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Use of visual analysis to investigate networked learning in online forums

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Use of Visual Analysis to Investigate Networked Learning in Online Forums

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Abstract

Asynchronous online forums such as FirstClass are frequently used in many educational settings to link networks of learners. They offer opportunities for knowledge-building dialogue and for the exchange of learning resources, but many students struggle to make effective use of them. Researchers have therefore been concerned to investigate how learners successfully build knowledge together in online forums and which skills and literacies are likely to help users to learn in these environments. To date, much of this research has focused on the textual elements of online forum dialogue. This paper acknowledges the importance of studying these textual elements, but presents visual analysis as a complementary tool that can significantly extend understanding of activity in these forums.

Asynchronous dialogue, like written text, is typically both verbal and visual, with much of its meaning carried by a range of visual features, including layout and typographical elements. These aspects of forum data require analysis of the composition of the dialogue alongside its content. In the case of such composite texts, with meanings realised through different semiotic codes, visual and verbal elements interact and should be analysed as an integrated whole. This semiotic approach draws attention to the syntax of images as a source of meaning and to the structuring principles that enable viewers to make sense of the layout of text and images. These principles include salience, frames, vectors and reading paths.

This paper demonstrates ways in which analysis that makes use of these structuring principles can increase understanding of online exchanges between learners. It takes as an exemplar a series of forum postings that were shared in the formal setting of an online course at the UK's Open University. It shows that the construction of knowledge in an online forum is heavily reliant on visual elements of the online interaction, and that a focus on words alone does not make it clear either how this construction takes place or why it fails to take place on some occasions. Visual analysis shows that groups of learners use affordances of forum software to increase the salience of some elements of the dialogue and to increase the coherence of their discussion.

Keywords

Asynchronous dialogue, Cohesive ties, Computer-mediated collaboration, Frames, Knowledge building, Networked learning, Online forums, Reading paths, Salience, Vectors, Visual analysis

Introduction

Asynchronous dialogue within online forums can provide networked learners with important components of cooperation and collaboration, including discussion and dialogue, without the traditional constraints of time and place (Jones, Cook, Jones, & De Laat, 2007). As responses are delayed, learners have time to reflect, to be explicit and to order content and issues (Garrison & Anderson, 2003). Transcripts and archives provide records of group interaction that can be consulted at any point (Kaye, 1989; Lapadat, 2002). Despite these advantages, learners may be unwilling to engage in dialogue in these environments, and may not make use of the potential for collaboration that forums provide (Ferguson, 2010).

One problem for learners is that within asynchronous forums topics are often discussed in parallel, rather than in sequence. Learners face the challenge of linking dialogue coherently without access to all the markers of adjacency and cohesive ties that they would use in speech (Herring, 1999, 2003). Such ties are used to establish links between phrases and sentences (Halliday & Hasan, 1976). They include the use of punctuation to signal the start or end of ideas and repetition to recall past input. Cataphoric references, references to what is to come,

are also commonly used. In the context of education, cohesive ties have been used analytically to pursue the emergence of ideas and to show how people create meaning together (Mercer, 2000).

The affordances and constraints of asynchronous dialogue mean that researchers require effective methods of studying this type of interaction in order to understand how to support collaboration between learners. Forum dialogue has been analysed in a variety of ways. Content analysis, in particular, has been applied to such data – but meta-analysis of many of these studies has challenged the validity and reliability of this method (de Wever, Schellens, Vallcke, & van Keer, 2006; Rourke, Anderson, Garrison, & Archer, 2003). In a forum environment it is difficult to identify a unit of analysis because punctuation is non-standard and new material is interwoven with direct and partial quotations (Ferguson, 2009). Consistent coding of learning also relies on coders' interpretation of what is being learned – learning in forums is not confined to content, but includes learning how to use and interact with online tools and groups (Ferguson, 2009; Littleton & Whitelock, 2005; Liu & Tsai, 2008). In addition, visual elements of the dialogue can confound analysis (Hull & Saxon, 2009). There is a clear need for other forms of analysis to support understanding of the ways in which learners may build knowledge together and establish shared meaning in asynchronous environments.

Asynchronous dialogue, like written text, is typically both verbal and visual, with much of its meaning carried by visual features such as layout and typographic elements. In the case of such composite texts, with meanings realised through different semiotic codes, Kress and van Leeuwen (2006) demonstrated that visual and verbal elements interact, and should be analysed as an integrated whole. Their semiotic approach drew attention to the syntax of images as a source of representational meaning. This led them to identify a set of structuring principles that enable viewers to make sense of the layout of text and images, including salience, frames, vectors and reading paths (Kress & van Leeuwen, 1990, 2006).

Salience is the relation of meaningful elements to one another in a text. Where and when elements appear in a text increases or reduces their weight, marking them as more or less important. Frames distinguish different sections of a composition. These are not necessarily boxes or rules – they can be represented by colour, by typographical elements or by spaces. While frames separate different areas, vectors connect them by leading the viewer from one element to the next, prioritising the most salient items. They thus encode a reading path, a preferred route through the text. These principles form the basis of a set of closely related methods of semiotic analysis, of which visual analysis is a sub-set that has been employed to analyse diverse forms of data including combinations of images and words (Jewitt & Oyama, 2001).

The following sections show how visual analysis can be used to support study of dialogue in asynchronous online forums. They draw upon an extensive study which is described in more detail elsewhere (Ferguson, Whitelock, & Littleton, 2010). The full study analysed all interaction between members of three project groups, and drew on interview data to extend understanding of those interactions. However, the focus of this article is on the method of visual analysis that was employed. The analysis of knowledge construction considered below is presented as an exemplar, rather than as a full account of the dataset analysis, and focuses on just one discussion thread in order to focus attention on the method.

Data collection and preparation

The exemplar postings analysed here are drawn from an extensive set of material in which separate groups of students with no face-to-face contact collaborated online using FirstClass conferencing software. Within these forums, small groups of undergraduate students at The Open University, with the support of tutors, developed and carried out research projects. Three six-week forums were archived in their entirety for this research. The archived material included the text and title of all messages posted in the forums, the names of their authors and the dates and times when they were posted. It also included documents or icons attached to the postings and a screen capture of each message. In addition, the history of each posting was recorded: who had created it, who had opened it, who had downloaded its attachments and when they had done this.

It proved useful to have the posting data available in three forms: as searchable text, as images and in the original forum. Searchable text allowed forum postings to be printed out so that many could be viewed at a time, specific instances could be compared side by side, and the effects of ordering by author, title or date could be compared. Images preserved elements such as icons, colour, shading and layout, including features such as text history that cannot easily be converted to text files. If the original forums become inaccessible or are deleted, text and image files preserve much of the data. Nevertheless, retaining the original forum for analysis has many

advantages: it supports shifts from the researcher's perspective to an experience more akin to that of a forum member, the original forum often proves easier to negotiate than printed files, and it can be viewed on a variety of screens and devices to recreate the experience of different users.

With the consent of all participants in the forums, images of message histories, icons and forum home pages were stored as screen grabs. Individuals, groups and the course have been given pseudonyms here. This involved making changes to those elements of the screen grabs presented in Figures 1-3. A document was also created for each forum, giving details of participants, type sizes and styles used, associated folders, attached documents and the dates when the forum was in use. Another document included more details about attached documents, including the text of the posting with which they were associated, their title, the person who had posted them, and details of any documents to which they were related. Analysis was an iterative process that involved moving between text files, image files and the online forums in order to compare representations and interpretations and to investigate how meaning was conveyed.

The detailed consideration of three postings from 'Jet' group presented here is intended to draw attention to the roles played by visual elements. It demonstrates ways in which these are important to the construction of cohesive dialogue, shared understanding and collaborative work. However, these were not isolated examples; the full analysis revealing the significance of these elements was extensive and covered over 1000 postings.

The postings discussed here were the start of a nine-post threaded conversation by 'Jet' group. The group was made up of seven undergraduate psychology students, supported by two tutors. These postings were added to the forum when group members were interacting for the first time and so had to develop ways of collaborating with the other members of their newly formed group. They had only a few days in which to put together a research proposal on a project proposal form (PPF), to agree which of six video clips they would use as data and to decide on a research question and method of analysis.

Data analysis

This thread starts with a posting by 'Kenny' (Figure 1). The most striking element of this posting, when viewed in colour, is the header section, which is shaded light green. This framing device adds salience to the highlighted text. Within this section, three lines are automatically filled in by the forum software and therefore, like article header and footers, are formulaic and easily passed over by the eye. The forum software thus positions the Subject line at the start of a reading path. The eye is drawn to this Subject line, which frames the ensuing discussion. In this case, it makes reference back to previous discussion threads with its use of the words 'livechat' and 'PPF'. By framing these words in this way, Kenny positions Posting 1 as part of a continuing discussion. These words act as cohesive ties to connect, produce and develop talk about the subject matter that is identified in the thread's Subject line – the rescheduling of synchronous online discussion (livechat) and production of draft project proposals.

Kenny's Subject line thus links back to and prioritises elements of previous dialogue. The affordances of the conferencing medium support this work because the software gives added emphasis to the Subject line by setting it apart. By default, FirstClass postings are filed under their Subject lines, which are visible to anyone opening the forum, even if they choose not to read the message. While discussion moves on, these words continue to feature in the list of titles of forum postings. Without opening Posting 1, other group members can connect it with previous postings such as 'Project Proposal Forms are ready' and 'Scheduling a livechat tonight'. At the same time, the title signals what readers can expect to find in Kenny's posting, and suggests that subsequent dialogue will include discussion of the timing of livechat, and the drafting of project proposal forms.

Within the body of the message, Kenny continues to supply prompts that will frame subsequent discussion. His first list, which starts '1 defer livechat', is clearly labelled as a set of proposals that requires response; the numbers act as vectors that lead readers from point to point. This list is followed by the direct request: 'Please let me know what you think.' Another numbered list distinguishes between video clips. This use of numbering supports a more orderly discussion than would be typical in spoken dialogue. A set of three main proposals and numerous sub-proposals would be difficult to understand and retain if presented as a single turn of speech, and it is unlikely that each one would be followed up. On the other hand, if these options and sub-options were presented singly in speech, Kenny's ideas would not appear as a coherent set, but would be woven between or buried among the contributions of other group members. Framed separately in textual form, the proposals have added salience because they are presented in an orderly and coherent manner.

Kenny's use of the affordances of the software and his use of cohesive ties situate his contribution within an ongoing dialogue. Because asynchronous discussion is chronologically fragmented, not all subsequent posts were relevant to Kenny's. The group began, continued and finished several other short threaded discussions while this dialogue was in progress. In the case of this discussion, Posting 2 (Figure 2, below), Hannah's direct response to Kenny's posting, is the next posting that was written in the forum. For readers who view their posts chronologically, Hannah thus signals a relationship between the posts by their adjacency. However, learners may also opt to order their forum view by topic or by author. It is important, therefore, that group members have other means of establishing adjacency between postings. To develop the discussion coherently in this way requires work by each author as well as by readers.
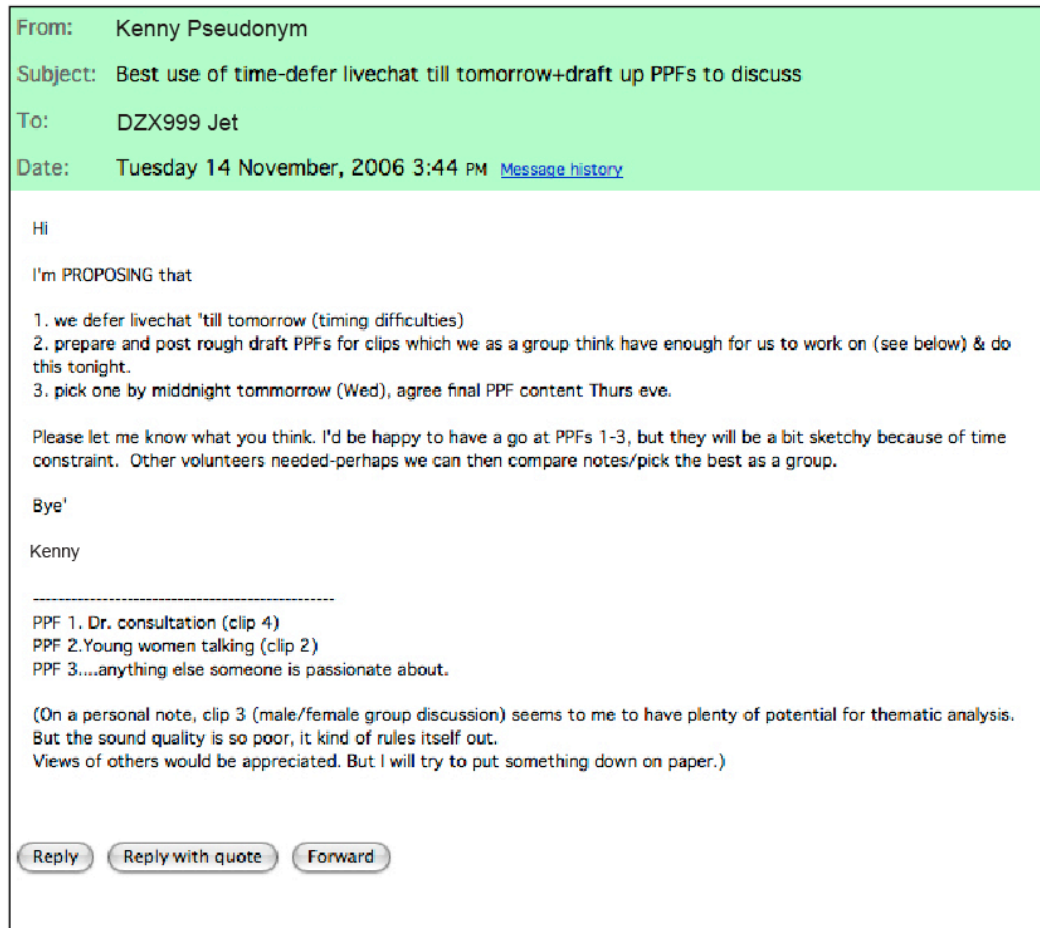
Figure 1: Posting 1 in the thread, authored by Kenny.

Learners communicating through forum software can establish a threaded connection and thus link their postings with previous ones by choosing to 'Reply' to a previous contribution. Hannah does this with Posting 2, linking it to Posting 1 by responding with a reply, in order to establish the threaded connection. In addition, she opts to 'Reply with quote'. The FirstClass software automatically copies and highlights the block of text she has chosen to quote and also notes who has been quoted. Firm ties are thus established between Posting 1 and Posting 2. At the same time, the quotes from Kenny are framed by being highlighted in grey, and Hannah's responses are given added salience because they are presented in bright blue.

Hannah embeds the majority of Kenny's post within her own, stressing its salience within the continuing dialogue. She winds her words around his suggestions, producing six separate responses within one message – framing them so that each clearly refers to a separate section of the original. This allows her to develop different parts of his message in different ways. The numbering in Posting 1 (Figure 1) acts as a framing device that allows subsequent authors, including Hannah, to develop a more orderly discussion than would be typical in

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speech. Because ideas and suggestions are clearly separated, it is possible to respond to each in turn. When framing devices are not used in this way to prompt ordered response (as happened in other group discussions), subsequent discussion is limited because postings are treated as blocks of ideas to be dealt with en masse.

In the case of Postings 1 and 2, Kenny's division of his original posting into sentences, paragraphs and lists makes it easy for Hannah to reply to each of his ideas by following the patterning of his posting. However, it is her use of typographical elements in Posting 2 that enables other group members to identify reading pathways through her message, clearly separating her words from Kenny's original input. She makes use of colour and layout to clarify and add visual weight to her response and, in so doing; she also makes use of the typography and layout used by Kenny in his original posting.

Her use of quotation enables Hannah to show how she has interpreted and developed Kenny's words, and also enables others to follow how the discussion is developing. Threading and quotation do not automatically clarify the flow of ideas because, unedited, they may weight elements of a posting in a misleading fashion. In this case, though, Hannah creates reading paths through the different sections of her posting, establishing a clear and comprehensible connection to Kenny's input. She is able to do this partly because of the way in which Kenny laid out his original message, and partly because of the ways in which she handles the cohesive ties within her message. These ties make use of the affordances of the conferencing medium and are therefore much more apparent than they would be either in spoken conversation or in other forms of textual communication.

Figure 2: Posting 2, authored by Hannah. Quoted text appears on a shaded grey background, while Hannah's contributions are distinguished by the use of blue text.

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Kenny's initial posting (Figure 1) is lexically dense, containing more information and propositions than would be possible in a typical turn of spoken conversation. He frames and weights his ideas by the use of a series of visual devices: sentences, paragraphs, numbered lists and typographical division. He thus produces prompts implying that respondents should frame the subject matter in similar ways – as Hannah does in Posting 2.

Apart from the title and automatically generated header, Kenny's posting consists of the main body of his message, and a form of postscript. This final section carries less visual weight than the earlier parts of the posting because it is divided from the main body of the message by a row of hyphens, and this lack of visual weight results in it being set aside by Hannah and by Kenny's other respondents. In Posting 2, Hannah quotes the main body of Kenny's posting in full, but she chooses to delete part of the final section, thus excluding it from the discussion. Kenny's first three-part list, which invited response, is retained; while the second three-part list, placed after the dividing line, is lost. Kenny's use of framing thus influences decisions about the elements of his posting to be taken forward.

In Posting 2, if Hannah presented both proposals and responses in the default 10pt Arial black typeface, it would take a lot of work for readers to develop a reading path through her posting that would distinguish her contributions from Kenny's quoted input. Figure 3 shows the next posting in this thread, which demonstrates how much extra work is involved for readers if clear reading paths are not established. At first glance it is not at all clear who is the author or which new text has been added to the discussion.

Figure 3: Posting 3. All text in the body of the posting appears as black text on a white background

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Although the header specifies that this message is from Olivia, the first lines of the text suggest it is from Hannah or Kenny. Olivia's contribution, only a small fraction of the posting, is almost hidden at the bottom. Its distinguishing characteristics are that it is not marked by > signs or numbering and that it does not use capitalization. These negative indicators give very little weight to her contribution and make it difficult to distinguish it from others. Olivia's use of the same colour and point size when quoting Hannah's post mean that it is almost impossible to separate Kenny's quoted input from Hannah's, because no framing devices are used to divide one from the other. This can be compared with Figure 2, where Hannah uses colour and point size to weight and frame the contributions of different individuals in the same text.

The use of different colours and fonts was effectively modelled from the start by this group's tutors. However, in one of the groups studied, the tutor kept to 10pt Arial black and so did all the students – which made the sort of detailed response seen in Posting 2 difficult to implement or understand because fewer weighting and framing devices were employed. In the case of Posting 2, Hannah's use of typography allows her to build clearly on Kenny's input in Posting 1. Her use of 14pt Arial blue draws the eye to her input and to the interplay between the given and the new by increasing the visual weight of her contribution. Use of different colours, fonts and font sizes allows complex discussion to develop, with clear ties between separate postings, because reading pathways through the material can clearly be distinguished.

Conclusion

Visual analysis demonstrates that, as a textual medium, asynchronous dialogue provides opportunities that are not available when using speech. A straightforward example of this is the use of posting titles. The visual weight of titles is increased by their point size, their position and their coloured background, as well as by their appearance on index pages and their repetition in threaded discussion. This added weight means they can be used to connect, prioritise and develop talk. Visual elements are also used to create reading pathways through text. Series of ideas are numbered or separated typographically in a variety of ways. In asynchronous dialogue, such divisions link discussion, prompting others to consider these ideas individually rather than as a set, and to provide responses to each in turn. These frames and vectors therefore promote an orderly, structured response.

Visual elements afforded by the software thus help learners to structure discussion so that postings build on past turns. These elements also help structure future contributions, making dialogue comprehensible to participants. Layout and typography enable the creation of reading pathways through postings and give greater or lesser weight to different ideas and responses. Colour and direct quotation can be used to support discussion, to build reading paths through dialogue and to enable the complex development of arguments. These affordances of the software also function as important back channels to dialogue (Drummond & Hopper, 1993), wordlessly signalling reaction to the contributions of others by ignoring, highlighting or prioritizing them.

These back channels of communication are more useful and less open to misinterpretation when learners are aware of their existence. Learners can therefore benefit from their tutors acting as 'discourse guides' (Littleton & Whitelock, 2004) who can model appropriate use of the visual elements of online dialogue, Learners need to be aware that where and when elements appear in a text mark them as more or less important, contributions can be given extra weight by use of typography and layout, and elements of dialogue can be marked off from each other by being framed by numbers, colours or other elements. Without effective use of visual cues, asynchronous dialogue can quickly become confusing. If a posting's author does not work to establish clear reading paths this is left to individual readers, thus increasing a group's workload.

Although asynchronous dialogue, such as that found in online forums, has characteristics of both talk and writing; its chronology and its use of layout and typography mean that it has emergent properties that belong to neither, and that it is structured in ways that differ from both text and talk. Visual analysis provides a method of examining these properties and their implications for the construction of knowledge within a networked environment. When using this form of analysis, it is important to bear in mind that different technologies and operating systems render the same postings in different ways. To achieve results that are not specific to one type of computer or one form of software, analysis of multiple representations of the same text is likely to be necessary. When this is done, this form of analysis can be used to consider the meanings of regularities in the ways in which visual elements of asynchronous dialogue are used. It also provides a way of identifying the cues that learners use when deciding where to focus their attention when engaged in asynchronous dialogue.

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Online learners may be expected to have extensive experience of employing the techniques for sense-making that are used in classroom talk. However, their experience of asynchronous dialogue is likely to be limited, and the data examined in this study suggests that they frequently encounter problems due to their unfamiliarity with the use of typographic elements to structure and make sense of academic dialogue. Visual analysis provides a method of understanding the elements of typography and layout that are key to the construction of knowledge in online forums. This understanding has the potential to be employed to identify the skills and literacy practices required by learners in order to make effective use of these environments.

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