & Littlefield.
- Bowers, C. A. (1988). *The cultural dimensions of educational computing*. New York: Teachers College Press.
- Brown, R. (2004). *Exploring the notion of 'Pedagogic Space' through students' writings about a classroom community of practice*. Paper presented at the AARE Conference 2004, University of Melbourne.
- Castells, M. (1996). *The information age. Economy, society and culture. Volume 1. The rise of the networked society*. Oxford: Blackwell.
- Christie, F. (Ed.). (1999). *Pedagogy and the shaping of consciousness. Linguistic and social processes*. London: Continuum.
- Daniels, H. (2001a). Bernstein and activity theory. In A. Morais, I. Neves, B. Davies & H. Daniels (Eds.), *Towards a sociology of pedagogy. The contribution of Basil Bernstein to research* (pp. 99-111). New York: Peter Lang.
- Daniels, H. (2001b). *Vygotsky and pedagogy*. London: RoutledgeFalmer.
- Daniels, H. (2004, 15-18 July). *Activity, discourse and pedagogic change*. Paper presented at the Third International Basil Bernstein Symposium, Cambridge.
- Edwards, R. (2005, 14-17 September). *Contexts, boundary zones and boundary objects in lifelong learning*. Paper presented at the British Educational Research Association Annual Conference, University of Glamorgan.
- Edwards, R., & Usher, R. (2000). *Globalisation and pedagogy. Space, place and identity*. London: Routledge.
- Engestrom, Y. (1999). Activity theory and individual and social transformation. In Y. Engestrom, R. Miettinen & R.-L. Punamaki (Eds.), *Perspectives on activity theory* (pp. 19-39). Cambridge: Cambridge University Press.
- Refereed proceedings from Learning and Socio-cultural theory: Exploring modern Vygotskian perspectives workshop, 2007, Wollongong University

- Engestrom, Y. (2001). *Expansive learning at work. Towards an activity-theoretical reconceptualisation*. London: Institute of Education, University of London.
- Engestrom, Y., Miettinen, R., & Punamaki, R.-L. (Eds.). (1999). *Perspectives on activity theory*. Cambridge: Cambridge University Press.
- Errington, E. (2004). The impact of teacher beliefs on flexible learning innovation: Some practices and possibilities for academic developers. *Innovations in education and teaching international*, 41(1), 39-47.
- John, J., & Baggott la Velle, L. (2005). Devices and desires: Subject sub-cultures, pedagogical identity and the challenge of ICT. *Technology, Education and Pedagogy*.
- Kaptelinin, V. (1996). Activity theory: Implications for human-computer interaction. In B. Nardi (Ed.), *Contexts and consciousness. Activity theory and human-computer interaction* (pp. 103-114). The MIT Press: Cambridge.
- Kostogriz, A., & Peeler, E. (2004). *Professional identity and pedagogic space: Negotiating difference in teacher workplaces*. Paper presented at the AARE Conference 2004, University of Melbourne.
- Kuutti, K. (1996). Activity theory as a potential framework for human-computer interaction research. In B. Nardi (Ed.), *Contexts and consciousness. Activity theory and human-computer interaction* (pp. 17-44). The MIT Press: Cambridge.
- Lamnias, C., & Kamarianos, J. (2002). *Society, technology and education: A critical approach towards the evolution of new technologies in education*. Retrieved 13 January, 2003, from <http://www.ioe.ac.uk/ccs/conference2000/papers/tpm/papers/lamnias&kamarianos.html>
- Marland, P. (1998). Teachers' practical theories: Implications for preservice teacher education. *Asia-Pacific journal of teacher education & development*, 1(2), 15-23.
- McMichael, H. (1999). *An activity based perspective for information systems research*. Paper presented at the 10th Australian Conference on Information Systems.
- Morrison, D. (2003). Using activity theory to design constructivist online learning environments for higher order thinking: A retrospective analysis. *Canadian journal of learning and technology*, 29(3).
- Mwanza, D., & Engestrom, Y. (2003, 7–11 November). *Pedagogical adeptness in the design of e-learning environments: Experiences from Lab@Future project*. Paper presented at the E-Learn 2003 International Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education, Phoenix, AR.
- Nardi, B. (Ed.). (1996). *Contexts and consciousness. Activity theory and human-computer interaction*. The MIT Press: Cambridge.
- Robertson, I. (2006). *Teachers integrating online technology in TAFE*. Unpublished Doctor of Education, Monash University, Melbourne.

Russell, D. (2002). Looking beyond the interface. Activity theory and distributed learning. In M. Lea & K. Nicoll (Eds.), *Distribute learning. Social and cultural approaches to practice*. London: RoutledgeFalmer.

Soloman, J., & Tsatsaroni, A. (2001). Educational evaluation: The social production of texts and practices. In A. Morais, I. Neves, B. Davies & H. Daniels (Eds.), *Towards a sociology of pedagogy. The contribution of Basil Bernstein to research* (pp. 287-315). New York: Peter Lang.

Verenkina, I., & Gould, E. (1997, 7-10 December). *Activity Theory as a framework for interface design*. Paper presented at the Ascilite '97, Curtin University, Western Australia.