

Reciprocity, generativity and transformation in communications using multiple digital tools

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Abstract

This paper explores the use of multiple tools for technology mediated communication, drawing on two recent empirical studies in which students and researchers in UK Higher Education worked on collaborative activities. The case studies are presented separately and the way in which the tools were used in each study is discussed. The quality of the communications and their contributions to collaborative working, and how this is influenced by the tools used is then outlined, drawing on the work of Pea (1994) who proposes that communications can be understood as transmissive, ritualized or transformative depending on their impact on other participants.

The findings show that students and researchers used a wide variety of communication tools. Most of the students' communications were, however, either transmissive or ritualistic, although there were examples of conversations offering mutual support and showing evidence of co-construction of knowledge and generativity. The researchers' conversations were more often transformative and reciprocal and they used these tools consistently, for specific purposes. Furthermore, the researchers were quite deliberate in matching the tool to the specific needs of the task, whereas the students chose tools based on friendship groups and lifestyles and not on their appropriateness for the task in hand.

Keywords

Communication, digital tools, socio-cultural theory, reciprocity, meaning making, transformation

Introduction

This paper reports on two recent qualitative studies on the use of multiple digital tools for communication in small group learning in different learning contexts in Higher Education. Both studies are grounded in socio-cultural theories of learning and use participative research methodologies. We explore the use to which the different digital tools were employed, what drove the choice of such tools and the connection between the choice of tool and the quality of the communications. The first study involves third year undergraduate students taking an elective module where they were grouped into small, online special interest groups (eSIGs) and the second involves two researchers who collaborated to analyse video data.

Digital communication is integral to the personal lives of most young people who are or will become university students (Oblinger, 2004). Most students now use multiple digital tools and communication devices habitually (Borrenson Caruso & Salaway, 2007) including mobile and instant online messaging. Similarly, higher education researchers also engage in multiple forms of communication (Nentwich, 2003), and for both these groups, choices and decisions need to be made over how, when and where to communicate and interact with others.

Previous studies of campus-based students' communications and interactions using digital tools have tended to focus on the use of one specific tool, hosted within institutions (e.g. Cox, Carr, & Hall, 2004, Timmis & O'Leary, 2004). Two previous studies, however, have looked at multiple tools, suggesting that students often preferred instant messaging to asynchronous discussion boards and email (Crook, 2002). A wide variety of communication tools were used by law undergraduates to organise work, but no standard

pattern was discernible and access to tools was very variable, leading to sharply differentiated patterns of interaction (Jones & Bloxham, 2001).

Furthermore, there is considerable existing literature outlining studies investigating computer mediated communication (CMC) in higher education and more broadly. These have tended to concentrate on fully online distance learning contexts, investigating aspects of the social context: for example, community networks (Haythornthwaite, 2002) and the development of social presence (Rourke & Anderson, 2002). However, these studies have again all concentrated on the use of a single communications tool.

This all suggests that we need more in-depth understanding of the choices and rationales for using digital tools and of the actual communicative activities that learners engage in to support their learning. Herring urges that we take “a step back from examining the parade of passing technologies and consider more deeply what determines people’s use of mediated communication” (Herring, 2004: p34). This paper explores the ways in which the multiple digital tools were used by the researchers and learners in two studies and relates these to the rationales the actors gave for the choices they made.

We also explore the way in which these communications support the collaborative work undertaken in the studies. The next section discusses our understanding of the relationship between learning and communication in small groups.

Learning and communication in small groups

Both studies focus on small-group ‘learning’, but differ in the ways learning is constructed. To explain, we draw on the work of Eraut (2007), who borrows the notion of ‘object’ from Activity Theory (Engestrom, 1987). He suggests that it is useful to distinguish between learning that takes place through deliberately designed learning activities (the ‘object’ is learning) and learning takes place as a by-product of working (the ‘object’ is working); the first project described in this paper can be seen as the former and the second can be seen as the latter.

Small group collaborative learning requires communication between the members of the group to support problem solving and the building of a joint problem space (Roschelle & Teasley, 1995) and communication and coordination of group activity are mutually supporting elements in collaborative work (Davies, 1995).

There is a reciprocity inherent in any dialogic communication (Bakhtin, 1999) and Pea (1994) contrasts a transformative view of communication with a view of communication as either transmission or ritual, depending on its impact on other participants. Transmissive communication is, as the name suggests, the transmission of information, a paradigm commonly seen in educational environments. This form of communication is one-way because it does not invite participation from others. Ritual communication, on the other hand, demands the participation of others in ‘the construction and continual interactional maintenance of social order by means of seemingly ordinary conversations in everyday life (Pea, 1994, p. 287). However, as Pea argues, even though this type of communication is important in that it considers participation to be significant, it does not ‘establish generativity of the kind required for education’. He suggests ‘generativity’ or evolution of ‘ways of knowing’ come about through transformative communication, where participants are mutually transformed by the process of communication with the cultural messages of others, and hence go beyond the common body of knowledge, or ‘expand the ways of knowing’ (ibid, p. 288), which, Pea suggests, describes learning. Crucially, in transformative communication, each participant offers resources for transforming the practice and meaning making of others which is a key aspect of the co-construction of knowledge. Gunawardena, Lowe, & Anderson, (1997) and Pena-Shaff & Nicholls (2004), argue that co-construction of knowledge should also include discovery and exploration of dissonance. This view of communication therefore includes the idea of reciprocity and generativity in meaning making which embodies some tension between the needs of the self and others and a means of mutual transformation.

In collaborative group learning, the ‘establishment of patterns of interactions to guide communication and to support coordination of the group’ (Stahl and Hesse, 2006) are key elements of success, which imposes a

task on learners which is additional to attending to the 'problem domain' (Suthers, 2006). In networked learning, where we aim to promote connections between one learner and other learners in a learning community, involving online interactions with resources and people¹, there are additional challenges, such as establishing social presence (Rourke & Anderson, 2002) and trust (Handy, 1995), and a commitment to the group and the task. Furthermore, approaches to learning may be more complex when required to learn both face to face and in online environments and open to more unplanned influences than traditional courses (Jones & Bloxham, 2001). Developing a deeper understanding of the communicative practices that underpin these collaborations is therefore essential.

e-SIG Communications

The first of the two studies focuses on the digital communications activities of campus-based undergraduate students working in small (typically 4-5 participants), collaborative online special interest groups, known as e-SIGs, during the academic year 2006/2007. The research focuses on the activities of a cohort (68 students) of third year students taking an elective module (in e-Business) at a university in the United Kingdom. The module introduces students to the key concepts of e-Business through a combination of fortnightly lectures and a collaborative research project conducted in small groups, based on their choices of research topics. Groups are set up on the university VLE and students are required to provide key updates using this tool. They are also encouraged to use a variety of other personal (e.g. instant messaging, mobile phones, blogs) and institutional communication tools and to meet face to face if they wish.

The study investigated what communication tools students use and what factors influence their choices. It also considered how, where and when the students engaged in communication and what rationales they gave for these choices and decisions. A study group of ten students collected their personal communications data at two key points in the module and also reflected on their own practices through a series of video-recorded student-led group interviews, supported by completion of preparatory questionnaires a week in advance. Postings from all the e-SIG VLE discussion forums and one e-SIG blog were also collected.

The findings of the study show that the students used a wide variety of personal digital tools: MSN messenger and Skype² (both voice and chat facilities), personal email, blogs, mobile phones, and to a limited extent social networking sites such as Facebook. The most commonly used were MSN and Skype. There were also very blurred boundaries between study and personal conversations but this tended to be where ad-hoc discussions on the e-SIGS emerged and did not generally include premeditated discussion on the project work. The choice of tools was closely related to membership of particular friendship groups. Choices also related to home context (where students with their own home were more likely to have a PC that was always on and therefore tools such as MSN were readily available). Institutional tools such as the VLE and email were used for more formal communications (each group was required to post a number of specific items on the VLE group discussion board). The university email was primarily used for communication between students and tutors and not for peer to peer conversations. A blog was set up by one group who used it as the main vehicle for communication. The use of this was very similar to their use of the VLE and almost acted as mirror site. However the students set this up because one student in the e-SIG could not post to the VLE and also because they wanted to use RSS feeds to get alerts for new messages. This was interesting as many students in the group interviews felt that the VLE was difficult to use because you could not tell easily whether anything new had been posted. Only one e-SIG reported having spent time getting to know each other face to face early on and this group saw the main benefit of the e-SIGS as being a way of having made a new friend. The postings on the VLE can be seen to become progressively more relaxed and dialogic as the module proceeds, in contrast to other groups which retained a more formal tone.

¹ See <http://csalt.lancs.ac.uk/jisc/definition.htm> for definition

² Skype is an online communication tool which includes both instant chat (text) and VOIP functionality.
<http://www.skype.com>

Figure 1 presents a matrix of tools and their uses within the study. The matrix shows the wide variety of uses the tools were put to and the large areas of overlap between tools.

Method/tool	1. Make new contact	2. Intimate social chat	3. Group co-ordination/grounding	4. Elicit/offer support/empathy	5. Elicit/offer information	6. Share/compare information	7. Test/modify ideas	8. Agree new ideas
Face to face meetings								
Uni Email				with tutors				
VLE groups								
MSN Chat								
Skype Voice								
Skype Chat								
Blog								
Personal email								
Mobile txt								
Mobile voice								
Facebook/MySpace								

Figure 1: Summary of digital tools in use in e-SIGS and their purposes

The eight categories range from making initial contacts with people in the e-SIG they did not know (1), having close and intimate conversations with existing friends in their own e-SIG or in others (2), communication to establish and maintain group coherence and activity coordination (3) to communications that elicit and offer either empathy and support or information (4,5). It can be seen that communications that support the social and affective aspects of the relationships, together with the transfer of information are conducted using a wide variety of tools. As stated earlier, the choice of these relates to friendship groups, home context and access and economic factors.

Categories 6-8 show the uses of the tools for knowledge construction activities. It can be seen that these are confined to a more limited group of tools. This reflects the fact, in part at least, that the students reported low levels of collaboration generally; the data shows that collaboration was largely confined to agreeing a specific topic and project title. There were some examples, however, on MSN and Skype, where students were working together to share and develop ideas, particularly when preparing their assignments. The areas where there is no apparent evidence of collaborative activity to support knowledge construction is in resolving arguments and differences and negotiating meaning. The absence of communications that show arguments and dissonant discussions or a struggle for joint meaning might therefore be an indicator of the quality of the collaborative work and learning taking place.

The data was further analysed to identify transmissive, ritualistic or transformative communications. The following examples are from conversations using MSN, Skype and the institutional VLE. The first conversation (Figure 2, below) is indicative of many similar examples in the data and shows an intimate chat between two students who already knew each other before the e-SIGS module began. This kind of empathetic conversation was common amongst students who already knew each other. Although the study group also reported that they did not establish this level of rapport with students who they did not know before the module began. In Pea's terms, this appears to be an example of ritualistic communication where meaning is shared at the pre-existing level. There is reciprocity in the dialogic exchange but there are no resources offered between participants or any search for new meaning demonstrated, although they do show commitment and support for each other as members of a community (ritualistic communication).

However, in contrast to the ritualistic communications that were in strong evidence, there were some examples in the instant messaging data and to a limited extent the VLE and blog data of transformative communications. Figure 3 (below) provides an example of such a conversation. Here the two students identify a common problem and work out a solution, although one participant is really doing the work.

Nevertheless there is an exchange of both the problem and an agreed solution and a new understanding is created and shared so it can be seen as generative, reciprocal and transformative.

hey [name], howz ur e-biz going?
hi mate, slowly
you!
lol i only just e-mail my assignment title
yeah i had a panic this morning managed to send it by about 10 o'clock, what title have you suggested doing
ha thats what i did.. ive been doing one of my law essays and forgot about e-biz, didnt really put forward a title, just said copyright and the internet.. im sure i will get an e-mail bk asking me to explain - haha
what did u suggest?
well i suggested Phishing and the way it affects eBiz
Cool

Figure 2: Extract from MSN Chat conversation – 12/3/07 16:24

lol; I:ve never referenced a BLOG before
yeah thats a new1 to me as well
check out leeds university harward guide
will do, thanks 4 the tip
i'll find the URLs
http://www.leeds.ac.uk/library/training/referencing/harvard.htm
cheers

Figure 3: Extract from Skype Chat conversation - 5/4/07 20:28

Figure 4 (below) is indicative of a large number of posts which received no reply. Although there was activity on all of the e-SIG discussion boards students reported that they did not know people in their group and were therefore unsure who they were collaborating with. The student presents his personal ideas and then tentatively asks for reassurance, which is never forthcoming. The group is not addressed at the beginning of the message and it is signed off “regards” which also betrays a lack of group cohesion and grounding. This message is mono-directional and therefore a transmissive communication in the sense that it is informational, without reciprocity or dialogue. Furthermore, the message reflects a tension in this module between the individual assignment that students were asked to undertake and the requirement to work collaboratively, meaning that their commitment to the group and the task were quite weak.

Thread: My idea for my part of the project Post: My idea for my part of the project Author: [CD]	Date: Wednesday, February 28, 2007 Status: Published Overall rating: Not rated
I have been thinking about possible ideas that incorporate HCI/Usability and looking at the other ideas already stated. I am going to look into the different Operating Systems available, i.e Mac/Windows/Linux etc and how they can each benefit a company. I will talk about the pros and cons of each and how each is setup for the user to use i.e. GUI (Graphical User Interface) or command based.	
Hope this OK with everyone??	
Regards [student C]	

Figure 4: VLE Discussion Board Message (initial message, no replies received)

In summary, the students used a wide variety of digital communication tools to engage in communication activities. However, the choice of tools related to friendship groups, home context, access and economic factors rather than the task. Transmissive, ritualistic and transformative communications were found but there were relatively few that could be said to transform the resources of other members of the group.

Trinity (MiMeG)

The second project (Trinity), was an analytic autoethnographic study (Anderson, 2006) in which two of the authors of this paper collaborated to research the ways in which they used a range of tools to research the use of computer software in primary school classrooms³. Trinity took place under the umbrella of MiMeG (Mixed Media Grid), an ESRC funded project⁴ which is a node of the e-Social Science programme. MiMeG's agenda is to investigate the way social scientists analyse video and audio data and to produce software to facilitate that analysis. Some of the features of MiMeG software are that it allows researchers in different locations to view video data jointly, to mark up the video on screen with freeform scribbles notation, symbols etc and to make annotations and transcriptions linked to the video. When using MiMeG, researchers usually use a communication tool such as instant chat or VOIP. We used both the chat and VOIP aspects of Skype to 'talk' to each other as we worked on the video. In our Trinity research, along with MiMeG, we also used a range of other digital tools throughout the research process, including instant chat (MSN messenger and Skype), email, a blog, a wiki, and an online shared document service (Google documents and spreadsheets). Where practical, we saved our communications for later analysis.

We analysed our communications using a framework of 'learning conversations' (Gudeman & Rivera, 1999). The focus of each of the conversations was a different aspect of the research process (preparation and planning, which includes literature searching), analysis (including transcription), writing up, reviewing and housekeeping). Although the planning and housekeeping conversations were of crucial importance to the smooth running of the project, we see the other conversations as more cognitively demanding.

The content was scanned for instances of 'telling', 'giving information' and so on (transmissive), for instances of greeting, establishing protocols and ways of working together (ritualistic) and for instances of, for example, negotiating meaning and building understanding (transformative). We also took into account the main purposes and achievements of each conversation. The analysis of the conversation data is summarised in Figure 5 (below). The depth of colour in each cell relates to the importance of the type of communication in the conversation. As this mapping demonstrates, transformative communication dominated in the cognitive research stages of the project, whereas in the other areas the ritualistic and transmissive communication was more important.

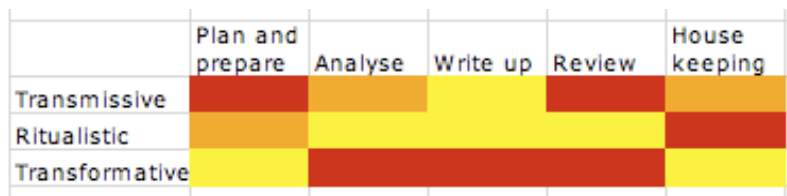


Figure 5: Summary of conversation analysis

We also found that all conversations were characterised by high levels of reciprocity, with each of us making contributions and developing ideas. We suggest that this is explained by a number of factors: the small group size (in which dialogue was essential to keep things going), our joint commitment to the project, mutual respect and friendship. These last factors may be particularly significant because they mitigated much of the need to establish social presence. However, we would also like to draw attention to the importance we placed on the house-keeping conversation, in which we developed ways of working together and established mutual trust.

We mapped our tool use onto the learning conversations (see Figure 6 below), which shows which tools were used in each learning conversation, and also provides an idea of how important we perceived each tool to be (the darker the shading, the more important). The tool map shows that a range of tools was used in all conversations. In the analysis phase, MiMeG (plus Skype) played an important role. The way we used this tool was as a thinking space, or as an environment to work in. By using annotations which linked to the video, we were able to view selected episodes in detail, knowing that we were both viewing exactly the same part of the video. We also developed our analysis in shared writing, for which we chose to use Google

³ We use the first person plural to report this research to maintain an authentic voice when reporting autoethnography

⁴ <http://www.ncess.ac.uk/research/video/mimeg>

documents, because we found it easy to work on a joint document in this way; we only had one version of the document so knew we were working on the most recent. For the same reason we used Google documents in writing up our analysis, as well as our wiki (on which we shared our semi-formalised, developing ideas and recorded the ideas we had already discussed) and our blog (on which we shared our emerging thinking in a more formal form with the rest of the MiMeG team). For reviewing our ongoing work we used the same tools in the same sorts of ways, but we also used MSN as a much more informal review tool; here we felt safe to make suggestions, bat ideas around and debate our emerging ideas.

	Plan and prepare	Analyse	Write up	Review	House keeping
MSN	Red	Yellow		Red	Red
Blog			Orange	Red	
Wiki	Yellow		Yellow	Red	
Google docs	Orange	Orange	Red	Orange	Red
Skype		Red			
email				Orange	
MiMeG	Orange	Red			

Figure 6: Tool map in Trinity

This analysis emphasises the multiples modes of communication we used and the complexity of the relationships between these different modes. Further, the findings suggest that there is a relationship between the formality of the tool (as we perceived it) chosen and the level of commitment we were prepared to make in sharing our emerging ideas. We suggest that the tools we chose and the ways in which we used them was influenced again by the factors of our relationship and by the efforts we put into developing protocols for working together. This means that we deliberately chose different tools to record and share our ideas depending on the degree to which we were committed to our developing findings and on the audience for whom we were presenting our work.

We are interested in the extent to which there is a relationship between the two analyses presented above. Does the use of the tool influence the nature of communication? Does the nature of the communication needed relate to the tools we chose to use? From the analyses, we suggest first that the tool chosen does not necessarily have any influence on the type of communication, although it does appear that MSN was largely used in transmissive and ritualistic communications and much less in transformative communication. On the other hand, MiMeG, the blog, the wiki and Google documents were used more in transformative communications; we used these tools for much of our collective cognitive work.

Transmission, ritual and transformative communications

A joint analysis of the conversations from both projects using Pea's notions of transmission, ritual and transformative communication found that most students' communications can be seen as transmissive or ritualistic. There were, however, examples of synchronous conversations offering mutual support and showing evidence of co-construction of knowledge. The researchers' conversations were more often transformative, and there is strong evidence of co-construction of ideas and interpretations. The blog and the wiki were designed for public use in transmissive communication. The researchers used these tools consistently, deliberately and for specific purposes, matching the tool to the specific needs of the task, whereas the students chose tools based on friendship groups and lifestyles, economic and access factors and did not consider how this matched the task. The only exception was the use of the blog which performed a similar function to the VLE groups, but even here this was to improve access rather than the task itself.

Collaborations in the eSIGs amongst the students were often hindered by a lack of commitment to the e-SIG group and task and we suggest that this may be because, although the project was set as a collaborative activity, in fact the students viewed it as a co-operative task, where co-operation supports every member of the team to attain their individual goals, collaboration is based on setting a common goal (Lewis, 1997). In contrast, the two researchers showed very high levels of commitment and investment to a professional

project and an established social presence that developed over time. The need for collaboration and the division of labour was understood and represented a shared value. We conclude, therefore, that the researchers matched the tool to the task, whereas the students might be thought to have matched the tool to the group and that this “task” in itself contributes to the transformation of the two groups in different ways.

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