Social Processes and Pedagogy in Online Learning

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Online learning environments offer efficient ways of interconnecting group members and satisfying their communicative needs. However, learning does not proceed through shared communication alone; all groups imply social processes and learning groups demand an additional pedagogical intention. Popular online learning systems satisfactorily enable the management of students and teaching staff but offer limited tools to support familiar educational techniques and even fewer to support the essential processes of group dynamics that accompany learning.

This article draws from both the literature of learning and of interpersonal and social interaction to define those characteristics of an online group that support learning and proceeds to use these criteria as a tool to evaluate currently available systems.

In this article we approach the examination and eventually some evaluation of online learning environments from a number of aspects. So often the starting point for such an enterprise is a particular technology and the new potential that it claims to offer. However, technologies are ultimately only tools to achieve human purposes and once those purposes are made explicit, some tools become less than ideal. Thus, we will in turn describe the context, both social and technical, in which learning is to occur, the nature

of the learning process, and then some of the software tools currently offered for the purpose. It is hoped that by defining the desirable characteristics of a sound learning environment and the allied social and group development that must accompany it, we will have a more objective framework against which specific technologies may be judged. Teaching and learning is more than simply communicating content; it is a complex dynamic with clear responsibilities and processes for both teachers and learners, which are so often assumed to be implicit in network systems, but actually demand explicit structures.

One of the themes emerging from the literature on online learning is the need for structures to support social and pedagogic processes. Almost every author in two recent collections (Alexander & Boud, 2001; White & Weight, 2000) called in one way or another for more structural support for online facilitators to enable them to implement effective online pedagogies. This article has also been written from this perspective. While we agree that the tutor's role in structuring online learning experiences is critical (Alexander & Boud, 2001), an additional burden has been placed on tutors by the relative lack of structural supports for pedagogy built into software packages for online teaching and learning. This article attempts to extend the preliminary work we have done in this area (Hughes & Hewson, 2001; Hewson & Hughes, 2001) by exploring some of the social and pedagogic processes involved in online groups, and the structural desiderata that could be implemented to support them.

SOCIAL TASKS

A consideration of facilitator tasks and roles should reflect the tasks students face as they develop their participation in an educationally productive way in an online classroom. The best way to conduct this analysis is to draw on the literatures that relate to real classroom dynamics. Drawing on face-to-face experiences when designing online learning is an approach that is now well accepted in the literatures of online learning (Alexander & Boud, 2001). Salmon (1999), for example, drew on group dynamics to describe a staged model of online participation that outlines five stages of development: access, socialisation, information exchange, knowledge construction, and independent control of learning and development. However Salmon's stages blend technical issues with social and pedagogic issues, and so the resulting model is sometimes less than useful.

The importance of social tasks in the formation, operation, and maintenance of groups has long been recognised. Jacques (1991) considered these tasks from two perspectives: the group building and maintenance functions, and the group task functions. Among the social functions identified by Jacques were:

- Encouraging

- Mediating

- Gate-keeping

- Standard-setting

- Following

- Relieving tension

- Initiating

- Information seeking and giving

- Clarifying

- Elaborating

- Coordinating

- Orienting

- Testing

- Summarizing

Jacques regarded these functions as being distributed among the members of a group so any member may perform a function even though he or she is not the designated leader. Research consistently fails to identify any set of functions that is universally the peculiar responsibility of the designated

leader (Jacques, 1991). Neither are all the functions required all the time, indeed their inappropriate performance may impede the operation of the group. Yet most groups have leaders, and most groups have structures and mechanisms for encouraging and acknowledging the performance of the social functions.

The social dimension of online learning is also widely recognised and many authors provide a number of recommendations for the role of the online facilitator in relation to social tasks (Harasim, 1990; Chickering & Ehrmann, 1996). Online facilitators are urged to be friendly and welcoming (Lewis, 2000), to encourage "netiquette" (Mason, 1991; Hiss, 2000), to maintain harmony in the group, and to model desired behaviours (Bischoff, 2000).

PHATIC PROCESSES

The tasks that challenge students as they first join a group, whether face-to-face or online, are essentially phatic; concerned largely with establishing and supporting social relations with other members of the group, including the facilitator, more than with the consideration of content (Addesso, 2000). Students need to establish an identity in the class, get to know others, discover and contribute to the communication etiquette of the group, and begin to develop supportive and trusting relationships with others. These phatic tasks are prominent in Salmon's (1999) stages of socialisation and information exchange. They are supported in some web conferences by facilities for presenting personal profiles, for introductions to be made and responded to, and the consideration of issues concerning the etiquette of communication and the ground rules for the group. These phatic tasks are in some ways harder and in others easier to achieve in online groups than they are in face-to-face groups.

They are harder especially because of the lack of ongoing visual interaction among the members of the group, whereby they can watch each other's reactions during introductions and other activities. You cannot communicate with a wink and a raised eyebrow or facial expression online. Without this rich visual information to support communication with at least some other members of the group, and without the ready opportunity for private interactions and asides, it is very hard to develop real intimacy. Dreyfus (2001) characterized this as an issue of disembodiment, arguing that the lack

of a physical body in online groups imposes severe constraints on what is educationally possible. We accept much of his argument, but consider that the attempt to develop the potential of the medium as much as possible is still worthwhile. We do this with the clear knowledge that there are distinct limits, and that a point will inevitably be reached where no amount of online interaction will support a student's further development towards mastery.

At the same time, the phatic tasks can also be easier, at least in some respects, to achieve. Jourard (1971) demonstrated that the personal act of self-disclosure in a group is at the same time an invitation to self-disclosure from others. Similarly, Cutler (1995) described "disclosure" as a powerful social tool, and suggested that it is a currency that participants use to maintain interaction and to establish a persona online. Online profiles often reveal much more about the participants than would ever be gleaned from the brief introductions or icebreakers that usually occur in real class groups. Moreover online introductions and profiles are semi-permanent. You can read them at your leisure, and you can return to them whenever you like. They can compensate partially for the constraints on communication that the lack of embodiment raises to individuals within the group.

When the information provided in online profiles goes beyond the level of disclosure normally found in face-to-face groups, this can be seen as an attempt by the participants to compensate for the lack of visual cues in online communication. Increased disclosure is a way of achieving a higher level of intimacy than would otherwise be possible. We surmise that online participants increase the level of disclosure in order to overcome the "transactional distance" (Murphy & Collins, 1997) that characterises asynchronous communication. It may also be that the relative safety of an online group, where real-world anonymity can be protected, may support higher levels of disclosure in the sort of liberatory move that allows those in an unfamiliar environment to act out of character and to do things they would not normally do on their home turf.

One of the ways that the accomplishment of the phatic tasks can be supported is by the provision of structures that delineate activities and modes of communication within a web conference. Structures can provide a level of compensation for the lack of visual and proxemic clues, spontaneity, synchronicity, and other linguistic elements. In face-to-face groups gradations of formality and informality are usually well differentiated, emotions are relatively easily expressed, and the demands of communicative interactions are easily negotiated. All of these characteristics of face-to-face

communication in groups are different online. Formality is heightened and difficult to dissolve, emotions more easily hidden than revealed, and the procedural requirements of interactions difficult to negotiate. As Spender (2001) has noted, online text, regardless of the author, looks the same and lacks the markers that are available in live classrooms to delineate authority and to give structure to discussions. Support for familiar structures that refer to their face-to-face correlates can ease some of these difficulties. Most standard software packages provide some structural supports for phatic tasks, including personal profiles and introductory activities. But they could go much further.

In a real class group, information about the participants is progressively revealed, both through the formal class interactions and through the informal interactions among class members that occur in the corridors and coffee shops of educational institutions. We get to know some of our peers much better than we do others, and sometimes subgroups form. Much the same occurs online (although the formation of sub-groups is not often straightforward) provided support for informal interactions is made available (Winograd, 2001). Support for ongoing modification of personal profiles and introductory statements should also be provided so participants can represent their developing online personas with varied and different levels of disclosure.

GROUP ESTABLISHMENT

The collection of individuals sharing an online conference must also move to becoming a cohesive group with a shared purpose. Khosifian and Buciewitz (1995) referred to the existence of an "organisational memory" generated and maintained through online dialogue once a group achieves cohesion. This suggests a synergistic process in which the group grows beyond the sum of its parts, to become an entity in itself with developing characteristics. The online facilitator has a major role to play in this transformation. He or she can assist the group to consider and accept a common purpose, and to agree on broadly common approaches to achieving it. Once the process of establishing a group begins, each individual member of the group has to address the same transformation psychologically. That is, he or she must now come to feel and act as part of the group. If this is not achieved, the individual may never come to truly join the emerging group, may become passive and eventually leave.

Proposing and debating goals and approaches can support formation of the group. Once the goals and approaches have been clarified, commitment can be garnered by seeking public affirmations and commitments. Of course, participants will only commit to a common goal if it converges with their own needs and interests to a sufficient extent. If this is achieved, then making a public affirmation of your commitment to the goals of a group supports the psychological buy-in that is required for each member of the group to fully participate. However, if a participant senses that the group is no longer addressing his or her needs and interests, then commitment may be reviewed. The facilitator's role here is not to exude excessive commitment in the hope of carrying the commitment of others, but rather to work constantly to ensure that the group activities address the needs and interests of each, or as many as possible, of the participants. Working to make contributions relevant to the areas of interest of the participants, and providing ongoing and explicit support for meta-communication and evaluation is vital (Winograd, 2001).

As a group develops, leadership tends to be more open. The impact of the authority of the teacher or facilitator diminishes and, according to Fawcett-Hill (1977), the leadership functions tend to be distributed. For periods of time, or for particular activities, individuals may take over the direction of a discussion, or the conduct of a decision-making process. Participants may propose and lead sessions or segments in a transparent but relatively smooth way. In a mature group these transitions are fluid. Everyone is aware of them happening so that the leadership functions are actually transferred and are operative, but there is little procedural activity involved.

TRUST

These tasks are almost entirely social. However, more than these purely social tasks must be accomplished for effective educational interactions to be possible. For pedagogical purposes, each student must develop trust in the facilitator, and in the others in the group, to a degree that can support ongoing disclosure from the group. The need to trust falls largely to the participants. Facilitators, on the other hand, must prove themselves to be trustworthy.

Most accounts of trust in the educational literature focus on relatively static characteristics of the participants. Facilitators are urged to display the

characteristics of a trustworthy person (Schindler & Thomas, 1993) and to foster an atmosphere of openness and trust. However, real trust is not born from affirmations and the adoption of trusting attitudes; trust arises from experience, from tests and trials of trust (Luhmann, 1979; Dreyfus, 2001). Participants in groups constantly test the waters, contributing and committing minor disclosures to see how they are received and treated. Their tests involve being on the lookout for betrayal. Will a contribution be dismissed without due consideration, will it result in embarrassment? Will a contribution be respected or will it be used to stereotype the contributor? This is what each participant is watching for, and as they are reassured, trust builds. For the educational purpose to be achieved, the participants must come to trust the facilitator and each other, and the facilitator must prove trustworthy. As trust builds during the life of a group, so disclosure and intimacy will increase. More may be expected later in a course than at the beginning.

In summary then, a student joining a new group, whether online or live, must accomplish a number of phatic tasks to build a basis for their ongoing engagement in educational activities:

- make himself or herself known;

- develop an identity within the group;

- get to know others;

- discover and contribute to the communication etiquette for the group;

- develop supportive relationships with others as individuals and as group members; and

- develop a level of trust in other members of the group and the facilitator.

PEDAGOGIC TASKS

There are a number of conceptual frameworks within the literature of higher education useful in examining the pedagogical processes of the online classroom. Laurillard (1993) developed a model of university teaching and learning based on research into student approaches to learning (Biggs, 1987;

Ramsden, 1992) and the conversational theory of Pask (1976). Her significant contribution to research was the manner in which she portrayed media in the processes of learning. Her model identifies four "moments" in the learning process that are vital:

- *Discursive interaction*. Educational processes, especially in higher education aim to alter the conceptions of students about aspects of the world, and particularly about how these aspects are to be appropriately theorised and described. Formal discussion in a class must address student conceptions and misconceptions, and it must be able to draw on participants' experience of the phenomena under discussion.

- *Interaction with a microworld.* Teachers establish microworlds or problem spaces to give students a venue for safe action on, and experience of, the phenomena under consideration. Within these microworlds students act to achieve set goals. The microworld should itself give feedback (intrinsic feedback) on the actions of the student within it.

- *Adaptation of action.* Teachers need to be able to adapt the microworld in light of the ongoing theoretical discussion and of the activity of the student within the microworld. They may alter the parameters of the microworld, the set goals, or the feedback given. Students should adapt their actions in the microworld in light of the feedback they receive from it, and of the ongoing theoretical discussions.

- *Reflection on action.* Both teachers and students need to reflect on what happens in the microworld and to build the results of these reflections into their ongoing theoretical discussion.

In Laurillard's view, a fully adequate educational design must provide appropriate support for each of these moments. If a course is conducted entirely online, then the online environment must provide them all.

Of these, discursive interaction is easiest to support through the provision of discussion groups. The cognitive processes involved in reflection are, naturally, private to the individuals concerned, but this private cogitation can be encouraged and even facilitated by structured online interaction. Online packages may also provide learning activity through the establishment and operation of microworlds. Most course management packages (e.g., WebCT, 2003; Blackboard Learning System, 2003) provide only

minimal support for microworlds that require more than text for their implementation. Where more complex microworlds are needed online, multimedia packages are usually used to develop and deliver them through browser plug-ins. However, the concept of a microworld or task space where students actively engage with concepts, develop solutions to problems and work in a practical way towards set goals is also possible through the structuring of interaction in a discourse.

While most course management packages support a level of communication between group members, it is seen as secondary to the publication of content. Laurillard's conversational model of pedagogy is the area that commands the least attention from software developers. Often, the communications facility sits aside, not at the centre of most packages, and is relatively undeveloped. Most software packages provide standard threaded newsgroup facilities to support discussion. These have their origin in corporate and military communications applications, we argue, and are quite ill suited to educational purposes. To see why this might be so, we will delve into the intricacies of educational communication.

Laurillard characterised the discussions in her model, as conversational, but educational discussions of the type she envisaged are quite different from normal conversations. In an educational conversation, especially in higher education, the teacher has a specific agenda: that of helping the student develop an acceptable (to the teacher and the discipline as a whole) account of the phenomena under discussion. This is very different to a conversation where the parties may or may not have an intention or adopt such a proselytsing attitude.

To facilitate student learning in this way, teachers need to have access to the conceptions, misconceptions, and understandings of students, and they need to be able to make their own understandings plain to their students in ways that will assist the learning process. Teachers do not just need to present information and discuss it; they sometimes need to challenge students, to put them in uncomfortable situations, to create tensions within students and within classes. They do this to bring to the surface, challenge, develop, and highlight student conceptions and misconceptions. These considerations suggest the mere presentation of information with the opportunity to ask questions or respond to statements is a totally inadequate pedagogical strategy.

To enact pedagogic purposes in their educational discussions, teachers employ a range of discrete techniques and methods to access and address student conceptions and misconceptions. Earlier theories of educational design, such as Gagné's "instructional events" approach (1985), provided a perspective on these group processes. Gagné described nine distinct events that fall into five main phases of instruction, each with a specific pedagogical purpose (Table 1):

Table 1

Gagné's Events of Instruction

Orientation	Gain the learner's attention. Inform the learner of the goals of the lesson and what to expect from the lesson. Make the learner recall any prerequisite information that is important to the current lesson or that the current lesson builds upon.
Presentation	Present the lesson information. Guide the learner as the lesson information is presented.
Practice	Provide opportunities for the learner to interact with the lesson. Provide the learner with informational feedback based on these interactions.
Testing	Test the learner in reliable and valid ways on the predetermined learning outcomes.
Retention and transfer	Consider how to help the learner remember and apply the lesson information in similar and dissimilar contexts (learning transfer) in the near and distant future.

While these stages and events were proposed at a time when constructivism was in its infancy, they do serve to demonstrate that teacher-learner interactions are not simply the serial exchange of comments, but rather conversations that seek to achieve different and specific outcomes at various stages. Most classroom techniques or methods can still be usefully categorised according to Gagné's scheme.

Recent work on expertise by Dreyfus (2001), concerning the ability of online groups to promote learning, suggests that for certain higher levels of expertise or mastery, a physical presence or embodiment of the teacher/expert is required. This work builds on his earlier research (Dreyfus &

Dreyfus, 1986, 1996, 1999) into the nature of expertise in which he identifies six discrete stages or steps between novice and expert. Identified as novice, advanced beginner, competent, proficient, expert, master, these developmental stages represent the acquisition of increasingly complex levels of cognition and skills. Dreyfus proposed that online learning, whether individual or group-based, can only support learners to the proficient stage, after which apprenticeship with and the personal presence of a master are necessary to provide the degree of feedback and modeling required to develop further. This may be so in the sciences and fine arts, where high levels of refinement in practical skills are necessary and where studio and "sitting at the masters knee" pedagogical techniques are still common. However, in the social sciences and particularly with regard to the theoretical skills typical of university learning, mastery may be achieved without the intimacy of the classroom or studio or the physical presence of a master. In addition, these higher levels of expertise are seldom set as outcomes for undergraduate level courses where acquiring a knowledge base and learning to engage with the discourse of a discipline are goals that are more typical. It could also be argued that the relatively small number of learners who ever acquire mastery level in any discipline should not prevent the majority of learners from using online interaction to become proficient. The challenge, in the majority of university classes, is to implement sound teaching techniques that engage students with content and each other. To do this, we return to an examination of the techniques that may facilitate Laurillard's moments.

PEDAGOGICAL TECHNIQUES

First among the pedagogical techniques is obviously discussion. Others used include questioning, brainstorming, case studies, debates, arguments, role-plays, information gap exercises, and so on. Most involve the manipulation of the parameters of communication employed in the conversations between teachers and students. Thus brainstorms attempt to enforce a sort of anonymity by requiring rapid, top-of-the-head responses that are accepted without comment. Questions, well handled, impose a wait time so that the cognitive processes they are designed to provoke may proceed uninterrupted. Information gap exercises deliberately create situations in which students require information from others and act to seek it, while debates demand prepared cases presented in a formal order and within time and linguistic

constraints. These, and the many other techniques, provoke students into articulating their conceptualisations, opening them to consideration and challenge, and promote individual reflection.

Such pedagogical techniques are well developed in the classroom, yet they are rarely explicitly supported online. Many teachers go to extraordinary lengths to enact online correlates of classroom-based pedagogic techniques (Paulsen, 1995) whether using e-mail or web conferencing. They run debates by starting threads in a conference for each case, they brainstorm by setting a thread to suppress the identity of contributors, they pose questions and inhibit the ability of the software to accept answers for a time, and so on. To manipulate these variables, teachers have to delve into the technical depths of the software and develop a language and conception of their activity that is quite foreign to their developed skills and the knowledge base they use for classroom teaching. A similar, though somewhat less onerous task is imposed on students. Many writers about online education even welcome these challenges, speaking of the need for paradigm shifts in thinking and for new modes and forms of education (Dolence & Norris, 1995).

With these thoughts in mind, we can now examine the facilities offered by common software packages for both their support of social and pedagogical processes. We can also evaluate them against the criteria that are implicit in these considerations.

THE CHARACTERISTICS OF THE ONLINE ENVIRONMENT

For the purposes of this article, we will concentrate on asynchronous communication systems, as they are the most common, the most popular, and the most useful.

Asynchronous systems have a long history in educational settings (Harasim, Hiltz, Teles, & Turoff, 1995) and their continued use suggests that they are meeting a real need. But what are the characteristics of these systems as educational tools, how do they differ from traditional classrooms and what benefits have they offered to sustain their use for over 15 years?

Asynchronous learning systems:

- reflect all the strengths and weakness inherent in written text, such as spelling, the potential for misunderstanding and limited expression,

- change the time frame and the temporal dynamics of the discourse,

- enable several discussions to occur in parallel within the same time-frame, or in serial order,

- lack the visual, proxemic, and nonverbal cues common to face-to-face discussion,

- have the potential for disorganisation and even chaos as themes or conversations diverge,

- are democratic and "uninterruptable" as each contributor gets to say their piece in total before responses are possible,

- allow for the possibility of anonymity, false personas, or avatars for participants,

- reduce discrimination as the postings are "sans race, gender, physical appearance, physical handicap, or socio-economic cues" (Berge & Collins, 1993),

- encourage active engagement with the subject of the discourse rather than irrelevancies,

- are revisable, archivable, and retrievable (Harasim, 1990) as the transcript is stored centrally on a server and may be accessed at any time to inspect the past, and

- influence, and usually increase the transactional distance (Murphy & Collins, 1998; Moore, 1993) between participants.

Many of these characteristics, and especially their co-incidence, are unique to the asynchronous medium. Some prove restrictive and serve to introduce noise into the communication process, while others are clearly advantageous, both socially and educationally and offer functionality unavailable in the face-to-face classroom. Every teacher wants to encourage deep learning (Biggs, 1987) by actively engaging students through dialogue, but the real

challenge in an online group is to achieve absorption in that dialogue (Paulsen, 1995).

This emphasises the role of the moderator or facilitator and suggests that such responsibility goes far beyond the guidance of learners through published content, to setting the tone or tenor of the group and the conventions that structure the interactive processes. Richardson and Turner (2000) also emphasised the need for metacognition about the processes that occur and the need to set a timeframe for activities. So some of the characteristics of the online environment previously listed may be quite useful for these specific purposes and actually benefit some social and pedagogic processes.

SOFTWARE SUPPORT FOR SOCIALISATION AND PEDAGOGY

Online learning environments should support processes of socialisation and pedagogy to optimise the effectiveness of asynchronous group learning. These dual goals may be addressed through opportunities for dialogue and through the structuring of the discourse (Moore & Kearsley, 1996). As previously mentioned, most currently available systems provide a standard threaded bulletin board or newsgroup structure for the purposes of dialogue. They also offer student (and staff) homepages or profiles to support the phatic goals of establishing a presence, meeting others, and identifying with the group. The moderator, during discussion, must negotiate the setting of rules or etiquette and any procedural structure within the dynamics of the group. Paulsen (1995) suggested that the best learning occurs when the moderator can minimise procedural discussions to maximise engagement with content. He supports Moore and Kearsley (1996) in suggesting that structure affords this better than free-form exchanges. The suggestion that structure in interaction supports a wider range of action has been variously articulated in philosophical discourse over the centuries. In the educational realm, Rotem (1993, p. 120) developed a concept of a "liberating structure" that highlights the "paradox concerning the need for clear and well defined structure to achieve freedom in learning." For Rotem, structure enabled communication and exploration in learning groups, while lack of structure inhibits these same elements.

Each of the currently available online learning environments supports

pedagogical and social processes to varying degrees. Rather than develop an elaborate table comparing commercial systems, most of which offer similar features, we offer a list of desirable features for online environments. In most cases it should be obvious that few available packages provide explicit support for them. So, from the considerations presented, what would an ideal communication system for online learning and teaching look like?

PHATIC TASKS

Earlier we outlined a number of phatic tasks that students need to accomplish to enable them to fully participate in the educational activities of a group. These included the need to make themselves known to the group; to develop an identity within the group; and to get to know others. To support these processes, online environments first need to employ interfaces that are easy to use. This is both a matter of good design in the technical sense, but also of drawing on familiar metaphors in the interface design so that the learning curve for participants is minimised. This will help overcome the issues of anxiety that may challenge novice users.

Most packages provide facilities for presenting personal profiles, for introductions to be made and responded to, and the consideration of issues concerning the etiquette of communication, the ground rules for the group. Some leave these issues to the facilitator to address using generic structures; others provide specific support for profiles for example. To fully support the phatic tasks, profiles should be editable at any time to allow participants to update them to reflect their developing online personalities.

Online environments should offer password protection so participants can be assured of a minimal level of confidentiality within the group. Contributions should be identified by preferred names, and even by pseudonyms if participants choose. For some activities the educational process may require full anonymity or alternate identification, and the software should allow this to be set. To personalize the communication and support the phatic tasks, environments should support the uploading of photographs and their display in profiles. Ideally thumbnail photos should accompany each contribution.

Private contact between individual participants and among small groups should be supported and these contacts should be able to be initiated by individuals in a straightforward way. For any subgroups that are set up, the

identity of those who do and don't have access should be apparent. Similarly, levels of formality should be catered to. Many packages do this by offering a "coffee shop" or some such, as a place for informal interaction, and a more formal course communication area.

Ideally, there should be ways of representing tone and intent in communications. This may be done by manipulating the presentation of contributions, or by the addition of emoticons or the like. A range of modes of communication should also be supported as much as possible. Giving a presentation about yourself (an introduction to the group) is different from negotiating group rules and roles, and debating a point is different again. These differences should ideally be marked by structures, layouts, and graphic elements so that the richness of the communication is enhanced.

When it comes to support for the trust building process, much falls to the facilitator and the other group members. How they react to participant's contributions, the extent to which they treat them in accordance with the intention of the contributor (serious contributions are treated seriously, humorous contributions jokingly, asides as asides, confessions as confessions, and so on), will determine the course of the trust building process. Software can do little to support this process, although the availability of anonymity in the early stages may help participant's over difficult moments. Later, as Dreyfus (2001, p. 70) said, "the facilitator will need to balance the need to provide a safe environment with the need to provide a challenging one." To support this, the software should enable facilitators to manipulate the availability of anonymity. Sometimes it is appropriate, at other times it may not be. Supporting structures can go even further than this. They can provide communication modes that force participants to make choices and to defend them. Dreyfus underlined the important role of risk taking in education, and structures that support and require risk taking should be available to the facilitator and to participants. The ability, with the agreement of others, to edit or erase past contributions selectively is also important. But the qualifier is critical. When offensive contributions are made, intentionally or innocently, resolution processes may demand their eventual withdrawal. This should be possible, but only with the agreement of those involved.

To Support the Establishment of a Group Identity

The establishment of a group identity owes much to the behaviour of the facilitator and of the participants because it is bound up with the trust building process. The facilitator needs to ensure that the discussion of ground rules and communication etiquette occurs, and that the agreements reached are a real point of reference for the group. For this to be supported, a permanent posting of the ground rules should be made available so that it can be referred to and edited as the group proceeds.

To support the distribution of leadership functions, online environments first need to support the idea of leadership functions. Few do. The sorts of leadership options that can be supported include the ability to change communication modes, to redirect discussions, to institute particular teaching or decision making strategies, to start or close activities, and to create small group activities and to assign participants to them, and so on. These types of leadership functions are sometimes supported for group leaders or facilitators. To fully support the functioning of mature groups, they need to be accessible to other participants. Given the nature of online environments and the relatively clumsy facilities for handling procedural matters, most environments give the ability to delegate leadership functions, at least in the formal communication areas, to the facilitator. In the less formal areas of the environment, the leadership functions and the ability to delegate them can be given to whoever starts an activity or thread.

Clarifying or evaluative discussion is also important to group functioning. Participants need to be able to raise issues of process or seek clarification on procedures at any time. In live groups this is handled by asides and elaborate qualifiers. In online environments these sorts of discussions are ideally marked off from the direct discussions that are the focus of an activity. Sometimes they can be adequately supported by the use of a dedicated thread or area for evaluation purposes, at other times they need to be identified as contributions of a different kind within an activity or thread. This is especially important when modes of communication are in place that suppress identity or enforce other constraints. The ability to break out of a mode to contribute a query about the process or about the purpose of an activity can be important in supporting continuing participation.

To Support the Development and Maintenance of Trust

While the ultimate level of trust that can be developed in an online environ-ment may be severely constrained, nevertheless it is important to support the development of as much trust between the participants and the facilitator and among the participants, as is possible. Support for anonymity and the use of pseudonyms, controllable for each contribution if the communication mode in place allows it, can be an important facility for supporting initial contributions. Private communication between members of the group, and private sub-groups, can also be important.

As trust develops within a group, the tone of contributions and the expecta-tions of participants may diverge from the standards set at the outset. In live groups these shifts and divergences are accepted as a part of the process, and are only sometimes rendered explicit. This can occur when someone makes a procedural remark such as "Aren't we getting on well now?" or some such. Making such comments in an online environment can be more difficult, if only because the level of trust attained may not be high enough. Online environments that support clarifying and evaluative discussions can facilitate this sort of shift in tone and expectations, and the use of anonymi-ty, emoticons, and pseudonyms can also support these shifts. Ideally a broader range of emoticons, more informal discussion, greater distribution of leadership roles and functions should be supported as groups mature. The decision to shift the level of support for more intimate communication of this sort could be left to the facilitator, who exercises his or her control on behalf of the group and in the name of the further development of the group.

To Support Engrossing Conversation or Dialogue

To implement and support the engrossing discussion and dialogue necessary for absorption, online software should promote a range of behaviours and facilitate sound pedagogic and communication practices. These practices demand that:

- *All contributions be treated seriously*

    Each contribution, no matter how small or misconceived, should be recognised and validated as part of the discourse. While the timing of the synchronous classroom is lost in online groups, the range of comment is not. Simple questions and humorous asides offer learning

opportunities and can be used as effectively as lengthy well-structured arguments. It is important that all contributions be recognised and nurtured in this unfamiliar asynchronous environment. This is most easily achieved through a labelling and identification of each contribution as it occurs during discussion using date and time stamps and usernames. Users may wish to have graphic icons of themselves to enable the matching of comments with participants, and even anonymity should be noted when it occurs.

- *Clarity of communication be enhanced through formatting*

An online system should help to clarify or enhance communication by providing ways to "mark up" contributions with formatting options and spell checking. Italic, bold, and coloured text can be used to establish a set of communication conventions that reflect familiar classroom dynamics such as shouting, whispering, and directing emphasis. These formatting conventions remove barriers to clarity, including typing errors, and enable some degree of emphasis to be encoded in the otherwise plain-text comment.

- *Contributions retain their context*

As interaction proceeds serially, the software systems should record the processes as such. Although culturally determined, most participants read left-to-right and top-to-bottom. If the discourse is documented in this way, it presents a more revisable, archivable, and retrievable transcript of the process. This also ensures that contributions address the current focus of the discussion or explicitly refer back to an earlier comment. Users may wish to re-sort the transcript in reverse chronological order for convenience during long discussions, but the serial record should ensure a contribution is kept in the context in which it was made. As described, learning occurs through the description and redescription of conceptions and reflection on that process. This dynamic should be mirrored in the record of the online dialogue.

- *Participants respect each others' contributions*

As the recognition of all contributions is desirable, so participants should value and show respect for the contribution of others. An inappropriate comment in a face-to-face class would be managed within the ground rules and social processes of that group. Similarly, conven-

tions for disagreement and criticism should be negotiated and supported in the online group.

- *Contributors respond to each other, not just to the teacher(s)*

Optimum interaction within a group requires open access to all members. If contributions are always directed to or through the teacher(s), opportunities to establish relationships with others and to individualise comments are lost. While the teacher has a clear moderating role to play in the overall direction of activities within a formal class discussion, s/he should also step back and allow peer interaction to occur to enable reflection on the concepts (or misconceptions) that students maintain. Ideally, there should also be support for peer-initiated and even private discussions within the online system. Just as peer interaction (and learning) occurs outside of traditional class, so online equivalents of informal venues should be encouraged to enable these processes to occur. Virtual coffee shops and study groups provide increased opportunities to interact outside the formal structures of class.

- *Contributors respond within a time frame so that relevance and currency are enhanced*

As prolonged silences make normal interpersonal communication awkward and incoherent, continuity ("synchronised asynchronicity") is critical to the maintenance of a successful online dialogue. While most pedagogic and social processes take longer to negotiate online, inordinate delays prevent coherent engagement with the topic. Facilitators need to set parameters (e.g., overall duration of activity, frequency of contributions) prior to conduct of the discussion and the software should enable the timely notification of participants to minimise delays. Relying on asynchronous participants to regularly log-on to monitor group activity is inadequate. The software system needs to notify group members of activity, as it occurs, to encourage a level of synchronicity and to promote group dynamics.

To Support the Online Correlates of Pedagogic Techniques

To apply familiar classroom teaching strategies and techniques online, the software system is required to provide specific functionalities to combine with the general support for dialogue. These include:

- *Support for a range of communication modes*

  Learning occurs not only within the formal processes of a classroom, but also through membership of a group or community that has a common purpose (Lave & Wenger, 1990). The need to build "communities of practice" has led to the adjunct application of WWW technology as a supplement to the traditional classroom. However, when no physical classroom exists, the software supporting the group ought to provide a range of communication "registers" to encourage the ongoing community discourse at a number of levels. At the most general level, these include not only the structured classroom where formal learning occurs, but also the notice boards and informal meeting places in which those communities continue to engage with their common purpose. Within these broad registers, specific modes of communication may also need to be supported.

  These specific modes include familiar learning strategies such as discussion, debate, brainstorming, questioning, and task setting. These modes are the building blocks from which a coherent yet complex dialogue may be constructed towards a specific learning outcome. It is apparent from the list of instructional events previously described (Gagné, 1985), that particular modes are more appropriate for particular pedagogical goals (e.g., orientation, presentation, testing). When the system can provide such functionality, the learning processes it supports can move between modes in the same way the face-to-face class processes incorporate presentation, discussion, questioning, and brainstorming into an overall learning design.

- *Identification of the communication in each mode with distinct markers*

  To clearly delineate which mode is currently in use, the software systems should use visual conventions to indicate changes in modes of communication and to cue the user as to the state of the discourse. In a simple discussion, the identity of the contributor will be displayed.

However, during debate, the order and sequence of speakers for and against a proposition can be explicitly signalled using coloured or formatted text. The various roles within the group, such as teacher, student, or guest may also be delineated with visual conventions.

- *Manipulation of available parameters to create structural and temporal processes that correlate to common pedagogic techniques*

  Once available within the online learning system, the parameters used to control the interaction need to permit manipulation. Variables such as anonymity, display options, response delays, and access controls may be manipulated by both teacher and learners according to their status within the discussion or activity. Individuals, who may wish to be temporarily anonymous, or teachers who wish to allocate membership of small groups should be able to do so during activities and have the interface respond accordingly.

- *Clear marking of communication mode transitions*

  To signal changes in teaching strategy during interaction, the system should be explicit about those changes and recognise the group member responsible. In this way the physical cues and conventions of the familiar classroom (e.g., moving desks together, working in pairs, reflecting on a question) have a correlate in the online group. This is particularly important while text is the dominant medium of discourse. The text must not only communicate content but also clearly document the social and educational dynamic that is occurring.

- *Ability to control access to mode transitions so that leadership roles are supported*

  Although the classroom teacher has the ultimate responsibility for the learning environment of students, authority is often delegated during group work, student-centred activities, or during visits by guests. A software system should support the establishment of similar leadership roles and responsibilities and offer the ability to assign or re-assign such roles during learning.

- *Restriction of contribution options to those appropriate to the current mode of communication*

One difficulty in the development of software to support flexible online interaction is the trade-off between offering sufficient teaching strategies, and the availability and possible misuse of too many. The ideal is to offer a broad repertoire but only display those user options that are appropriate at any given point during the discourse. So, anonymity may be enforced during brainstorming but suppressed when arguments are invited on a proposition. Heavily structured processes such as debates would allow only the next logical speaker in the set sequence, while quizzes would withhold the display of answers until a user has attempted the items. In this way, the choice and consequent cognitive load will be better managed, leaving more cognition for learning.

- *Facility for meta-communication and informal communication at any time, regardless of the mode in use.*

It is often desirable during class, to halt proceedings temporarily while the teacher directs focus to the actual process being experienced. The conversation may be going in an unexpected direction or it may be timely to stimulate activity that has faltered. It is at these points that meta-comments about the process may prove beneficial. These draw attention away from the immediate content or purpose of the classroom activity to take a wider perspective on the overall progress of the learning. Some members may not be contributing, general misunderstandings may have arisen regarding the activity or trends may be emerging that need recognition. Such facility is also needed within online groups where the overall dynamic of the activity may not be so apparent to all group members. A carefully worded aside can clarify or stimulate if offered at the appropriate time. The online system must distinguish such comments as they occur but set them aside from the general process undertaken. Again, visual cues or formatting can be used to clearly indicate meta-comments or informal comments as they occur.

In summary, this list of desirable pedagogic and social characteristics for an online learning system indicates the complexity of the task of facilitating effective online learning. At best, most currently available systems implement or support such features poorly or not at all. The dearth in variety of teaching techniques available may lead to an unstructured series of comments without clear intention. If it is desirable that teaching methods align with both the intentions and assessment of the online course (Biggs, 1996),

software is needed to implement a range of familiar classroom techniques with minimum imposition on both teacher and learner. Online learning systems need to more openly address and support the social and pedagogical aspects of learning.

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