

Research note

Stress caused by on-line collaboration in e-learning: a developing model

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Keywords

Stress, Small to medium-sized enterprises

Abstract

On-line collaboration is becoming increasingly common in education and in organisations. It was believed that this could in itself cause stress for collaborators. An analysis of on-line learning diaries, phone interviews and questionnaires indicated that on-line collaboration could cause stress, and this stress was linked to the dependency of the collaborators on each other, and the level of their mutual trust. Stress could be designed out of on-line collaborative exercises through management of the on-line working processes. The trend in both education and management towards increased on-line working and collaboration indicates that further research needs to be carried out into finding how to reduce stress from this cause.

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Introduction

The Open University (OU) has some 220,000 students on-line using e-mail and Web sites. Many OU courses now use students in small collaborative on-line teams (e-teams or virtual teams) to produce work that is assessed as part of their course work. In this collaborative work, students are dependent on each other and cannot work solely as individuals. As part of the OU, the Open University Business School (OUBS) uses collaborative on-line work extensively in its courses with more than 30,000 students per year in over 30 countries world-wide. Collaboration on-line is increasingly a requisite of organisations sponsoring students with the OUBS. On-line collaboration is becoming part of normal organisational working practice – in particular in tele-working (working whilst on the telephone and/or connected to the Internet or an intranet).

Annual surveys of thousands of OU students by the Institute of Educational Technology show that on-line activity is one of the least popular elements of OU courses. This has also been the experience of the authors, who have become increasingly aware, over the last five years, of the possible stressful effect for students undertaking on-line collaborative activities.

Stress is now the second greatest cause of absence from work in the EU (back pain is the greatest) with over 50 per cent of absenteeism having its roots in work related stress – although this stress is lessened when tele-working from home (BT, 2002). With over 20 million tele-workers in the EU, working at a distance electronically is a rapid growth area. The stresses caused by tele-working and on-line collaboration may be similar in many areas, and this paper draws on experience in both tele-working and on-line collaborative activities. On-line collaborative activities are studied in an educational context but are becoming increasingly common in organisational working methods. Virtual teams are becoming common in education, training and work, Lipnack and Stamps (1997) define them as groups of people who interact through interdependent tasks guided by common purpose and work across space, time and organisational boundaries with links strengthened by webs of communication technologies.



Stress can be defined as “when the perceived pressure exceeds your perceived ability to cope” (Palmer *et al.*, 2003). Stress is thus always perceived; a situation is only stressful for a given individual – not for all individuals. An external viewer cannot label an experience as stressful unless the subject displays physiological symptoms of stress, there is a medical diagnosis concluding that stress is the cause, or the subject states that they have experienced stress. This means that one student may feel that a situation is “stressful” whilst another student may perceive it as “enjoyable”. This may account for why some students in our study described particular activities as stressful, where others did not.

Stress in a distance learning course, such as those dealt with in this paper, can be minimised by course design and by appropriate “acclimatisation” of the student to situations such as collaboration at the start of the course. There is little, however, in the literature on distance learning that deals with perceived stress in students. Simpson (2000) is one of the few writers to discuss stress in relation to distance learning – but only does so in the general discussion of stress management, rather than the question of designing out stress from courses. Surveys of collaborative work in Australian universities, such as that carried out by Scott *et al.* (1997), have also indicated that collaborative work can cause stress, particularly when there are time constraints.

“Acclimatisation” of students in collaboration at the start of a course can be achieved either by simple collaborative tasks (as exemplified at the start of the 18-day course detailed below) or by explaining methods of interaction during collaboration that will avoid stress. An example of the latter is the empathy templates (Zimmer, 1995) tested in the Open University by Dr Bob Zimmer on the introductory technology course XT001 (Alexander, 1995). Zimmer sees a major problem in collaborative learning as “competitive opposition or withdrawal: fight-or-flight. In computer-supported collaborative learning-at-a-distance, the problem is worse”. This competing or withdrawal, rather than collaborating, can cause students to abandon their course. Zimmer developed a set of protocols called empathy templates to encourage creative co-operation on-line. Examples:

- Here’s my own experience and what I want to do:
- [Name], I’d welcome knowing what you think I mean, to be sure my feelings are accepted.
- [Name], tell me what you want to do here, so that I can see your point of view.
- [Name], what I think you mean in essence is... My own view differs in this way...

Where collaborative work on-line is linked to assessment there seems to be a greater problem and more perception of stress. A student quoted by McConnell (2000) says about this “It was obvious that a number of the others were very concerned. Some of the suggestions made me feel very uneasy and the insecurity seemed to spread through the group”. McConnell feels that computer supported co-operative learning (CSCL) causes “less sense of anxiety” than face-to-face collaboration, but at the same time, when considering rejoining a CSCL group after an absence he describes how the “psychological and emotional stress of rejoining is high” compared to face-to-face groups. Hughes *et al.* (2002) found that in collaboration conflicts between peers forced them to defend their positions.

Our experience is that CSCL can be more stressful than face-to-face unless suitable precautions are taken to minimise stressors. There has to be a balance between positive student stress and student motivation (Wyeth, 1997) – what one student sees as exciting and motivational, another may see as stressful.

Online working, for example making use of available resources on the Internet, opens up unprecedented opportunities for people to access information. Searching for information is known as information “pull” and is controlled by the user; other examples are accessing bulletin boards or an intranet (Haywood, 1998). There is also information “push”, for example phone calls, unfiltered e-mail and CSCL conferencing. This needs to be managed if you are not to experience information overload as this can be stressful. Mehrabian (1977 – quoted in Hiltz and Turoff, 1985) feels that some students are screeners and can reduce information overload by disregarding low-priority inputs, however, this disregard for the messages of other students can, in our view, cause the authors stress since disregard for their messages can be perceived as a disregard for

their self esteem (Mason and Kaye, 1989), so care needs to be taken.

Collaborative distance learning is likely to increase as an educational tool (Collis, 1996) as learning with other students, for example through explaining your own ideas and building on those of others, leads to an increase in group knowledge (Webb, 1982). The use of the on-line environment for collaborative learning is particularly appropriate because it emphasises group interaction and encourages involvement (Gunawardena *et al.*, 2001). However, some educators are realising that collaboration is stressful, and thus the ability of students to handle stress and frustration is an essential skill (Palloff and Pratt, 1999).

Background

In 2000, drawing from experience of studying 2,000 MBA students in on-line collaborative activities, two barriers to fully functional teleworking were proposed (Salmon *et al.*, 2000). The two barriers were “technical aspects” and “collaboration” and it was found that both caused stress and had to be overcome for fully functional teleworking (Figure 1).

A third, major barrier for virtual team working is lack of trust (Walther, 1992; Lipnack and Stamps, 1997; Haywood, 1998; Jarvenpaa and Leidner, 1999; Cohen and Gibson, 2003), where trust is “a confidence in someone’s competence and his or her commitment to a goal” (Handy, 1995). Hall feels that trust is more of a problem on-line (Hall, 1999).

In the Open University we recognise the stresses that can be derived from technical difficulties and try to minimise them through the use of induction courses and helpdesks.

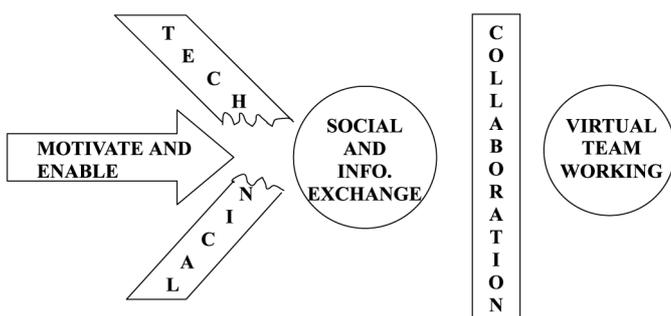
Traditionally, stress caused by online collaboration has been considered less of an issue, so in order to ascertain to what degree it affects students, a scoping study was carried out during the winter of 2002/2003. Students from two groups taking part in the one year long diploma in management course completed questionnaires to establish how they felt about their regular, course-based, online group activities. Students from the short, 18-day online management challenge course were also asked about their experiences whilst working online. The results, as well as showing that some students definitely do feel stressed when working online, revealed some other interesting findings. This has led to the development of a proposed model to indicate the main factors in on-line collaboration stress.

The one-year groups

The students in the one-year groups were studying for a management diploma on a year long distance learning course run by the Open University Business School. The course models supported distance learning, with students having paper-based materials, online group activities, online support and the option of face-to-face or online tutorials.

Two groups, of about 15 students each, were questioned with a view to comparing them with respect to their previous experience of working online. One group was made up of people from a wide variety of backgrounds including both the public and private sector. These students had little experience of e-mail and did not know each other prior to the beginning of the course. The second group comprised students who were all employed by the same organisation. They used e-mail extensively and already knew each other in the work environment.

Figure 1 Barriers to teleworking



Methodology

Students from each group were given a form that asked them to select from a list of options describing their on-line collaboration. The choices were:

- fun;
- worrying;
- stressful;
- helpful;

- not relevant;
- slowed me down;
- enhanced my learning;
- other(s) please write below.

Those who ticked the “stressful” box were then asked “If you found the on-line experience stressful, it would be most helpful if you could write a few sentences to say why this was so”. The results were analysed by keyword for “stress”, “collaboration”, “colleagues” etc., as well as by concepts such as “letting people down”, “time pressure”, “access difficulty” etc. The results were charted, with separate results for the two student groups that could be compared.

Findings

The results of the questionnaire showed that some students from both groups described their on-line collaboration work as “stressful”, however, this was 40 per cent of the students from the first group, with little prior experience of online working, and 53 per cent of the more experienced students from the second group.

Analysis of the reasons given for feeling stress indicated that it was mainly experienced because the student felt responsible for playing a part in the other students’ learning and performance. If a student was late in making a contribution, or made a contribution of poor quality, then this let down other members of the group; the other members might then lose marks for their assignment (part of the formal course assessment). The students clearly felt high dependency in the collaboration.

A secondary reason was frustration caused by being dependent on others’ contributions; a student could not submit an assignment for assessment without input from other group members. If a contributor was a week late in posting a contribution, then the other students would be delayed a week in their assignment submission. This again indicated high dependency on each other.

The reason for the higher percentage of students from the same corporate employer experiencing stress appeared to be that they were all work colleagues and therefore even more concerned about letting each other down in collaborative on-line activities. Disappointing a colleague in the education setting could spill over into the work setting.

Several students also deliberately held back on their own contributions beyond the specified end date (which lost them marks) so as to be able to include, at a later date, contributions from a colleague student who had workload problems, and so help them pass their assignment. This indicated a dependency that extended outside the learning forum into the workplace. Indeed it started in the workplace and dependency in the learning environment may have been secondary.

The 18-day groups

The students on the 18-day course were studying as part of a management certificate programme run by the Open University Business School. The course is the online equivalent of a two-day residential school that is a compulsory part of the certificate programme, although no assessment marks are allocated for it. This follows a similar supported distance learning model, with students being provided with paper-based materials, online group activities and online support. The course is run four times a year with between 30 and 80 students “attending”.

For this course, the students were familiar with working on-line as each one had already undertaken most of the certificate program. This meant that they had already been required to work online in tutor groups, involving online conferencing for disseminating information and discussing ideas. The discussions would have been amongst students and with the tutor for their marked assignments.

Because of the short length of the course and the need to get the groups working together quickly, the course includes an introductory activity that enables students to start collaborating and building trust with each other early on. They then break into sub-groups and take part in a series of other activities, periodically returning to their main tutor group to reflect on their learning. During this time they are also encouraged to complete a personal learning diary noting what they have learned each day, for personal reflection and to draw on when contributing to the group reflection at the end of each activity.

Methodology

The learning diaries were produced on a Web site that could be accessed by students (their own entry only) tutors (all their student group entries) and specified administrators including the researchers (all student entries). The learning diaries for 200 students (the four intakes during 2002) were extracted and converted to Word format. They were then searched for any entry that used the word "stress". In addition, each diary entry was scanned visually for phrases that might indicate stress such as "I was very upset by ...". We did not use predetermined phrases since stress is not something identified by an external viewer, but rather something perceived by the subject (Palmer *et al.*, 2003). Each entry that could indicate stress was noted.

Following on from this a survey was carried out in January 2003 using an online questionnaire for a course of around 35 students. The students were e-mailed at the start of the course and asked if they would complete an online questionnaire, accessible via a link within the e-mail. Those that completed the first questionnaire were subsequently e-mailed again to complete a second, short questionnaire that included a request to leave a telephone number if they did not mind taking part in a short telephone questionnaire afterwards. A total of 20 students completed the initial questionnaire, and of these, seven agreed to the follow-up telephone interview to provide further details.

Findings

The learning diaries for the 200 students indicated that stress had been caused due to technical problems for five students, and stress had been caused by on-line activities for two students. The diaries for another 20 students indicated some frustration with the early attempts to collaborate together, for a variety of reasons.

The learning diaries also indicated the introductory activity had facilitated the groups in on-line collaboration. The activity consisted of guessing which one of three statements made by a tutor was true (e.g. "I am an experienced glider pilot, I have seven children and I have written a book on

moths"). These statements were discussed by students in groups of three to six, who then made a collaborative decision. Students were able to judge whether their fellow students kept to time schedules and made worthwhile contributions. This enabled them to make a "trust" judgement in a situation of minimal interdependency; that is the students were not relying on each other for output that would then be used to judge their own efforts. For later activities the students were more co-dependent as the group work relied on each group member making a contribution to the final outcome.

The students surveyed using the online questionnaires suffered some unusual system problems and this showed in their responses, where most students had found the technical problems frustrating. However, the ramifications from this went further than a lack of access to other group members: in one instance some students turned to using individual e-mails, but not all group members were copied in on these. The result was frustration and stress for one student as they felt left out of the decision-making loop. This may reflect the findings of Duarte and Snyder (1999) where, if group members perceive someone as being less competent than themselves, they can be left out of the one-to-one communication between high performers. In this instance there was low trust of some students' ability to contribute, when they were faced with a high dependency on those who helped to complete the task.

Such actions can be the result of hastily formed opinions that may not be correct. The reason for this is that when we work online we do not have many cues and have to draw conclusions based on little evidence. There are two key influences that affect this: first, the tendency to form opinions based on past experiences of other, seemingly similar people (Jackson *et al.*, 1992; Wallace, 1999); and second, more importantly, the pressure to form opinions quickly because of the short space of time available for getting to know other group members (Walther, 1996; Wallace, 1999). These can result in people having quite inaccurate perceptions of their team-mates in the short term.

There were also other symptoms of stress mainly relating to the perception of unequal contributions and the issues of "silence" or lack of response. The students were aware

that although their contribution was not given a grade, they had to demonstrate adequate participation in order to “pass” this learning event. Students seemed to respond either pragmatically, by assuming that individually what they were doing was enough, or in a more global manner, where they felt that the efforts of the group reflected their own contribution and if a group did not seem to be performing they felt obliged to increase their own work load to try to compensate. These latter inevitably felt some additional stress.

Despite their experience of working online, students still found the process of working asynchronously to be difficult; the need to wait for replies before moving on and the lack of response to some postings proved to be consistent issues. Again, these are recognized problems, as Gunawardena *et al.* (2001) have found, delays in replying results in a “... lack of immediate feedback which makes it difficult to determine if the receiver has understood the message”. Gunawardena also identified “communication anxiety” (Feenberg, 1987) which is the feeling experienced when one’s message is not answered or referenced, and this was felt by some of the students.

Finally, the timing of the event also had some effect on stress levels as it coincided with students’ revision period for an exam.

Stress caused by on-line collaboration

The results of the scoping study indicate a potential for stress caused by on-line collaboration whether in e-learning or collaborating on-line in the work environment. Little existing research appears to have been done in this area. The term “cyberstress” was first used by Crouch and Montecino (1997) and is defined as “asynchronous anxiety”. This was, however, concerning teaching on-line rather than specifically group collaborative activities on-line.

“Technostress” was coined in 1988 by Gardner and Schermerhorn (1988) with specific reference to e-mails and was studied by Duxbury (Duxbery *et al.*, 1987) who confirmed that stress can arise through e-mail usage.

It would appear that there is an additional kind of stress caused by on-line collaboration

– “e-team stress” resulting from a desire not to let colleagues in the cyber-team down. Stress seems to be caused by the relationship of dependency and trust between individuals. This is despite students who choose to take Web-based courses being considered to have taken up these courses as a result of being specifically attracted to distance-learning as an opportunity to learn without having to react with others (Jones and Martinez, 2001) (Figure 2).

A developing model of on-line stress

Part of the reason for the slow build up of trust when working online is the lack of “social presence”, that is “the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships” (Short *et al.*, 1976). Different media can affect levels of social presence (Daft and Lengel, 1986; Walther, 1992; Burke, 1999), with rich media, such as video, offering more visual cues and thus enhancing social presence, and lean media, such as pure online text, offering far fewer opportunities for developing social presence. However, with virtual teams trying to gain group consensus, Yoo and Alvai (2001) have found that task participation is even more important than social presence. The tangible act of taking part in a task does a lot to develop trust amongst team members.

Stress can also be caused by other factors such as technical problems (although these tend to occur just at the start), context (for example timing, when there are other equally pressing demands on their time) and poor communications (where students lack the necessary experience or skills to communicate adequately online).

Figure 2 Trust-dependency matrix

	High		
		Stress Very Likely	Stress Possible
Dependency		Stress Unlikely	Stress Very Unlikely
	Low		High
			Trust

Designing out stress

Many of these stress factors can be overcome, or reduced, through management of the online working process. A number of authors have compiled lists of principles for working in online teams, such as Haywood's (1998) four principles for communicating successfully:

- (1) Standards for availability and acknowledgement are defined and respected.
- (2) The team members replace lost context in their communication.
- (3) The team members regularly use synchronous communication.
- (4) Senders take responsibility for prioritizing communication.

And specifically in a learning context, Palloff and Pratt (1999) suggest for successful collaborative learning:

- formulate a shared goal for learning;
- negotiate guidelines;
- use problems, interests and experiences as springboards for learning;
- facilitate dialogue as inquiry;
- facilitate inter-group collaboration;
- facilitate resource sharing;
- facilitate collaborative writing.

However, our initial studies indicate that such principles do not place enough emphasis on the importance of establishing trust at an early stage (before collaborative on-line activities commence) and engendering a "safe" learning culture where mistakes are accepted. As McConnell (2000) says "if learners have a large degree of trust in each other, then challenges will become part of the culture of the group and will be seen as productive". It would seem essential before setting up any formal on-line collaboration, to arrange for the participants to engage in some activity that will enable them to begin to establish trust. This could take many forms – even a series of simple introductory messages and comments will enable participants to start forming relationships and evaluating each other's abilities to collaborate in a timely and dependable manner.

Putting up personal Web pages early on, including photographs and a short resumé, would help to establish social presence that in turn helps to develop trust. Also developing learning contracts can contribute to establishing trust and building a sense of community among group members (Murphy

et al., 2000). The learning contract is developed through group discussions to agree on processes such as how decisions will be made (consensus, majority voting etc.), what contingency plans are for emergencies, membership roles including leadership, etc.

The use of empathy when dealing with the contributions of others is shown to minimise opposition or withdrawal. The fight or flight stress identified by Zimmer (1995), relating to on-line collaboration, can start to be addressed through encouraging group members to exercise empathy in their communications with each other. Using greater care with communications, paying attention to content and responding appropriately can be shown to minimise opposition and reduce withdrawal.

Finally, students should be briefed on how to communicate effectively online, including aspects such as netiquette. The rules of netiquette are still evolving but many believe that people should be cautious in their communications, avoiding being rude and being aware that aspects such as humour can be misinterpreted without normal face-to-face clues such as a smile, or the tone of voice. One way to overcome this latter situation is to include emoticons, that is textual representations of social aspects – such as a smiley – to indicate humour, or an acronym – such as IMOH (in my humble opinion). These help to temper what can otherwise be misconstrued as brash statements. However, care needs to be taken not to overuse netiquette as this has been found to constrain group progress (Cox *et al.*, 2000), where the "storming" stage of group development (Tuckman, 1965) is never able to get underway properly as everyone is being too polite to establish group norms.

Conclusions

Stress is perceived by the person being stressed, it has no external validation unless severe medical symptoms result. If a person expresses the feeling that they have been "stressed" by online collaboration then we must accept this as so.

The trend in both education and management towards increased on-line working and collaboration indicates that further research needs to be carried out into finding how to reduce stress from this cause.

This is particularly apposite as both teaching and managing are already in the category of occupations reporting the highest stress levels (HSE, 2000).

We believe that stress can be caused by on-line collaboration; this may be caused by a combination of factors relating to working online, from cyber-stress, to techno-stress, but can also be caused more specifically by pressures related to working within a group online. We have chosen to call this “e-team stress” and believe that it is due to two major components – dependency and trust.

People working together in online teams can find themselves in a situation where they do not feel that they “know” other members in terms of their skills, knowledge or reliability. This is often due to the increased time it takes to build relationships online, and the inevitable lack of trust that exists whilst relationships are still forming. When there is the additional constraint of a tight deadline, participants may opt to form hasty opinions of others based on stereotypes and previous experiences, which can often reduce trust within the group.

A lack of trust makes working together more difficult, but this is exacerbated when there is a dependency on others to perform in order to satisfy your own goals, for example when each team member is measured on group, rather than individual, performance. Thus the dual factors of trust and dependency can affect online working.

The degree to which an online group activity may cause stress can be determined by using the online stress model we have developed. Once the possibility of stress has been identified, actions can be taken, such as adopting suitable introductory activities, which can significantly reduce stress in the ensuing collaborations.

We believe that further research is needed to reduce stress through the use of activities at the start of on-line collaboration, and that examination of perceived stressors in collaborative activities can lead to improved collaboration design. We are now carrying out such research.

Future work

The trust-dependency model is being refined at present and introductory activities will be trialled with a further “one year” group of

students to see if “stress” can be brought down below 40 per cent. The results should be ready by January 2004.

Since e-teams are on the increase in organisations and in research activities, methods of limiting stress need to be researched further; collaboration with other researchers in this area would be welcomed.

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