Is an “Effective” Online Group Really Effective?

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Abstract

The aim of this paper is to explore the real value of effectiveness and success of online collaborative learning teams by studying and analysing their collaborative behaviour with respect to their problem solving performance. To that end, we focus on online learning groups that are engaged in a problem solving situation which ends up with successful group learning outcomes; the final product they deliver as a group is judged satisfactory. But can we safely admit that such a group was really effective? In other words, can we claim that each individual member achieved the learning objectives set or obtained the same benefit as the others? Or, did the group manage a well-balanced participation and contribution of all its members? This work presents an integrated approach that focuses on analysing the participatory attitudes of group members in collaborative learning activities (group functioning) and their contributions to the problem solving (task performance). This allows us to assess the real effectiveness of online collaborative learning teams by examining and measuring the skills that should characterise an effective collaborative learning team. In particular, we explore the interaction behaviour of different collaborative groups that apparently proved to be effective as regards their performance at problem solving level. The ultimate aim of our work is to provide both a better understanding of group interaction and the means to improve the effectiveness of online learning groups as well as to enhance individual member learning and success.

Keywords: Computer Supported Collaborative Learning, Analysis of collaborative interactions, Case Studies Evaluation
1. Introduction

Our work relies on real, long-term, complex, on-line collaborative problem-solving situations that form part of three distance learning undergraduate courses (Daradoumis, et al., 2001). It involves a significant number of tutors and students collaborating, mainly asynchronously, and participating in a variety of activities.

This work forms part of an ongoing research that aims to provide an in-depth analysis of the collaborative interactions and performance of online learning teams. The first step toward this analysis is the definition of an effective evaluation approach of the collaborative learning process, i.e., the establishment of clear evaluation criteria to assess the interaction behaviour (group functioning) and the learning outcomes (task performance) of the group and its individual members (Daradoumis, et al., 2003a). Based on this we proceeded to study the relationship between group functioning and task performance and to examine how each element affects and conditions the other (Daradoumis, et al., 2003b).

Research in Computer-Supported Collaborative Learning (CSCL) explored the types of problems that may result from insufficient group interaction and support (see, Kiesler & Sproull, 1987; Dobson & McCracken, 1997; Cameron, et al., 1999; Thomas, 2000).

As a result, several research approaches have been developed for observing, analysing and assessing collaborative learning interactions as well as for developing methods and tools that provide guidance and support to on-line learning teams (see, Nurmela, et al., 1999; Barros and Verdejo, 2000; Soller, 2001; Jerman 2002; Martinez, et al., 2002; Jonassen and Rimedez, 2002; Reiser, 2002; Zumbach, et al., 2002).

Common to the most of these approaches is their development and testing on a rather small sample of on-line learning groups on an experimental basis, focusing on the analysis of the participatory and social aspects of collaborative learning processes, or exploring the characteristics of effective collaborative learning teams.

In this paper, we focus on analysing the interaction behaviour and performance of the so called “effective learning teams” in a real collaborative learning situation, with the aim of assessing the true implications of this effectiveness; that is, find out whether the state of effectiveness was equally reached by each group member as concerns both learning and collaboration.

2. Research method

This research describes an integrated approach that derives its theoretical basis from existing collaborative learning theories and models. One of these, the Time, Interaction and Performance theory (TIP) – McGrath, 1991 – states that successful groups always undertake three functions at the same time: (i) the first is working on a common task together (production function); (ii) the second is achieving and facilitating a quality interaction and communication among group members (group well-being); (iii) the third is providing effective help to the other members when needed (member support).

The above functions are further exemplified by the Collaborative Learning Model of Soller (2001) that describes potential characteristics of effective collaborative learning teams, classified into five categories: (i) participation (active interaction), (ii) social grounding (well-balanced interaction, clear roles and natural role switches), (iii) active learning conversation skills (knowing when and how to question, inform and motivate one’s teammates, how to mediate and facilitate task management, etc.), (iv) performance analysis and group processing (promote group processing by evaluating students’ individual and group performance), and (v) promotive interaction (promote effective collaboration through support).

This research takes all previous work into account to define adequate criteria that measure the teamwork skills and consequently the effectiveness of an online learning team at two levels: problem solving (PS) or task performance and group functioning (GF) or interaction behaviour and learning process management. These evaluation criteria are the following (see (Daradoumis, et al., 2003a) for more details):

PS1 The students’ contributing behaviour during task realisation (production function and use of active learning skills).
GF1 Active participation behaviour.
GF2 Social grounding skills (well-balanced contributions and role playing).
GF3 Active learning interaction or processing skills that monitor and facilitate the group’s well-being function.

To carry out this study we gathered real data (daily log files) from two collaborative problem solving experiences run over a period of four months in two undergraduate distance courses. One of these courses, “Applying information technology to business”, involved 90 students and 2 tutors, having 15 groups of 6 members. The other course, “Techniques of software development”, involved 44 students and 1 tutor having 11 groups of 4 members.

All practices were carried out mostly asynchronously; synchronous interaction occurred in few specific cases of decision-making. All asynchronous collaborative interactions took place on the Basic Support for Cooperative Work (BSCW) system, a groupware tool that enables asynchronous (as well as synchronous) collaboration over the web (Bentley, et al., 1997). BSCW offers shared workspaces that groups can use to store, manage, jointly edit and share documents, realise threaded discussions, use an agenda, contact member information, etc.

To perform our analysis we chose the six more successful groups from each course and we used the above criteria as parameters to measure their real effectiveness as concerns task performance and group functioning. Due to space restrictions, we discuss the results obtained by the analysis of one of the most representative cases; however, this allows us to draw interesting conclusions about how to assess and improve group effectiveness.

3. Analysing and assessing group effectiveness

The analysis of the BSCW log files is based on four generic types of events (or actions) that BSCW generates and relates to an object: (a) Create events (when new objects are created); (b) Change events (when an object is edited, a new document version is added, meta-information on objects is modified); (c) Read events (when a workspace member reads a document); (d) Move events (when an existing object is copied, cut, etc.).

In this study we take three major objects into account: folder (related to task and workspace management), document (related to task realisation and learning), and note(s) (related to communication processing). The rest, which are considered minor objects, are grouped into a class called others and include, among others, concepts such as URL, Appointment, User, or Group Agenda.

The create and change actions basically indicate active involvement to problem-solving and knowledge building. Hence, we call them active learning contributions. The read and move actions indicate a receptive and organisational behaviour respectively. We call the latter information processing contributions.

The group analysed was one that had proved to be very effective at the end of the collaborative problem solving practice since it was evaluated with a global A mark by the tutor at both problem solving and group functioning level. We call this group, Group A.

We proceed now to check the real value of effectiveness and success of this group by examining the internal working of the group in more detail in terms of the actions performed by each member and the evaluation criteria defined above.

3.1 Setting the bases for the analysis

We consider that a learning group is really effective if it meets all the evaluation criteria satisfactorily.

A group achieves criterion GF1 if its members are actively involved in the three actions: create, change and read. We decided not to measure action move since it focuses more on workspace processing tasks and thus it is not directly related to active learning participation.

Instead, we consider all four actions in order to measure the accomplishment of criterion GF2, since we examine whether all members participated equally at all levels of contribution, so that the group interaction is well-balanced.

The degree of achievement of criterion GF3 is more subtle and difficult to determine in a quantitative way, so the measurement of this criterion is rather approximate and subjective. A further in-depth analysis through qualitative means and sources is needed to support a more principled exploration of this criterion. In this study, the achievement of the criterion GF3 is measured by the following actions along with their following associated objects:
• Create Folder: indicates task and workspace management.
• Create Others: involves task planning (i.e., planning and preparation of virtual meetings, or group agenda). That is, both create actions are related to task processing.
• Move “all objects”: describes the workspace organisation and maintenance (workspace processing).
• Change Document: it manifests either active learning contribution (if it is related to the specific actions edit, revise or version) or facilitation of knowledge processing (if it is related to actions like rate, rename, replace, or change document information). For the sake of simplicity, in this study we will consider that Change Document is related only to active learning contribution.
• Change Note/Folder/Other: it supports knowledge processing (edit, rate, rename, replace or change description) rather than contributing to the learning task.

In sum, the above create, move and change actions are clearly related to the criterion GF3, since they represent mainly processing and secondly active learning interaction skills that monitor and facilitate the group’s well-being function.

Finally, in order to examine whether criterion PS1 is satisfied, we need to dispose of a detailed register of all the actions performed by each member and the associated objects each action refers to.

3.2 Analysis of the Interaction behaviour of an “effective” Group

First, we examine whether this group meets criterion GF1 (active participation behaviour). Figure 1 shows the percentage of the create, change and read actions performed by each member.

Clearly, there are two members (crl and car) that do not show an active participation behaviour as the other members (except in the case of the read action), that is, the group did not achieve that all its members participate in the learning process in the same way.

As regards the accomplishment of criterion GF2 (well-balanced contributions and role playing), Figure 2 shows an unbalanced behaviour of the group regarding all actions; only the read action seems to be well enough balanced for all the members.

Indeed, there is a member (fer) who leads group contributions at all action levels (except the change action which is leaded by the second active member, fgw).

Leaders are a quite frequent phenomenon in collaborative groups; this may result that some members be left at a secondary level. In this case, the

![Figure 1. Active participation behaviour of group members](image)

![Figure 2. Contributions performed by group members](image)
excessive activity of member fer as well as the insufficient contributions of members crl and car, give an unbalanced image of the collaborative interaction performed within the group.

Moreover, each member was assigned a specific role which is that of coordinating a particular phase of the problem solving situation. Coordination of a phase means watching for the correct participatory and contributory activity of all members in order to accomplish the specific goals and tasks set in that phase. At the end of the phase, the coordinator is the person who delivers the final product resulted from the group's collaborative work and a the group's self evaluation report about group functioning.

In addition, the coordinator has responsibilities related to task and workspace processing; that is, he/she has to care about task planning and management as well as about the workspace organisation and maintenance during the whole phase. This particular aspect is assessed though criterion GF3 (which explores the processing skills members should have in order to monitor and facilitate the group’s well-being function). This criterion also involves the evaluation of skills such as knowledge processing and active learning interaction that contribute to improve the quality of interaction among group members.

In order to be able to figure out whether a group achieved a good balance both of active learning interaction and processing skills by all its members, we need to have a detailed description of all actions performed by each member and also which objects each action is related to.

Table 1 presents a detailed description of the four generic actions and the percentage of objects (document, notes folder, and others) each member contributed with respect to the other members. For instance, the member crl contributed to the creation of the 6.5% of all the documents produced in the group.

The analysis of the data provided in Table 1, allow us to draw the following conclusions regarding the achievement of criterion GF3 by group A.

Table 1: Percentage of objects created, read, modified, or moved by each member

<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>MEMBERS</th>
<th>crl</th>
<th>car</th>
<th>fer</th>
<th>fgu</th>
<th>jur</th>
<th>san</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>Document</td>
<td>6.5</td>
<td>15.45</td>
<td>38.21</td>
<td>14.63</td>
<td>13.82</td>
<td>11.38</td>
</tr>
<tr>
<td></td>
<td>Note/s</td>
<td>10.05</td>
<td>10.32</td>
<td>20.63</td>
<td>21.69</td>
<td>18.78</td>
<td>18.51</td>
</tr>
<tr>
<td></td>
<td>Folder</td>
<td>17.65</td>
<td>5.88</td>
<td>52.94</td>
<td>5.88</td>
<td>5.88</td>
<td>11.76</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>40</td>
<td>26.67</td>
<td>33.33</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Read</td>
<td>Document</td>
<td>12.36</td>
<td>16.30</td>
<td>20.90</td>
<td>18.16</td>
<td>15.54</td>
<td>16.74</td>
</tr>
<tr>
<td></td>
<td>Note/s</td>
<td>14.07</td>
<td>14.07</td>
<td>18.98</td>
<td>17.49</td>
<td>17.76</td>
<td>17.61</td>
</tr>
<tr>
<td>Change</td>
<td>Document</td>
<td>6.42</td>
<td>8.02</td>
<td>25.67</td>
<td>28.89</td>
<td>13.90</td>
<td>17.11</td>
</tr>
<tr>
<td></td>
<td>Note/s</td>
<td>0</td>
<td>0</td>
<td>20.83</td>
<td>37.50</td>
<td>33.33</td>
<td>8.33</td>
</tr>
<tr>
<td></td>
<td>Folder</td>
<td>0</td>
<td>0</td>
<td>66.67</td>
<td>0</td>
<td>0</td>
<td>33.33</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Move</td>
<td>Document</td>
<td>1.23</td>
<td>3.70</td>
<td>39.50</td>
<td>8.64</td>
<td>4.94</td>
<td>41.97</td>
</tr>
<tr>
<td></td>
<td>Note/s</td>
<td>6.67</td>
<td>13.33</td>
<td>40</td>
<td>13.33</td>
<td>26.67</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Folder</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>33.33</td>
<td>0</td>
<td>66.67</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
As regards task processing (create folder/others), we observe that there is one member (fer) who distinguishes among the others, since he is actively involved in task processing labour. To that end, two other members (crl and car) also tried to provide some support. On the contrary, the other three members contributed very little.

As for workspace processing (which concerns all move actions), we notice that there is just one member (again, this member is fer) who contributes the most for all objects; that is, member fer is the one who cared more for organising and maintaining the group’s workspace.

Regarding active learning contribution skills which are related to the members’ involvement to revising, editing, and creating new document versions (change document), there are only two active members (fer again, and fgu) who contributed more to this aspect, whereas two others (jur and san) provided some support. Instead, the rest two members were involved very little to this task.

Another aspect that supports a more effective collaboration among group members is related to adding appropriate meta-information to an object so that to facilitate and promote better understanding of the objects the members share in the group workspace and thus better interaction. That is, group members should show specific knowledge processing skills (like edit, rate, rename, replace or change description) which are captured by the action change document description/note/folder/others. Analysing the results of this action in Table 1, we figure out that there two members (crl and car) who did not contribute at all to this aspect.

In sum, group A does not meet criterion GF3 either, that is, group members did not contribute equally to task, workspace and knowledge processing; in fact, there has been one member (fer) who carried the most of the burden of responsibility for this particular collaboration aspect.

Finally, as for the criterion PS1 (the members contributing behaviour during task realisation), the data shown in Table 1 allow us to sufficiently analyse the production function and the use of active learning skills of the group members through the actions: create document/notes, change document, and read document/notes.

Again, we observe that there are important differences regarding the contribution behaviour of each member during task realisation. As before, member fer contributes a lot to all the actions mentioned; especially he proved to be the most active member in creating documents (he created more than 38% of all documents produced in the group workspace, whereas the rest of the members did not exceed the 15%). This important difference between one member and the rest, especially in a task that is closely related to the production function of the group, clearly shows the leading initiative hold by this member in task realisation.

4. Reflections of the analysis performed

As a result, the group failed to meet the evaluation criteria set in order to assess the real effectiveness of the group both at group functioning and task performance levels. Our analysis of the internal workings of the group as regards the types of actions performed by each member and the types of objects each member participated shows a specific pattern of interaction attitude and performance exhibited by this group. We call this pattern, nuclear collaborative behaviour. It is characterised by a nuclear set of members (one or two) who take over the runnings of the group (and consequently the most of the initiatives and responsibilities of the tasks to be carried out), whereas the rest of the members act and behave as satellites since they are involved in and contribute to the task realisation and group functioning at a secondary level.

As shown from this analysis, this pattern of collaboration does not favour neither enhances equal participation, efficient collaboration, learning benefits and successful learning outcomes by all group members. In other words, despite the apparent effectiveness the group shows during and at the end of the collaborative process, this analysis revealed an insufficient collaborative behaviour and involvement by some of its members. Contrasting this with the multivariate activity of the leading members we consider that the attitude of the latter (probably unintentionally) did not help in making the other members get more involvement and more contributions and thus gain a better collaboration as a learning team.

This makes evident that the evaluation of the group effectiveness which concerns the quality of group
interaction, the skills of individual members and the completion of collaborative aspects that characterise an effective collaborative team is a complex process. As a consequence, the point is to make the tutor, as well as the group members themselves, be well aware of an incorrect or insufficient collaborative pattern developed in the internal workings of the group and give them the chance to revise and remedy it the sooner the possible.

We certainly need then to develop better and more intuitive support means to help both the members to figure out their deficiencies and decide what behaviours to change (or maintain) and the tutor to assess and promote better collaboration. This is an eminent goal of our research.

5. Conclusions and future work

The analysis performed in this work, though limited at this stage, allowed us to draw interesting results as regards the effectiveness of a collaborative learning team. In particular, it demonstrated that an apparently effective learning group was not really successful in accomplishing a variety of evaluation criteria set for assessing the participatory attitudes and task contributions of its members.

A further detailed analysis will enable us to better determine the group behaviour and individual attitudes of its members in the shared workspace, as well as to identify both interaction problem areas and specific features that characterise any given group, as far as task achievement and good functioning (interaction quality and social support) concerns.

Our analysis can serve as a starting point to identify the weaknesses (types of problems and needs that may arise in a collaborative learning situation), and the strengths (the specific characteristics or patterns of effective collaboration) exhibited in a collaborative learning team.

The study performed thus far strongly suggests that further quantitative and qualitative analysis may be promising in this regard. The next steps involve gathering and analysing more data to strengthen the claims made and probably generalising these claims to a methodological framework for effective collaborative learning.

Acknowledgments

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6. References


