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Frameworks for Understanding the Nature of Interactions, Networking, and Community in a Social Networking Site for Academic Practice

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Abstract

This paper describes a new social networking site, Cloudworks, which has been developed to enable discussion and sharing of learning and teaching ideas/designs and to promote reflective academic practice. The site aims to foster new forms of social and participatory practices (peer critiquing, sharing, user-generated content, aggregation, and personalisation) within an educational context. One of the key challenges in the development of the site has been to understand the user interactions and the changing patterns of user behaviour as it evolves. The paper explores the extent to which four frameworks that have been used in researching networked learning contexts can provide insights into the patterns of user behaviour that we see in Cloudworks. The paper considers this within the current debate about the new types of interactions, networking, and community being observed as users adapt to and appropriate new technologies.

Keywords: Cloudworks; social networking; Web 2.0; social and participatory web practices; frameworks; connectivism; actor-network theory; activity theory; communities of practice; communities of inquiry; design based research

Introduction

Research into the use of technologies and in particular networked technologies is now well established (Andrews & Haythornthwaite, 2007; Conole & Oliver, 2007). Niche research sub-domains have emerged, such as networked learning, computer-supported collaborative learning (CSCL), e-learning, and technology-enhanced learning (TEL), each with its own particular focus, underlying principles, and preferred methodologies (such as case studies, evaluations, ethnography, quasi-experimental studies, discourse analysis, and social network analysis). See Conole (2010c) for a more detailed discussion of theory and methodology in the field. In a recent

series of interviews, broad notions of socio-cultural theoretical perspectives and in particular activity theory, actor-network theory, and design-based research seemed to be commonly cited points of reference for TEL researchers (Conole, Scanlon, Mundin, & Farrow, 2010). In addition, a range of popular frameworks and models have been used, such as Laurillard's conversational framework (Laurillard, 2002), Salmon's e-moderating framework (Salmon, 2000), Garrison et al.'s community of inquiry framework (Garrison, Anderson, & Archer, 2000), and Wenger's community of practice framework (Wenger, 1998). Collectively, research in the field, and in particular the application of these frameworks, has given us insights into the nature of interactions within these online spaces and some indication of barriers and success factors. However, the emergence of new forms of social and participatory technologies, sometimes referred to as Web 2.0 practices, has given rise to new challenges in terms of understanding the nature of user behaviour in these spaces. Specifically, what is the nature of interactions, networking, and community in these spaces?

It has been five years since publication of the key paper by O'Reilly (2005) that coined the phrase *Web 2.0*. Since then the breadth and variety of Web 2.0 tools have expanded rapidly (see Conole & Alevizou, 2010 for a recent review of Web 2.0 tools and practices). There are now many examples of different ways in which Web 2.0 tools are used, and there are empirical accounts of user behaviour and interactions. Perhaps a more descriptive term for these tools is *social and participatory technologies*, as this indicates more clearly the affordances these technologies provide. At the same time, a number of new theoretical and methodological insights have emerged, including new ideas/conceptualisations around the nature of learning in these spaces, most notably connectivism (Siemens, 2005a) and broader notions of networked learning (Steeples & Jones, 2002). However, it is evident that there is no clear understanding of exactly what these user behaviours and interactions are. This paper will attempt to provide a critique of these issues through the lens of an evaluation case study on the use of a new social networking site for learning and teaching, Cloudworks. It will consider in particular descriptions of user behaviour and interaction, including notions of interaction, connectivity, networking, and community.

Co-Evolution of Tools and Practices

Before considering some of the frameworks that have been used to describe and make sense of interactions in online environments, it is worth first discussing in general terms the nature of tool-user interaction.

Tools and users are not static. Of course technologies are continually developed and upgraded, but more importantly users adapt and change their behaviour and interaction with tools over time, as they a) gain more proficiency using the tools, b) begin to appropriate and personalise use, and c) see new ways in which the tool can replace previous patterns of behaviour. Think, for example, of the way tools such as word processors, email, and mobile phones have become more ingrained in everyday practice since their original introduction. This shift is both at an individual and an organisational level. For example, Internet use for finding and disseminating information is now ubiquitous across education, email has replaced memo communication, and secretaries no longer

laboriously type up handwritten letters (Conole, White, & Oliver, 2007). Gibson defines *affordances* as "All 'action possibilities' latent in an environment… but always in relation to the actor and therefore dependent on their capabilities" (Gibson, 1979). In considering the nature of user interaction with tools, this definition is useful.

Salomon describes Gibson's concept of affordances this way: "Affordance refers to the perceived and actual properties of a thing, primarily those functional properties that determine just how the thing could possibly be used" (Salomon, 1993, p. 51).

Simplistically, a tall tree has an affordance of food for a giraffe but not for a sheep; two parallel strips of wood with connecting rungs construe a ladder when against a wall or a fence when horizontal. Application of this concept to a technological context is useful because it describes the inter-connection between tools and users. As Pea et al. (cited in Borgeman et al., 2008) argue, there is a co-evolution of tools and users over time; interactions and patterns of user behaviour are not static. This co-evolution depends on both the inherent affordances of the tools and the characteristics of the users (i.e., their skills base, personal preferences and beliefs, and the context and culture within which they are interacting with the technologies). While this has always been the case, arguably the pace of change/co-evolution has increased dramatically in recent years, particularly around use of Web 2.0 tools. There has been a shift from a static-content Web to one that is more interactive; peer critiquing, user-generated content, sharing, personalisation, adaptation, and remixing are the kinds of user behaviours that characterise these new tools.

Frameworks for Describing Networked Learning

Understanding existing and evolving user behaviour in such online environments and being able to trace the co-evolution described above is a key challenge in networked learning research. Numerous frameworks and models have been developed and used in networked learning, both as guidance in the development of learning systems and as frameworks to structure the nature and form of analysis for understanding patterns of behaviour in networked learning contexts. These frameworks and models are valuable as they provide a specific lens on practices, which enables us to view them and understand them in a particular way. For example, some foreground communicative aspects of practice, and others aim to describe the context within which practices occur. There are too many to describe in detail here; instead, a selection of four is considered to give a representative overview of the breadth and types that have been used. The four frameworks are as follows: communities of inquiry (Garrison, 2009; Garrison, Anderson, & Archer, 2001); communities of practice (Wenger, 1998); activity theory (see for example Daniels, Cole, & Wertsch, 2007; Engeström, Punamäki-Gitai, & Miettinen, 1999); and actor-network theory (Latour, 1997). These were chosen because they provide distinct and different lenses on existing practices. Conole (2010b) provides a more detailed review, and describes twenty frameworks and models commonly used in networked learning, mapping these against the classification of learning theories derived by Mayes and De Freitas (i.e., where theories are grouped according to whether they are fundamentally associative, cognitive/constructivist, or situative) (Mayes & De Freitas, 2004).

After briefly describing the four frameworks and how they have been used in networked learning contexts, we will explore to what extent they are useful in describing patterns of user behaviour and interaction in a new form of social networking site, Cloudworks, which has been developed to promote sharing and discussing of learning and teaching ideas and in particular to support reflective practice. It is worth stating at this point that a broad definition of *learning* and *learners* has been used, covering learning across formal, non-formal, and informal contexts, and including learners in professional practice contexts. In particular, the Cloudworks site was primarily developed to support scholarly reflection and academic practice, and therefore sits within an informal learning context with professionals as learners.

Before describing the frameworks it is important to give some notion of the types of interaction with others that occur in modern online environments. Certainly within a formal educational context, much of the reported research into the use of the Web in the 1980s and 1990s centred on fairly well-defined groups, such as cohorts of learners. The research focus tended to be around analysing their use of tools, such as email and forums, in predominately *closed* settings (Hiltz & Goldman, 2005; Mason & Kaye, 1989). Social and participatory tools and their associated *open* practices enable learners to connect and interact with a broader audience beyond their class cohort, which has resulted in a blurring of the boundaries between formal and informal learning, moving beyond groups to more loosely connected actors. Researching these new environments raises new methodological challenges as the approaches used to describe relatively closed contexts often do not scale and are restricted by the inherent constraints of tightly defined contexts.

Dron and Anderson (2007) argue that in addition to groups in learning contexts, interactions in new social mediating tools lead to a network and a collective category (i.e., collectives) with a progressively looser connectivity across the three. Therefore *groups* are defined as relatively tightly formed with shared interests and intentions; *networks* are a more fluid form of social entity in which members join, create, and remove themselves through informal and semiformal connections; and *collectives* consist of individuals whose networked activities are harvested to generate the "wisdom of crowds" (Surowiecki, 2004). Dron and Anderson argue that most individuals use a mixture of all three in their practice, and the affordances of different tools may lend themselves better to use in a group, network, or collective context. Their categorisation provides a useful set of guidelines and strategies for how to use tools most effectively to suit the needs of the three different types of learning contexts.

The four frameworks chosen for discussion were all developed before the emergence of recent social and participatory tools; nonetheless, it is interesting to see to what extent they are applicable in terms of describing the rich mix of interactions and interplay of the groups, networks, and collectives Dron and Anderson describe. Each is briefly described then the next section considers to what extent they can be applied to describing patterns of user interaction in the Cloudworks site.

Communities of Inquiry

Originating out of CSCL research, and in particular analysis of online discussion forums, the community of inquiry (CoI) model developed by Garrison et al. (2000) has been used extensively. The model focuses on a community of inquiry consisting of teachers and students. Learning occurs within the community when three key prerequisites are sustained: cognitive presence, teaching presence, and social presence. This framework is often used as a basis to derive coding templates for analysis of online discussions, used to develop student evaluations of learning contexts (Arbaugh et al., 2008) and is particularly powerful when triangulated with methods such as critical recall and social network analysis (De Laat, 2006; De Laat et al. 2006).

Communities of Practice

Although originating from a different research context (social anthropology and the analysis of work-based community practices), Wenger's communities of practice (CoP) framework (1998) has also been extensively applied to understand networked learning and it shares a number of similarities to the CoI model. It is very much an example of a socially situated theory of learning where learning is seen as social participation and consists of four aspects: learning as community, learning as identity, learning as meaning, and learning as practice. Wenger's theory is valuable in that it considers the ways in which communities of practice are formed and developed; notions of trajectories of belonging, legitimate participation, and boundary objects/crossings have provided useful lenses to describe many interactions observed in online spaces. However, it does not lend itself as easily to direct codification or participant assessment as the CoI framework does; rather, it provides a generic, descriptive approach for contextualising community formation and identity.

Activity Theory

Firmly derived from socio-cultural perspectives, activity theory (AT) provides a descriptive framework for considering online interactions (see for example Daniels, Cole, & Wertsch, 2007; Engeström, Punamäki-Gitai, & Miettinen, 1999). The central premise is that activities occur in a context and that this context needs to be taken into account if we are to make meaning of the situation and appropriately interpret the results. One of the most common ways of representing activity theory is as a triangle diagram, showing a subject-object nexus of mediating artefacts (MAs) intended to achieve an outcome; around this are rules and regulations, divisions of labour, and community. Both the broader contextualisation that AT enables and the foregrounding of mediating artefacts are useful in terms of understanding interactions in online environments (see Conole, 2008, for a description of the use of mediating artefacts in learning design). Enablers and constraints can be identified by focusing on questions such as what environment is the activity occurring in, how is this influencing it, who is involved, and what are their roles? In addition, the focus on mediating artefacts helps to identify and crystallise the role of the tools in the process.

Actor-Network Theory

Latour (1997) argues that instead of thinking in terms of surfaces or dimensions, actor-network theory (ANT) focuses on nodes and connections. The central concept is the notion of an evolving, dynamic *actor-network*. A second key aspect of ANT is that it combines the basic properties of a network with *actors* (or *actants*) who do some work; these actors include both human and non-human entities. "Actors and networks are mutually constitutive, meaning that there is no actor without action; that is, relationship with other actors, and the network is built on the mutual influences and intermediaries that actors exchange between each other" (Esnault, 2007).

The inclusion of non-human actants is one of the attractions of using ANT in a networked learning context as it enables researchers to foreground technological mediating artefacts and to describe their interactions with other actants within the networked context. ANT is also useful because of its focus on networks and connections instead of on physical distances, which arguably is a more appropriate metaphor to apply to technological communication and interaction environments.

Indicators of Online Interaction

The examples described above give an indication of some of the different approaches that have been used to study and understand networking learning contexts. Of course each emphasises different aspects of the network: CoI focuses on individuals and types of presence; CoP focuses on the group or community; AT foregrounds the context within which the event occurs; and ANT emphasises connectivity and privileges of both human and non-human actants within the network.

The next section describes an example of a social networking site, Cloudworks, and describes in particular the approach we have taken to the design and evaluation of the site. A major focus of our research is on analysing and understanding evolving user behaviour and interactions in the site. The paper will conclude by considering the extent to which the four frameworks described above can be used to shed light on interactions in Cloudworks.

The Cloudworks Case Study

An Overview of Cloudworks

Cloudworks is a social networking site to support the sharing and discussing of learning and teaching ideas and designs (see http://cloudworks.ac.uk). The site combines social and participatory functionalities and enables multiple forms of communication, collaboration, and cross-boundary interactions among different communities of users. The core object in the site is a

cloud, which can be aggregated into community spaces called *cloudscapes*. A cloud can be anything to do with learning and teaching (e.g., a description of a learning/teaching practice, an outline about a particular tool or resource, a discussion point).

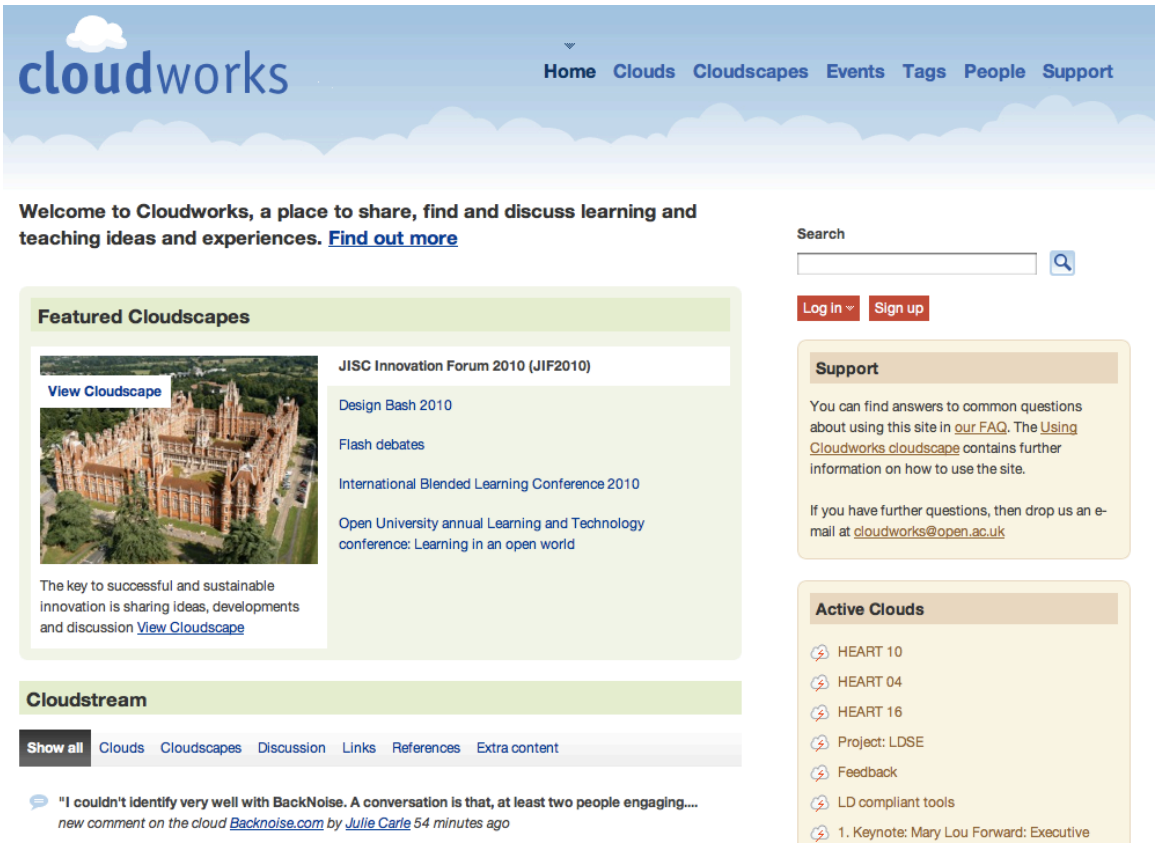

Figure 1. Screenshot of the Cloudworks homepage, July 2010.

Clouds combine a number of features of social and participatory technologies. Firstly, they act like multiuser blogs: Links and resources can be added to a cloud, which appear as series of sequential entries under the first contribution. Secondly, they are like discussion forums as users can post comments that appear sequentially. Thirdly, they are similar to social bookmarking sites, enabling the aggregation of resources (both links and academic references can be added). Finally, they have a range of other functionalities common to networking sites, such as tagging, favouriting, RSS feeds, Twitter-like follow-and-be-followed options, and activity streams for different aspects of the site. Cloudscapes are aggregations of clouds, and clouds can belong to more than one cloudscape. Collectively these features provide a range of routes through the site and enable users to collectively improve clouds in a number of ways. The homepage of the site, in addition to providing standard navigation routes (such as browsing of clouds, cloudscapes, people, and searching), shows recent activities, currently active clouds, and featured cloudscapes.

Methodology

We have adopted a design-based research (DBR) approach to the design and evaluation of the site. Design-based research has emerged in recent years as an approach for studying learning in context through systematic design and study of instructional strategies and tools (Barab, 2006; Design-Based Research Collective, 2003). It is used to study learning in environments that have been designed and systematically changed through interventions by the researcher and practitioners (Barab, 2006). Wang and Hannafin (2005, pp. 5-6) define DBR as "a systematic, but flexible methodology aimed to improve educational practice through iterative analysis design, development and implementation, based on collaboration between researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories."

Reigeluth and An (2009, pp. 378-379) articulate a comprehensive set of characteristics of DBR that readily map to the approach we are taking with Cloudworks: It is driven by theory and prior research, which is pragmatic, collaborative, contextual, integrative, interactive, adaptive/flexible, linked to actual practice, and generalisable (Conole, 2010a). We subscribe to the notion of co-evolution of tools and practices discussed earlier, and hence within our DBR approach we have adopted a socio-technical co-evolution approach (Figure 2) with two parallel strands of intervention, one technical and one social. Alongside this we have put in place a rich virtual ethnographic approach to evaluation of the use of the site and identification of emerging user behaviours.

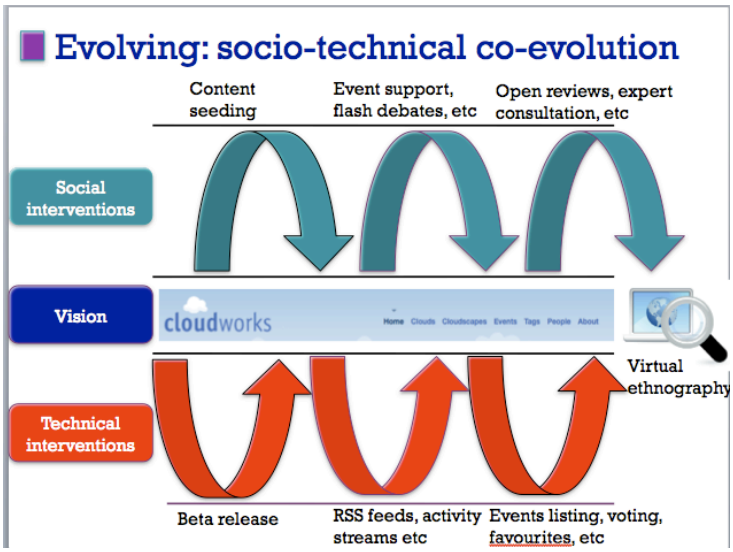

Figure 2. The approach to development and evaluation of Cloudworks.

Evaluation

Use and development of the site is being monitored in a number of ways (see Conole & Culver, 2010, for a description of the first few phases of design and evaluation of the site). Data

collection has included Web stats and Google analytics, analysis of site activities and discussions, collation of references to Cloudworks elsewhere (such as in the blogosphere and on Twitter), and use and evaluation of the site at numerous workshops and conferences. A Cloudworks evaluation and feedback questionnaire is also available online (see http://cloudworks.ac.uk/cloud/view/1906). This multifaceted evaluation strategy has gathered data that has then been used to inform ongoing design activities, thus ensuring an alignment between evolving technical developments and user needs. The data, and particularly the user feedback, has given us a rich understanding of how the site has evolved and how it is being used. At key points we have commissioned an expert review of the site and have to date undergone three site redesigns, commissioning an expert external designer.

A range of standard statistics is gathered routinely, along with an administrative cloudstream, which, in addition to listing activities on the site chronologically (in the way that the main site cloudstream does), documents when new users register with the site (the site is open, but users need to register if they wish to post anything or create clouds or cloudscapes) and when users choose to follow others. We will also be capturing the following on a biannual basis: the number of users who have posted clouds, the number of users who have posted comments, and the number of unique users posting a cloud or comment in the last 60 days. To measure sustainability and longevity of contribution, we are also capturing the following: the number of registered users who post a cloud or comment at least one month after registration (this way we don't count the initial use of the site for, say, a conference or workshop) and the number of registered users who post a cloud or comment at least one year after registration. Table 1 provides a summary of some of the cumulative quantitative figures for the site in mid-July 2010. By distinguishing between team and non-team contributions we are able to get a measure of the impact of our social interventions described above and the extent to which the site is moving toward being self-sustaining. The team consists of the authors of this paper and an additional researcher. They are all e-learning researchers with a range of both pedagogical and technical expertise.

Table 1

Statistics, Mid-July 2010

Aspect	**Everyone**	**Team**	**Non-team**
Cloudscapes	338	111	227
Clouds	2897	1260	1637
Comments	4065	1103	2962
Links	3733	1770	1963

The site is also linked to Google analytics, which shows the growth of the site since its launch in July 2009. As is evident with other social and participatory sites, the number of active contributors to the site (currently 2,935 registered) is less than the number of unique visitors

(87,325 visits from 167 countries). The top five countries are the UK, the United States, Canada, Australia, and Italy. From the monthly statistics we can see both a steady growth in the number of users signing up and in the number of unique visitors. In addition, from the contributions made, we can see that there is a growing number of users who are regular contributors both in terms of their activities and their reflections on the value of Cloudworks for their practice (see for example some of the comments in Table 2).

Classifying and Understanding Patterns of User Behaviour

We have used a mix of theoretical perspectives for the design of the site and the analysis of the way in which it is being used. Conole and Culver (2009) describe the theoretical perspectives that informed the initial design of the site, and Alevizou et al. (2010) describe recent work drawing on broader theoretical frameworks in order to understand emerging patterns of behaviour. In particular, Engestrom's notion of social objects (Engeström, 2005) has formed the basis for the design of Cloudworks around clouds as social objects. Similarly, Bouman et al.'s framework for sociality (Bouman et al., 2007) has provided a useful approach to the design and development of the site, based on developing environments that both mimic existing user behaviour and provide opportunities to expand and shift to new patterns of behaviour. We have undertaken a number of qualitative studies of the use of the site, including explorations of how the site is being used by a particular community or theme and through a series of interviews with users. Galley has developed a community of indicators framework as a mechanism for analysing interactions on the site and we have begun exploring how this might be used for analysing evaluation case studies of the site (Galley, Conole, Dalziel, & Ghiglione, 2010).

Applying a broad range of theoretical perspectives is proving necessary because of the unique structure/functionality of Cloudworks and the way in which we are seeing emergent patterns of user behaviour on the site. For example, one of the distinctive features of Cloudworks (in comparison to other social networking sites) is the way it enables and facilitates not only connections within communities but among them. It facilitates boundary crossings among communities, enabling different stakeholders (policy makers, researchers, teachers, learners, etc.) to interact in unanticipated ways. It has a genuine global reach with different kinds of stakeholders. The affordance of clouds, arising from their general layout/functionality (i.e., the initial cloud entry plus collective additional entries, embedded content, links, and references, coupled with a social space for discussion), seems to promote new and interesting forms of social interaction. A core principle of the site is that it is totally open; anyone can see anything in the site. This ensures that the site harnesses the best of social and participatory practices and affordances. Serendipity has been built into the site in a variety of ways, which enables individuals to cross community boundaries and to make unexpected connections. The site offers powerful mechanisms for supporting social networks in a range of ways and at different levels.

To date we have identified eight ways in which the site is being used.

1. **Events**. Use of Cloudworks for conferences, workshops, and seminars was one of the first patterns of user behaviour to emerge on the site. The site provides a new type of mediation space to support interactions and communications before, during, and after events. The discussion space associated with clouds provides a forum for users to discuss issues and to collectively liveblog. The ability to add links, references, and embedded content fosters collective intelligence (Lévy, 1997) and crowdsourcing (Howe, 2006). Because events have become such a dominant pattern of behaviour on the site, we now provide a dynamic list of events (http://cloudworks.ac.uk/events/events_list), and to date 47 events are listed as forthcoming (up to December 2010) and 85 cloudscapes have been labelled as past events.
2. **Debates**. A number of cloudscapes have now been established as discussion spaces, for example, the flash debate cloudscape (see http://cloudworks.ac.uk/cloudscape/view/1896), which includes a range of topical issues such as Citizendium versus Wikipedia, Has Twitter already peaked?, and What will the university of tomorrow look like? Recently we have also been exploring how the site can be used to facilitate timed discussions, see for example Spotlight on OER (see http://cloudworks.ac.uk/cloudscape/view/2105).
3. **Open reviews**. Cloudworks provides a good environment for support of open reviews (i.e., as a space to aggregating and discussing research literature reviews). Examples include a review of the use of Web 2.0 tools in HE (see http://cloudworks.ac.uk/cloudscape/view/1895) and a review of pedagogical models (see http://cloudworks.ac.uk/index.php/cloudscape/view/2009). Research questions can be set up as clouds and used as a basis for discussion and aggregation of resources. Drafts of the evolving review can also be posted for comment.
4. **Resource aggregation**. Cloudscapes have also been established that act as aggregators around particular topics or resources. Examples include the Horizon report cloudscape (see http://cloudworks.ac.uk/1957), the online research tools cloudscape (see http://cloudworks.ac.uk/cloudscape/view/2046), and the learning design toolbox (see http://cloudworks.ac.uk/index.php/cloudscape/view/18.82). Currently, a course team at the Open University is beginning to explore how Cloudworks might be used by learners as a means of aggregating course-related resources and sharing professional practices.
5. **Courses**. The site is also being used to support student activities. For example, students on the Masters in Open and Distance Education course at the OU have been exploring the site by taking part in a cloudquest challenge (see http://cloudworks.ac.uk/index.php/cloud/view/2699), contributing H800 flash debates (see http://cloudworks.ac.uk/index.php/cloudscape/view/1937) and using the site to find relevant resources for particular teaching contexts (see http://cloudworks.ac.uk/index.php/cloudscape/view/2057).
6. **Reading circles**. A relatively new type of cloudscape to appear on the site is the reading cloudscape. For example, the 800-strong community of researchers interested in exploring students' use of technologies has set up a space to aggregate and discuss

relevant readings from the field (see http://cloudworks.ac.uk/index.php/cloudscape/view/1968).

7. **Learning design**. Part of the original aspiration for the development of the site was to act as a channel for fostering more debate of design practices. A number of cloudscapes have been established that focus on learning and teaching issues around a particular course. These include spaces for those involved in designing courses (see for example http://cloudworks.ac.uk/index.php/cloudscape/view/1919) as well as those who have a tutoring role in delivering courses (see http://cloudworks.ac.uk/index.php/cloud/view/3342).
8. **Expert elicitation and consultation**. Finally, Cloudworks works well as a space to elicit expert views on a topic or to validate and discuss research outputs. One example is a literature review and expert elicitation around the role of educational technologists (see http://cloudworks.ac.uk/cloudscape/view/1872). Currently, a major consultation process around open educational resources and their associated practices is about to be launched, following the gathering and analysis of a set of international OER case studies (see http://cloudworks.ac.uk/cloudscape/view/2085) and articulation of a set of associated open educational practice dimensions (see http://cloudworks.ac.uk/cloudscape/view/2086).

Discussion

Having provided an overview of the statistics for the site and the categories of user behaviour, in this section we will attempt to map where and to what extent the frameworks described earlier for understanding interactions, networks, and communities in online spaces are evident from the Cloudworks evaluation data.

Table 2 provides examples of where each of the frameworks maps to activities in Cloudworks. This demonstrates the benefits of each framework in terms of providing a particular lens with which to describe what is happening. However, none of these frameworks on its own is adequate to describe the full range of user behaviour and interactions we see within the site.

Table 2

Application of the Four Frameworks to Patterns of User Behaviour in Cloudworks

Framework	**Characteristics**	**Application**	**Examples**
Communities of inquiry	Social, teaching, and cognitive presence Coding schemes can be derived from these then applied to online discourses.	Application of CoI is particularly relevant for cloudscapes that support events or teaching-related sessions, or cloudscapes where individuals are seeking advice.	**Social:** "Love the Wordle thanks for that!" *http://cloudworks.ac.uk/cloud/view/2597* **Teaching:** "As a former student enrolled in H807 and H809 courses, I can understand your early feelings here in Cloudworks. No doubt that moving from a defined group in a VLE to a network of practitioners in Cloudworks requires some time and adaptability." *http://cloudworks.ac.uk/cloud/view/2700* "This course is offered at certificate level through Distance and Flexible Learning (DFL)." *http://cloudworks.ac.uk/cloud/view/3855* **Cognitive:** Debate between two users about learners *http://cloudworks.ac.uk/cloud/view/4152* "This has been an interesting and valuable exercise. I intend to share this with my course writer." *http://cloudworks.ac.uk/cloud/view/3859*

Communities of practice	Learning as community, identity, meaning, and practice	Relevant for cloudscapes associated with an established group or community Evidence of evolving trajectories across communities and legitimate participation Explanation of boundary crossing	Cross-fertilisation of ideas from design thinking research domain to learning design: "It is an interesting idea to apply the notion of design thinking to the area of sharing and developing learning designs." *http://cloudworks.ac.uk/cloud/view/2606* Special interest group on mobile learning at the OU *http://cloudworks.ac.uk/cloudscape/view/1889* Series of sessions for OU staff interested in technology – IET technology coffee mornings *http://cloudworks.ac.uk/cloudscape/view/2107*
Activity theory	Subject-object mediated by mediating artefacts to achieve an outcome in the context of rules, regulations, community, and division of labour	Useful to provide a rich, descriptive, contextually located account of a set of interactions and user behaviour	OU Annual Learning and Teaching Conference **Subject:** Participants involved in the conference **Object:** The conference **Outcome:** Delegates participating in a two-day virtual conference held in Cloudworks with live sessions in Eluminate **Mediating artefacts:** Cloudworks, Eluminate, Twitter **Roles:** conference organisers, session facilitators, live bloggers, Eluminate presenters, Cloudworks contributors, and conference attendees **Rules:** two-day event, real and virtual, guidelines for interactions **Community:** OU staff and broader community interested in using technology in education **Division of labour:** organisers, presenters, delegates *http://cloudworks.ac.uk/cloudscape/view/2012*

Actor-network theory	Actor-network of nodes and connections made up of both human and non-human actants	Enables the focus to be on the connectivity across and beyond the site, showing how Cloudworks is part of the wider social networking ecology	Is Twitter killing blogging? This cloud demonstrates how Cloudworks can complement and work in synergy with other social networking tools. In this instance, a tweet started in Twitter was picked up in Cloudworks, which then sparked a detailed debate (49 comments) and set of crowdsourcing activities (20 links and 6 references). In turn, this prompted users to post further reflections on their own blog spaces. *http://cloudworks.ac.uk/cloud/view/2266*

In terms of Dron and Anderson's classifications, there is evidence of all three types in Cloudworks, although the majority of interactions are either networks or collectives, as group activities are already relatively well provided for by existing tools, it could be argued. Nonetheless, some of the learner cohorts and workshop cloudscapes could be classified as groups or at least straddle the network/collective categories. The many types of events show patterns of behaviour associated with both networks and collectives. This can be attributed in part to the fact that the structure of clouds is designed to promote both discussion and collective aggregation.

Conclusion

This paper has addressed a number of themes. Firstly, it describes an innovative new social networking site, Cloudworks, which has been designed to support discussion and sharing of learning and teaching ideas. Cloudworks provides a good example of emergent technologies, and it provides a good opportunity for exploring some of the methodological issues that arise in the use and understanding of new social mediating spaces. Secondly, the paper describes how we have adopted a design-based research approach to the design and evaluation of the site. Finally, the paper explores how a range of frameworks for understanding networked learning might be applied to understanding Cloudworks.

The paper considers one of the key challenges in researching new learning contexts through socially mediated environments, namely articulation and understanding of the nature of the interactions among users within these environments and between the users and the tools that form part of the environment. Four frameworks have been described and discussed in terms of the light they shed on patterns of user behaviour in one social networking site for academic practice, Cloudworks. The paper has demonstrated that these frameworks are indeed useful but only offer a partial solution. None of the frameworks provides a comprehensive holistic description. We plan to continue to explore different theoretical perspectives and frameworks in order to try to find an approach that provides this more holistic solution. As described earlier, Galley has developed a set of community indicators, which we are currently using to analyse some case study data on the site. We are also interested in exploring to what extent the notions of connectivism developed by

Siemens (Siemens, 2005b) and later critiqued by Downes (Downes, 2007) might be useful. In particular we are interested in exploring how the eight principles of connectivism (Siemens, 2005b) might be used both as a foundation for developing an analytic framework for understanding online interactions and as good practice principles. Crucial is the notion that connectivism emphasises the fact that knowledge is distributed and that learning is the process of growing/pruning those networks and connections in a dynamic and evolving way over time. We believe sites like Cloudworks can facilitate this process and provide learners with new connections and access to a distributed intelligence.

Certainly it is possible to see synergies with the four frameworks described in this paper; for example, two of the principles (1 and 5) related to the nature of interactions among users online mirror aspects of CoI, CoP, and Dron and Anderson's categories. However, perhaps not surprisingly, connectivism seems to have a particularly strong synergy with ANT (2, 3, 4, 5, 6, 7).

However, it is worth reiterating that one of the main problems with social networking sites is achieving critical mass: building a substantive user base that is self-sustaining over time. This paper has discussed the ways in which we have fostered various social interventions on the site in an attempt to do this. Comparisons of the contributions by team members and non-team members over time shows evidence of an ongoing shift toward non-team member contributions, which is encouraging; however, much of the site activity clusters around specific events, such as conferences and workshops. A challenge in the coming year will be to grow the number of core contributors and attempt to foster other types of activities, such as the flash debates, open reviews, and reading circles. We anticipate needing to remain active as a core team but hope that a growing body of Cloudworks champions will emerge as users see the benefits of the site and begin to use it in their daily practices.

In conclusion, focusing on Cloudworks as a case study in relation to existing and potential frameworks has provided a vehicle for considering some of the issues around understanding online interactions. What is evident is that as yet we do not have either the right metrics or an overarching framework to adequately describe the patterns of user behaviour we are seeing in today's online environments. The distinctive feature of these new environments in comparison to previous technologies is the importance and influence of the network in shaping user interactions and activities. Hence, further work is needed to explore how ideas like ANT, connectivism, and other recent theoretical perspectives on networking might be used to develop a more unifying and practical framework for describing and understanding these online spaces.

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