

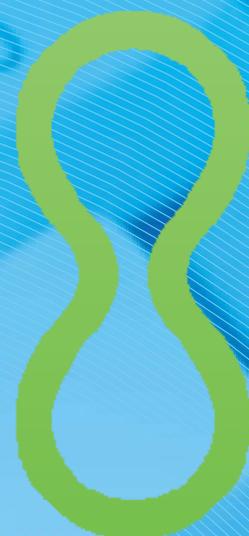
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Time factor in e-learning and assessment

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Margarida Romero*

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Time factor in e-learning and assessment

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INTRODUCTION

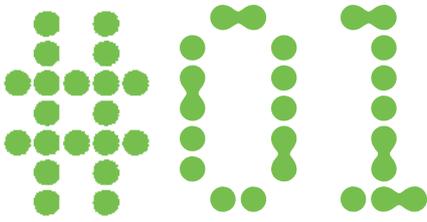
Time is probably one of the most polysemous words in education. In e-learning, characterization of the time factor is particularly relevant because of the high level of flexibility in the teaching and learning times, and the resulting responsibility of the e-learners in regulating their learning times. This volume intends to make progress in the characterization of the time factor in e-learning by analyzing its impact on the assessment processes. This leads us to consider two kinds of times. The first type is the evaluation of students' time during the process of their learning activities. The work of Carreras and Valax introduces the concept of time patterns as regular structures of time and a methodology for the study of time flexibility in the context of distance work and learning, discussing its implications in both professional and academic contexts. Also, in the context of analysis of the time patterns, Demeure and Romero analyze a long-term Computer Supported Collaborative Learning (CSCL) activity in order to identify the different levels of time patterns of the students participating in a collaborative writing task performed on a wiki page. Alvarez, Lopez & Hernandez study the learners' interactions in a forum considering time as the basis of the interaction pattern analysis.

The second type of time we consider is the time factor impact in revising and improving collaborative written products. In this perspective, the main objective of analysis is to characterize the impact of the delay and pace of the feedback in the collaborative learning process. In this perspective, Espasa analyzes the relationship between the time dimension and the assessment dimension, highlighting the impact of feedback according to the moment when the feedback is introduced in the collaborative learning process. Guasch, Espasa & Alvarez close this volume with an analysis of the impact of feedback in a collaborative writing activity in which they evaluate the writing process improvements when students receive regular feedback inviting them to interact in revising the written product.

Throughout this volume the time factor appears to be a key dimension in the assessment of long term interactions through the use of time patterns and time flexibility measurements, but also an essential factor in the understanding of the impact of assessment and feedback times in the collaborative learning process.

Margarida Romero





Demeure, V., Romero, M. & Lambropoulos, N. (2010). Assessment of e-learners' temporal patterns in an online collaborative writing task. *eLC Research Paper Series, 1*, 5-16.



ASSESSMENT OF E-LEARNERS' TEMPORAL PATTERNS

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Assessment of e-learners' temporal patterns in an online collaborative writing task

ABSTRACT

E-learners are generally adults with work and family constraints who get involved in the virtual campus looking for temporary academic flexibility. However, they are often confronted with collaborative learning activities which lead to additional organizational efforts by reducing their individual time flexibility. In this paper, we argue that time is a major variable in Computer Supported Collaborative Learning (CSCL) activities, and that assessing students' use of time in these situations can help educational designers to propose adequate time scripting to plan these educational activities.

This case study presents an exploratory analysis of time patterns for 15 groups of students (n=66), involved in a collaborative writing task. The results reveal that (a), e-learners' time-on-task increased since the beginning of the activity, (b), they work more during week days than during weekends and (c), they tend to work during "conventional" hours of the day. The identification of these patterns is the first step toward the development of new methodologies and computer-supported tools to enhance organisation of time and social aspects in CSCL.

KEYWORDS

E-learning; Computer-Supported Collaborative Learning; Academic time; Time patterns.

INTRODUCTION

Students' coordination in collaborative learning requires an additional organizational effort (Kirschner, Paas & Kirschner, 2009). This coordination activity could reduce students' efforts in their learning task. Despite the interest of Computer Supported Collaborative Learning (CSCL), in studies (Dillenbourg, Järvelä & Fisher, 2009; Stahl, 2002; Strijbos, Kirschner & Martens, 2004), very few studies have examined the efforts required in regards to coordination when considering time as a focus variable (Gros, Barberà & Kirschner, 2010). This paper supports the idea that time is a major variable in CSCL activities, and that understanding the time factor in e-learning is important to help students succeed. The first part of this paper highlights the importance of time in CSCL activities. In part two, the notion, reporting and assessment of time patterns are discussed. Following this theoretical characterisation, we introduce an exploratory analysis. The empirical analysis leads us to identify the different kinds of student time patterns during a CSCL course. Afterwards, we discuss the relation between the students' time pattern and the students' learning task success.

TIME FACTOR IN CSCL

Students engaged in e-learning (and distant education in general), are often adult learners who have work and family constraints (Diaz, 2002; Pallof & Pratt, 2003). The time they can allocate to their learning activities is thus reduced (after a day at work, during their children's nap, etc). Time is thus a central aspect in e-learning activities due to the lack of time experienced by e-learners. The numerous problems encountered by e-

learners can be attributed to time availability constraints both at an individual and a collective level.

INDIVIDUAL TIME MANAGEMENT DIFFICULTIES

We consider time management as a decision-making process and prioritising as regards time use. Students decide on their academic time use depending on the degree of flexibility allowed by the learning task and their own time constraints. Due to the scarcity of time perceived by e-learners, time flexibility is one of the main e-learners' expectations towards their decision to enrol in an online course (Petrides, 2002; Schrum, 2002; Sullivan, 2001). The major difficulty for these learners is therefore to conciliate all their professional, social, and academic activities. Frankola (2001) explains the high drop-out rate of e-learners due to the failure to achieve this conciliation. Temporal flexibility reduces the weight of the learning activity, enabling a better conciliation. This flexibility, which could be preserved during individual activities where the students self-regulate their time use, is dramatically reduced by the time organisation of the group in the context of collaborative learning.

COLLECTIVE TIME MANAGEMENT DIFFICULTIES

Time difficulties, which are already encountered on an individual level, remain at the collective level of CSCL. The level of interdependence in the organisation of collaborative activities as defined by the group reduces the individual time flexibility.



In collective activities where the group members had no previous knowledge about each other (*zero history groups*, Kreijns, 2004), planning and organising learning activities can be a costly task that may reduce progress in the learning activity. Indeed, on the basis of a given amount of time to perform the task, the time the learners spend on organization is directly deducted from the time remaining to do the task itself. During collective activities, e-learners not only have to find time for their learning activities, but also establish collective organisation, implying a certain level of interdependence. For example, if the group decides to collaborate in a synchronous way, they would need to find shared-time with their teammates to collaborate. In long term collective activities, the definition of an organizational pattern, could thus reduce opportune planning efforts and allow the students to focus on the learning task.

Students' time use is thus valuable data for people trying to support collaborative e-learning activities. However, few studies focus on the time factor assessment in this kind of activities. We think that assessment of temporal patterns of e-learners' activities can provide us with essential information about how and when supporting e-learners in CSCL in particular and e-learning in general.

TIME PATTERNS

The concept of patterns in research is used to simplify complex phenomena (Bonthoux, Berger & Blaye, 2004). Regarding student activity, a temporal pattern refers to structures appearing periodically within a given temporal rhythm (Romero, 2010; Valax, 1986). One of the interests in patterns is that they enable understanding of past events and the anticipation of future actions (Valax, 1986). Students could plan their collective

activity based on the knowledge they have of their teammates' time patterns. Knowing how e-learners manage their time can thus enable researchers to better understand the learning process in CSCL and enable educational designers and teachers to better adapt the temporal characteristics of learning activities', (duration, milestones, synchronicity, etc.).

Time patterns have been largely used to describe the dynamics of group work but very few studies focus on CSCL. However, we think, that results from group work cannot be extended to those from the learning group for two major reasons. Firstly, in professional contexts, distributed virtual teams work within the temporal patterns shaped by their organisation (working hours of their respective offices and time zones, working calendar, etc.), and the temporal constraints of their shared objectives (project milestones and deadlines). In online education, learners most likely define their academic time, once they have solved their professional and social temporal constraints. This first difference makes the extension of results obtained in e-working to e-learning contexts improbable. Secondly, the group history is different in e-working and e-learning. The group history refers to whether the team mates know each other or not at the beginning of the task (Kreijns, Kirschner & Jochems, 2003; Kreijns & Kirschner, 2004).

In other words, it takes into account the relations between teammates. It appears that in e-working environments teammates often know each other before the start of the collaborative activity, whereas in an e-learning environment, the geographic distance between teammates, and the fact that groups are often randomly established by the teachers or e-tutor, often lead to the creation of groups with no history. This difference is important in the sense that, in a group with no

history, teammates need time to get to know each other (their availability, the way they work, their competence in the task), whereas in a group with a longer history this phase is shorter. This will necessarily result in different time patterns, at least if the activity is analysed at the task level.

For these reasons, we think that temporal patterns of e-learning activities need to be explored deeply. However, to obtain useful results, the durations of temporal patterns need to be acknowledged as a specific stage of the learning activity.

TIME MULTILEVEL ANALYSIS

Previous research using time patterns show a great disparity in the duration of the investigated time patterns. This spectrum explored in empirical studies considers durations of some seconds (Carreras, 2001) to decades (Gentleman & Whitmore, 1985).

METHODOLOGY

PARTICIPANTS

The participants, (n=66), are master students from Ghent University (Belgium), the University of Oulu (Finland), the University of Turku (Finland), and the Universitat Ramon Llull (Spain). The participants engaged in the International CSCL Course (ICSCCLC), organised by the Learning and Educational Technology Research Unit (LET), at the University of Oulu. During the collaborative phase of the work, students were organised into 15 groups (mean = 4.4; *SD* = 0.48). In consideration of the privacy policy set up by the Finnish universities, we were unable to access the demographics data of students engaged in these courses.

Following the multilevel analysis approach recommended in CSCL by Cress (2008), and the micro and macro script differences proposed by Dillenbourg and Tchounikine (2007), we propose a time multilevel model with 3 levels. The first level is the collaborative activity duration as such. Most CSCL activities have a duration that is longer than one week (Reimann, 2009). However, this macro level is not always considered in the study of the evolution of organisational and learning processes in collaborative tasks. The second level is the weekly level; the week is the main time pattern in the organisation of human activities. Within the week, we can differentiate the time spent on week days or spent on the weekend (Fraisse, 1963). On the third level, we consider the time use during the day. Considering adult learners' chronotype and the professional constraints of adult students, we assume they will use the evening for their online learning activities.

TASK

During the first weeks of the International CSCL Course, the students were engaged in an individual writing task. At the end of the individual phase, the students could choose their subject preferences for the collaborative tasks according to three main topics (Motivation and Emotion in CSCL, Structuring and Scripting CSCL, The Structure of Communication). Once they had chosen their topic preference, the course coordinator at the University of Oulu composed the groups and assigned them a specific subtopic. During this collaborative phase of the work, students were invited to write a paper on a topic related to CSCL. Each



group was invited to use its own Knol for the collaborative-writing task.

Knol is a Google web-based collaborative publication platform oriented to the production of user-written articles based on wiki technology. Manber (2007) defines the Knol as a "unit of knowledge", defined by the end-user without the editorial supervision of Google. During the activity, each group of students had to write their collaborative paper on their Knol and use it to organize their activity (by sending messages through the comments' section). The duration of this collaborative task was five weeks.

The choice of analysing data coming from collaborative writing task was motivated by two concerns. Firstly, a writing task (collaborative or not), is an open-ended task by nature (Galegher & Kraut, 1996). In other words, this task does not have one single solution and students need to decide when the text they are writing is good enough to stop the task. Generally, the end is thus defined by the deadline, which guarantees that students will work during the entire duration of the task. In our study, the learning task has a common start date and deadline, allowing us to compare all the groups by the same temporal perimeter.

Secondly, collaborative writing is communication-dependent because it requires teammates to exchange their ideas on the task. In online environments, this type of task is an ideal test bed for evaluating the impact of Computer-Mediated Communication (CMC), and computer-supported collaborative tools in the student group collaboration process. The exploratory results obtained in this exploratory analysis could contribute to progress in this line of research.

DATA

Data about the learners' use of time in the activity by weeks and days was collected through the Knol logs of each group of students (n=15). The data collection aims to analyze the differences between groups during the three levels of activity: the five week duration of the activity, as well as the weekly and daily time use in each of the students' groups. Knols logs describe the type of contribution made by each group member, with its date and time of publication. For the exploratory analysis in this case study, we considered the date of the contribution in relation to the beginning of the task, (day after the start of the activity), the day of the week when the contribution was made and at what time.

In the five week longitudinal activity level analysis, we added up, for all the students of a group, the number of notifications made each day from the beginning to the end of the activity. For the weekly level analysis, the contributions of each student of a group were summed up according to the day of the week they were published. Finally, on the daily level, the contributions of each student of a group were added according to the time of their publication. A distinction between contributions published on week days and week-end days was also made.

In order to obtain more precise patterns and to compare each group, we choose to divide each level of analysis in shorter, uniform time slots according to the usual time slots considered culturally.

According to Gersick's punctuated equilibrium model (1988, 1989), and the results from Michinov and Michinov (2007) in an on-line environment, a major change appears in e-learners' behaviour at the mid-point of a task.

This mid-point period corresponds to a negative period where e-learners reduce their work on the task (Michinov & Michinov, 2007; Reisslein, Seeling & Reisslein, 2005). Following these results, the comparison of the groups in the longitudinal activity level was conducted over three periods: the beginning of the activity, (day 0 to day 10), the mid term of the activity (days 11 to 21), and the end of the activity (day 22 to day 32).

The weekly level was also divided, according to Fraisse (1963), into week days (Monday to Friday), and weekend days (Saturday and Sunday).

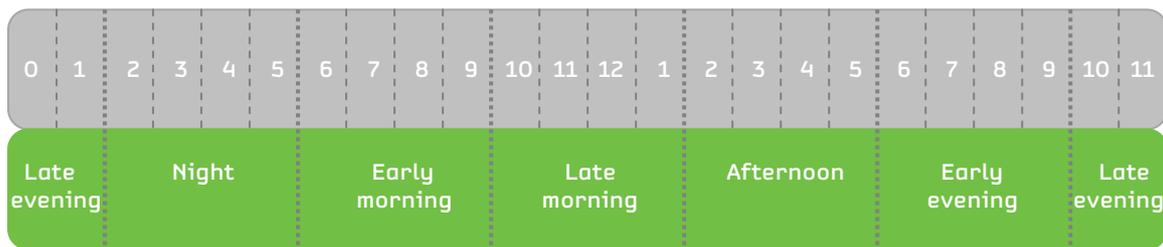
This distinction is particularly relevant in an e-learning context where adult students

usually have work constraints during week days.

Finally, for the daily level, we choose to follow the cutting used in Nie and Hillygus (2002). In their study, they examine the time spent on the internet according to six time blocks: night, early morning, late morning, afternoon, early evening and late evening. In our context, we defined the times of these six blocks according to a standard day of work: night corresponds to 2 a.m. to 5 a.m.; early morning corresponds to 6 a.m. to 9 a.m.; late morning goes from 10 a.m. to 1 p.m.; afternoon from 2 p.m. to 5 p.m.; early evening from 6 p.m. to 9 p.m. and late evening from 10 p.m. to 1 a.m.. See table 1.

Table 1

Ditribution of the six time blocks for of the daily level.



RESULTS AND DISCUSSION

Results were analysed using within-subject ANOVA, including a group of students as a between subject factor.

► LONGITUDINAL ACTIVITY LEVEL

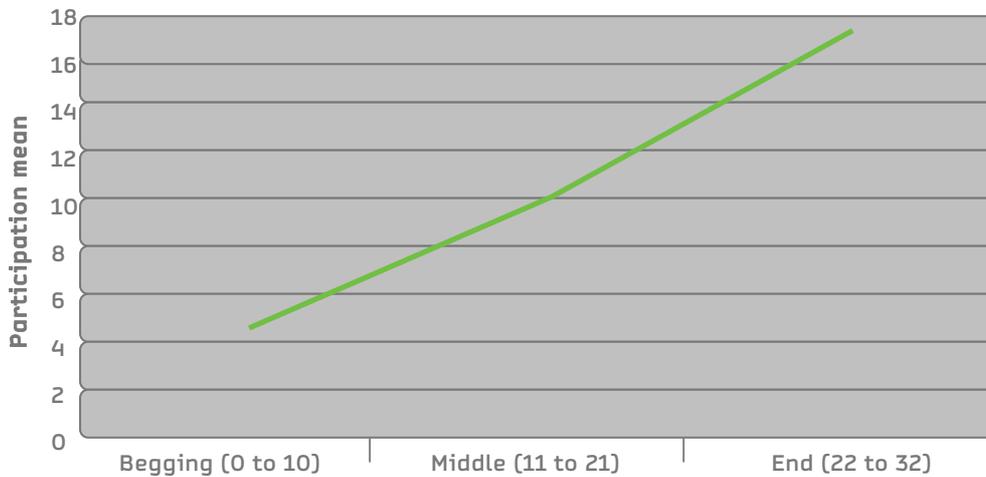
Results of the within subject ANOVA reveal a main effect of longitudinal activity [$F(2,46) = 13.09, p < .001, \eta^2 = .14$]¹, no group effect [$F(13,47) = 1.03, p = .44$], and no interaction effect between longitudinal activity and groups [$F(26,94) = 1.44, p = .10$].

Post hoc tests revealed that students' time-on-task increased constantly until the deadline.

The mean of participation on the Knol goes from 4.43 (SD = .80), at the beginning of the task (days 0 to 10), to 10.93 (SD = 1.65), at the mid-point of the task (days 11 to 21), $p < .001$, and to 17.04 (SD = 2.91), at the end of the activity (days 22 to 32), $p = .004$. See figure 1.



Figure 1. Temporal pattern for the longitudinal activity level.

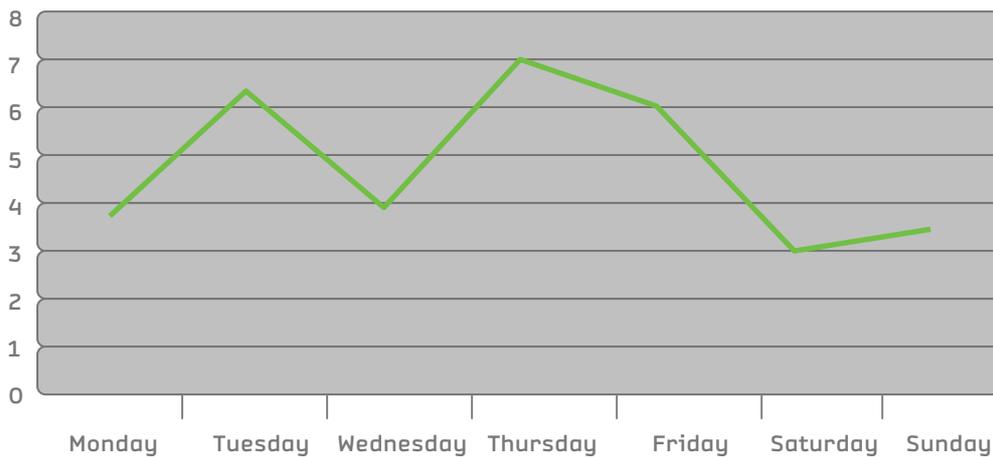


► WEEKLY LEVEL

Results of the ANOVA revealed one main effect on the days of the week [$F(6,42) = 2.44, p = .04, \eta^2 = .005$], without effect of the group [$F(13,42) = 1.02, p = .44$], and no interaction effect between the day of the week and the groups [$F(78,282) = 1.27, p = .08$].

A post hoc test revealed only one significant difference in the amount of student participation between each day. This difference is between Thursday (mean = 6.85, $SD = 1.51$), and Sunday (mean = 2.85, $SD = 0.77$). See figure 2 for the general trend of data.

Figure 2. Temporal pattern for the weekly level.



In order to explore more specifically the difference between week days and weekend days, we conducted a within subject ANOVA on the basis of the participation mean of each participant during week days (Monday to

Friday), as well as weekend days. Results show that e-learners tend to work more during week days (mean = 5.36, $SD = 6.57$), than during weekend days (mean = 3.07, $SD = 4.72$) [$F(1,47) = 7.15, p = .01, \eta^2 = .04$]. Again, no effect on the

groups was detected [$F(13,47) = 0.71, p = .17$], nor interaction effects between week days/weekend days and groups [$F(13,47) = 1.62, p = .11$].

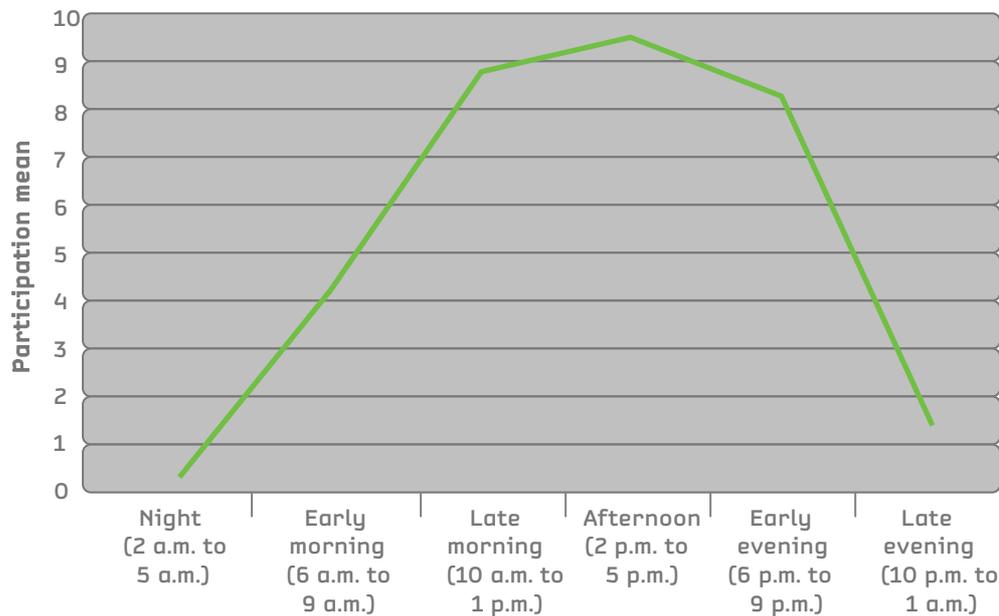
► DAILY LEVEL

Results from the ANOVA revealed one main effect on the time [$F(5,43) = 7.61, p < .001, \eta^2 = .20$], no effect on the group [$F(13,47) = 1.08, p = .40$], and no interaction effect between the time and the group, [$F(65,235) = 1.26, p = .11$].

Post hoc tests revealed that students worked more in the late morning (10 a.m. to 1 p.m.), mean = 8.65, $SD = 1.52$, afternoon (2 p.m. to 5

p.m.), mean = 9.41, $SD = 1.65$, and early evening (6 p.m. to 9 p.m.), mean = 8.18, $SD = 1.48$, than in the early morning (6 a.m. to 9 a.m.), mean = 4.15, $SD = 0.89$, (respectively $p = .001, p = .002$ and $p = .011$), the late evening (10 p.m. to 1 a.m.), mean = 1.31, $SD = 0.52$ (all $p < .001$), and at night (2 a.m. to 5 a.m.), mean = 0.27, $SD = 0.24$ (all $p < .001$). The difference between early morning and late evening is significant at $p = .009$, also between early morning and night at $p < .001$, and between night and late evening at $p = .04$. There is no significant difference between late morning, afternoon, and early evening. Figure 3 illustrates the data presented above.

Figure 3. Temporal pattern for the daily level.



CONCLUSION AND IMPLICATIONS FOR PRACTICE

The results from the longitudinal activity level contradict the previous findings of Michinov and Michinov (2007) and Reisslein, Seeling & Reisslein (2005), which showed a decrease of work at the mid-point of the task. Our

exploratory analysis shows, on the contrary, that students' time-on-task increased from the beginning to the end of the activity. Our results are however, consistent with the findings of Orvis, Wisher, Bonk, & Olson (2002).



Indeed, working on a synchronized problem-solving task, they showed a decrease in socio/emotional-oriented interaction to the benefit of the task-oriented interaction at the mid-point of the task. In the collaborative writing task we analyzed, the teammates had little previous group history, because most of the teammates did not know each other before the task. For this reason, we can suppose that the beginning of the task is used by teammates to get to know each other better, and to organize themselves (see, for example, the work of Hobaugh, 1997; Kreijns, Kirschner & Jochmens, 2002, 2003, highlighting the importance of this phase in collaborative learning). The increase in work is thus explained by the fact that the end of the organizational/social phase gives more time to the teammates to work on the task.

The results of the weekly analysis were not really conclusive regarding the general trends of worktime during the whole week, as they only show a significant difference between Thursday and Saturday. However, we have shown that e-learners tend to work more during week days than weekend days. This result is consistent with Valax's (1999) work suggesting that people are more effective in planning and performing tasks in a structured environment because the time constraints enable people to set their possible autonomy margins. The week days are more structured than the weekend days due to work and family constraints. In these conditions, it is not surprising that teammates spend more time working on the task during weekdays.

The results of the daily activity show that e-learners do not tend to work very early or very late as could be expected given their work and family constraints. As for the weekly level, this result can be explained by the higher constraints occurring during the "conventional" time of day (i.e. from 10 a.m. to 9 p.m.), limiting the work on the learning task.

For people with many constraints, as is often the case with e-learners, these results raised the question of the quality of time spent on the learning task. Indeed, if e-learners principally work during the residual time left by their others activities, we can suppose that this time is segmented in quite short intervals and that they are not totally focused on the learning task. This can potentially be problematic in terms of the quality of the work, and therefore the success of the learning task. The quality of the time spent on the learning task should thus be taken into account in further research to better understand its impact in e-learning.

This first exploratory analysis of e-learners' time patterns allows us to make some primary recommendations and ramifications for computer-mediated tools supporting time organisation. Firstly, regarding the results of the longitudinal activity level and considering them as the result of a decrease in organizational/social interaction, a tool enabling teammates to get to know each other (e.g. via profiling), and organize their activities more quickly should enhance the time allocated to the learning task itself, and thus potentially improve the performance of e-learners.

Secondly, if we consider that e-learners use residual time to work on the learning task (both on the weekly and daily level), helping them to organize themselves in another way may help them to free better quality time for the learning task.

However, some additional results are needed before being able to make precise recommendations. The concepts of the quality of time, e-learners' sensations, and the organizational/social phase of group construction, need to be analysed deeper to have a clearer view of their impact on CSCL.

Demeure, V., Romero, M. & Lambropoulos, N. (2010). Assessment of e-learners' temporal patterns in an online collaborative writing task. *eLC Research Paper Series, 1*, 5-16.

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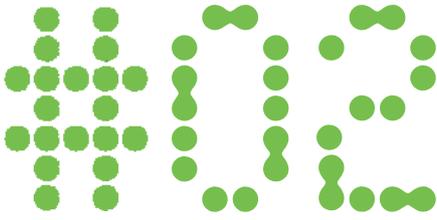
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Footnotes

¹In all the results sections, we report *semi partial η^2* , which are more appropriate and more conservative when using within-subject ANOVA.

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TEMPORAL AND ASSESSMENT DIMENSION

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Temporal and assessment dimensions: characterisation of feedback after assignments

ABSTRACT

The teaching and learning process in an online environment is based on the development of activities which take place continuously over time. In order to promote the formative function of assessment it is necessary for the teacher to give feedback after the student has delivered each assignment. From a descriptive point of view, this article defines the characteristics of this feedback which is offered after each assessment assignment in an online educational environment. Through the qualitative methodology of content analysis, a system of categories has been constructed which enables evidence to be provided of the actions that teachers undertake to provide feedback. The results

reveal various feedback strategies which take place at this particular point of the learning activity. These different strategies highlight the importance of the self-assessment process, which requires the planning of times at which the student can show the use made of the feedback, once they have compared their assignment with the model or solution posted in the classroom. This article provides empirical evidence of the link which is established between the temporal dimension (the time at which feedback takes place) and the assessment dimension (diagnostic/ formative/ summative function) in online teaching and learning processes.

KEYWORDS

Feedback; Online learning environments; Assessment of learning; Self-assessment.

INTRODUCTION

According to the socio-constructivist approach (Coll, 2001; Onrubia, 2005; Salomon & Perkins, 1998), the process of teaching and learning in online educational environments should be based on assignments that take place within a framework of continued learning assessment (Macdonald and Twinning, 2002). If this assessment is to contribute to advancing the learning process, as well as being continuous, it must also meet the formative condition of assessment; that is, it must be constantly focused on improving learning (Allal, 1979; Perrenaud, 1998). From the contributions of McLoughlin & Luca (2001), it can be deduced that formative and student-centered assessment is best suited to the characteristics of online environments. The particular characteristics of asynchrony, require there to be monitoring of the student's learning process. Formative assessment, in the university context in which we are situated, is normally complemented by more traditional summative or outcome assessment (Morgan and O'Reilly, 1999). Both kinds of assessment show the importance of the temporal dimension in the teaching and learning process. From the student's point of view, it is necessary to identify the progress they are making in the attainment of the proposed objectives both during the educational action and at the end. In this evaluative context, feedback processes help to give assessment a formative nature, geared towards the continued improvement of learning. At the same time, feedback has a regulatory nature which enables the student to understand and place the results of their actions within the context of the goals they aim to achieve.

In order to ensure the regulation of learning (Allal, 1979) in a teaching and learning

process based on the development of assessment activities (in the context of the Open University of Catalonia, they are called PACs), it is necessary for the student to receive feedback at three specific times. These times are as follows:

- A)** At the beginning of the educational activity, with a diagnostic function which enables the teacher to make the adjustments necessary in order to adapt to the students' characteristics and rate of learning.
- B)** After each of the proposed assignments of the course, with a formative function; that is to say, focused on improving learning.
- C)** At the end of the educational activity; with the aim of providing the student with information on the progress made in their own learning.

This article is focused on feedback given after each assignment of the course as this is the time at which feedback is hugely important as a facilitator of learning improvement. Feedback is thus conceptualised as part of the framework of formative assessment and is generally defined as the information received by students which allows them to make progress in their learning process. Feedback with a regulation function allows students to place their own learning against the proposed educational objectives (Nicol and Macfarlane-Dick, 2006).

Among several perspectives on feedback (see Mory, 2004 for a review), Narciss (2004) and Narciss and Huth (2006) identified three dimensions: presentation; that is, the form of feedback (who gives feedback? to whom? when? where?); functionality; that is, the proposed objective; and thirdly, a dimension



concerning semantics or feedback content. This study is focused on the latter: the semantic dimension. A review of the literature suggests that it is made up of four sub-dimensions. Feedback must therefore be made up of information for identifying and correcting errors, information about the correct response, information about improving the assessment assignment and information for going into the content which forms the object of study in more depth.

According to Kulhavy and Stock (1989), the first two sub-dimensions, linked to errors and correct responses, make up the verification component of feedback, and the latter two sub-dimensions, linked to improving the assignment in hand and information for going into the subject matter in more depth, belong to the elaboration component of feedback. According to Kulhavy and Stock and Mason and Brunning (2001), feedback must be made up of information for both verification and elaboration in order to ensure the success of the teaching and learning process. These three dimensions are complemented by another two factors, one of which relates to student characteristics (i.e. previous knowledge) and the other to instructional design, i.e. learning objectives, activities, content and evaluation.

Taking into account this multidimensional definition of feedback, many authors have identified the relevance of formative feedback (Alvarez, Espasa, & Guasch in press). There is a positive association between the presence of feedback and performance (Klecker, 2007; Kramarski and Zeichner, 2001; Mason and Brunning, 2001). However, the characteristics of this feedback are today being studied less. There are some precedents in F2F environments (Nicol & Macfarland-Dick, 2006; Shute, 2008) which could be considered a starting point, however, there are few other studies discussing the characteristics of feedback in an online environment.

Within this problematic situation, the research question to be answered in this study has its origin in the results of previous studies (Espasa, 2009; Espasa & Meneses, 2010). The results of this study show that there are statistical differences between feedback given after each assignment of the course and performance (i.e. marks and level of satisfaction). In this article we aim to go further and characterise this kind of feedback. The research question posed by this study is: what strategies do the teachers (and students) use to provide feedback after the assignments?

METHODOLOGY

This research is based on the specific case of the Open University of Catalonia (UOC), which has been a distance university from the very beginning¹. This university can be considered as a representative university where the whole teaching and learning process is on an online platform and the feedback is fundamentally provided in the form of an email.

DATA COLLECTION

Three courses were selected to be analysed: Fundamentals of Search and Recovery of Information, part of the Documentation

programme; Applied Statistics, part of the Market Research and Techniques programme; and Professional Orientation, part of the

Educational Psychology programme. These courses were identified as regulatory courses because of the nature of their feedback which is aimed at promoting the regulation of learning and because there were high levels of interaction between teachers and students (see selection criteria, Espasa, 2009).

This data collection procedure began with the recording of messages exchanged between teachers and students in the virtual classrooms of the selected subjects. Next, the observation technique (Savenye and Robinson, 2004; Mazur, 2004) was used to identify the Feedback Units (FBUs). This unit enables us to understand feedback in the form of a process or sequence; that is to say,

not in the form of an isolated message (Bardin, 1977; or Rourke, Anderson, Garrison and Archer, 2001). We define the FBUs as a sequence of not necessarily sequential messages which contain feedback information or material for the student. There is an evaluation component which triggers them and a thematic coherence which gives them meaning.

The FBUs identified make up the corpus of analysis of this study. A total of 1404 messages from the selected subjects were collected, organised and systematised. The table below shows a summary of these FBUs defined for each subject.

Table 1. Sample

Table 1 Sample	
	N Feedback Units (N total emails exchanged in virtual classrooms)
Fundamentals of Search and Recovery of Information	4 (327)
Professional Orientation	13 (777)
Applied Statistics	9 (300)
TOTAL	26 (1404)

ANALYTIC STRATEGY

The analytic strategy was based on a procedure of analysis of deductive/inductive content (Bardin, 1977; Mazur, 2004). The emails which made up the FBUs were divided into different extracts which inductively led to the categories emerging. The result of this categorisation enabled the diversity and typology of the actions carried out by the participants (teacher and students) in the teaching and learning process to be obtained in relation to the feedback processes. The

analysis of the content therefore involved a constant spiral going and froing, from theory to practice, so as to be able to construct a system of categories (see the results section). The analysis of these electronic exchanges facilitated the identification of a set of categories that will enable us to understand the semantic sub-dimensions of feedback: identification/ correction of errors, correct response, improving the assignment and more in-depth information.



RESULTS AND DISCUSSION

The objective of this study is to identify the strategies used by teachers to provide feedback after each assignment of the course. In order to structure the results obtained we will take into account the four sub-dimensions which have been defined by literature in relation to the semantic dimension of feedback. The table below (see Table 2) shows the categories we identified from the content analysis.

Table 2. Categories identified based on the systematic observation of feedback

	Category	Description
A) Identification and correction of errors	Identification of Error (simple form)	Feedback that shows an error has been committed without explaining it.
	Identification of Error with Argument	Feedback that shows an error has been committed arguing why it has been committed.
B) Correct response	Congratulations (simple form)	Feedback action that encompasses the positive expressions and assessments of students' contributions without explanation.
	Congratulations with Arguments	Feedback action that encompasses the positive expressions and assessments of students' contributions with an explanation of why.
	Reminder of Aims, Instructions and Criteria	Defines feedback action in which the teacher reminds the student of the aims, instructions or criteria that were previously introduced in relation to the specific assignment.
	Solution (simple form)	Defines feedback action which consists of the teacher posting a document for the virtual class with the correct response to the proposed assignment.
	Solution (Argued)	Defines feedback action which consists of the teacher posting a document in a communication space in the virtual classroom with the correct response to the proposed assignment, explaining why he or she has given that response and not another.
	Possible Solution (suggestion)	Defines feedback action which consists of providing a possible correct response to the query or question proposed (often students responding to other students, proposing a solution, although they are not sure of their own response). This response is also applied when the teacher responds to a question as part of a debate assignment, giving his or her own opinion.
	Model Student Responses (simple form)	Defines feedback action consisting of posting a model response from the student's responses without explaining why those responses have been selected and not others.
	Model Student Responses with Arguments	Defines feedback action consisting of posting a model response from the students' responses and explains why the response of those students have been selected and not others.

C) Improving the task	Guidelines for self-assessment	Defines feedback action in which the teacher provides guidelines for the self-assessment process that the student must undergo.
	Normative Assessment	Defines feedback action applied when giving instructions in relation to the normative assessment and in the normative assessment itself (file attached with a graph comparing the marks achieved by the students).
	Information about improving the assignment completed	Feedback action relating to the assignment or the specific question asked; that is, relating to the feedback's direct referent.
	Information about how to proceed with the learning process	Feedback action relating to the learning process and, therefore, not as related to the assignment or query made by the student as would be the case in the category: "information about how to improve the task completed".
D) In-depth information	Contribution of more in-depth information	Defines feedback action applied when in the same text (message or document) information is provided that helps the student look deeper into the content that forms the object of study.
	Contribution of more in-depth information through external resources	Defines feedback action that, through a bibliographic reference, a web page, or in general any other external source provides information that can be used by the student to go deeper into the content that forms the object of study.

The categories obtained enable us to prove the actions undertaken by the teacher when he or she gives feedback after each assignment. The time at which this feedback is given means that it acquires specific characteristics which make it different in comparison with feedback which is given at the start of the teaching and learning process and feedback which is given at the end.

In the table it can be seen that some of the categories identified belong to what we have called the "simple form" and the "argued form". The "argued form" is that which provides the student with explanatory information. Using this differentiation between the simple form and the argued form, parallels can be drawn with the verification elaboration that makes up the feedback. The categories identified as being a simple form correspond to verification feedback while the categories identified as the argued form, as they facilitate understanding and provide more

information for the student with which he or she can, potentially, self-regulate learning, correspond to elaboration feedback.

This article takes a closer look at feedback actions relating to the correct response (sub-dimension b.) as it is in this feedback where the most interesting strategies from the teacher's point of view are revealed. Nevertheless, the categories obtained in the content analysis show the actions relating to the identification of errors (sub-dimension a.), as well as the actions which relate to providing the student with information to improve the task (sub-dimension c.) or to expand and go deeper into the content referred to by the study (sub-dimension d.).

Focusing therefore on the teacher's strategies to provide the correct response in the case of feedback after the assignments are delivered, the results obtained show the presence of an evaluation component, the



congratulations which enable students to have an overall and general evaluation of the activity.

Furthermore, the results obtained specify that this type of feedback contains information on the learning objectives of the assignment, the assignment demand and, in some cases, information relating to the overall evaluation process. According to the

literature on regulation of learning processes (Boekaerts, 1997; Butler and Winne, 1995) remembering these aspects at the time of correction makes it easier for students to reflect on their own learning, as they are able to measure their efforts and plan the actions they need to undertake in order to achieve the proposed objectives. An example of this type of feedback is shown below:

Example of the category: "Reminder of aims, instructions and criteria"

Objectives:

First part:

. Identifying the main concepts of the current Professional Orientation definitions

. Examining the theoretical approaches on which the orientation action is based.

This assignment requires you to prepare the proposed study material and also the bibliographic or reference material that you have used.

(...)

Evaluation criteria

Consistency of the theoretical arguments with the practical orientation design

Preparation and summary of the concepts studied in the materials (...)

Another result obtained in the analysis of the content shows two clear actions undertaken by the teacher to provide students with the correct response. On the one hand, the solution (simple form, argued form and possible form) and, on the other, the response model (simple and argued form). Both forms of providing the correct response are based on the students' self-assessment; that is, it is the student's responsibility to compare the model

solution or response with the work they have done, thus identifying any possible errors.

In relation to the feedback after the assignments provided on the basis of the solutions, we find the simplest form (simple form), in which the teacher merely gives the student a specific response to what he or she has been asked. An example can be found in the extract below:

Example of the category: "Solution (simple form)"

What effect could be expected from a price increase of €60? (maximum 1 line) We can expect a decrease of $0.71 \times 60 = 42.6$ in sales

There is also the argued form, which could be considered a more elaborate feedback than the previous one as the solution is accompanied by an argument.

More information is therefore provided to the student, helping them to understand the solution to the assignment.

Example of the category: "Solution (argued form)"

In order to be able to find differences between the concepts in module 2, we have identified three main points: the classification of the stages of Professional Orientation undertaken by Álvarez (1995), which enables us to take a journey through time; point 2 "Definition and Dimensions of Professional Orientation", which allows us to identify the common and differential elements of previous and current concepts; and appendix 4 M2 "Orientation" by Sofia Isús, which makes a comparison of the ways of understanding a single concept, by means of its meaning.

Lastly, we have "possible solution" feedback. This feedback relates to the response given by students to questions raised in relation to the demand. The sequence which takes place in this case is started by a student who has a query. This query is answered by his or her classmates, who offer a solution which the student doesn't know if it's totally right. Finally, the teacher intervenes and gives the correct response.

Apart from solution-based feedback, a second

way of providing the correct response has been identified on the basis of a model constructed from extracts of the activities handed in by students. The simple form has also been identified in the models; that is, the teacher posts the model constructed from extracts that they have selected from the students' activities; and the argued form, which includes arguments informing the students of the reason for the selection of the assignment (or extract) in question. Examples of these actions are shown below:

Example of the category: "Model Student Responses (simple form)"

Shown below are various paragraphs from the work of three classmates which might help you with your assignment. I have highlighted some aspects with comments in the margin to allow you to take another look at your assumptions.

Student6 - Student 7 - Student 8

Highlighted points:

Advisory relationship of the adviser with the teaching staff.

Analysis of relevant information of the demand:

. The advice that the school implemented was informative and detailed

. Professional Orientation advice as an educational process.

(...)

Example of the category: "Model Student Responses with Arguments"

We will now discuss three types of designs studied by classmates aimed at different target groups: the first is a programme aimed at women seeking employment, the second is aimed at young people under the age of 25 moving into the employment market and the third discusses training and orientation for people with mental disabilities. In each of the three cases the mark is given on the basis of orientation and training. The definition of the characteristics of the target groups is very well defined and gives one a very rough idea of the tube of interventions which can be carried out (...)²



In short, after the assignments we have identified two different ways of providing the correct response. On the one hand, we have the solutions and, on the other, the models constructed from the activities handed in by students.

As has already been made clear, these two strategies for providing the correct response in an online environment are linked to a process of self-assessment by the student. Along these lines, Collis, De Boer, and Slotman (2001) studied different types of feedback, among which they identified model-response and solution-based feedback and pointed out the importance of the comparison between the assignment handed in by the student and the model provided by the teacher in the classroom. Macdonald (2001), a researcher focused on self-assessment processes in learning, gave us a more detailed idea of the composition of the revision and evaluation process triggered by feedback, which requires a comparison between the work done and a model. According to the author, this

comparative action should be accompanied by other actions aimed at discussing, reflecting on and sharing the revision undertaken by the students of the model presented. The results of our study do not include evidence proving that these actions to discuss and review the comparison between the student's assignment and the model actually take place.

Another of the categories identified makes reference to the instructions given by the teacher in relation to the self-assessment process. These are very simple instructions, often by way of a reminder, in which the teacher makes it clear to the students that they must carry out the exercise of comparison between their work and the solution or model provided to them and, once the comparison has been made, they may then ask questions or mention any queries they have in the classroom.

Shown below is an example of the instruction given by the teacher in relation to self-assessment:

Example of the category: "Guidelines for self-assessment"

From today, Tuesday 22 March, you can download the solution for PAC1 and check whether or not you have got the answers right. I recommend that, irrespective of the mark obtained and whether or not you have handed in PAC, you have a look at it to answer any queries you might have. If you have any questions you know where to find me!

Finally, another of the characteristics of feedback given after the assignment that has been observed in the analysis of online educational practice, is the information on normative assessment. Providing the students with general information on the activities carried out by all their classmates represents key information from the point of view of the regulation of learning, as it enables students to see how their progress in the learning process compares to the rest of their classmates. What is therefore being promoted

is normative assessment which, unlike criteria-based evaluation, does not set benchmarks which have to be achieved, but proposes an assessment process in which the benchmark is set by the level of knowledge held by the group of students as a whole.

To sum up, feedback given after the assignments in the courses analysed is semantically characterised by the identification of errors with and without (simple form) an argument. This type of

feedback is also based on the correct response. The results emphasise the relevance of model-response feedback. This feedback is made up of: a reminder of aims, instructions and criteria; promoting self-assessment; incorporating evidence of normative

evaluation and including congratulations on the quality of the assignments completed by the students. This feedback includes information on how to make progress in learning and also information that goes deeper into the content of the learning.

CONCLUSION AND IMPLICATIONS FOR PRACTICE

The presence of feedback at different points of teaching and learning processes in an online environment is necessary to facilitate learning. Instructional design in these environments is based on carrying out activities which progressively help the student to appropriate the learning content. One of the key points at which feedback must be promoted is after each assignment of the course because of their proven influence on the performance of students and in order to ensure the formative function of assessment. This article aims to show what this type of feedback is like, as well as its characteristics.

As is made clear by the results, one of the most important aspects of feedback at this specific point, after the activities have been handed in, is self-assessment. This process consists of a comparison between a model or solution and the assignment produced by the student. The comparison is expected to trigger a communication exchange process between students, or between the teacher and the student (Macdonald, 2001). The analysis of the content has enabled us to prove that the stages following the comparison of the student's work with the model do not take place even if the teacher provides the students with an incentive to do so. No evidence has thus been found which would

allow the teacher to identify the use that the student has made of the feedback. It can therefore be concluded that one way of providing feedback after the PAC identified in the selected subjects is based on self-assessment, but it must be ensured that this self-assessment process by the student is carried out to its conclusion.

The planning and instructional design of subjects in a virtual environment should therefore allow not only for a time of self-assessment, which requires an individual effort, but also for a time for communication exchange, in which the student can bring up any queries they may have and share them with their classmates and the teacher in order to resolve them and continue with the achievement of the proposed objectives.

Overall, the results of this research bring to light the necessary link between the temporal dimension and the assessment dimension. The asynchrony which characterises virtual environments involves a planning effort which affects all fields of educational activity, and therefore also affects assessment and its different functions (diagnostic, educational and summative) and forms (self-assessment, co-assessment, etc.).



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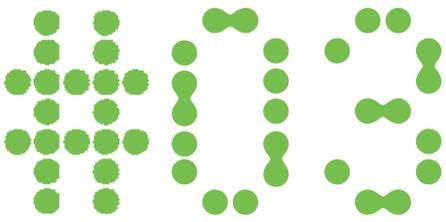


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Footnotes

¹More information about the pedagogical model and assessment model of the UOC can be found on the university's website: <http://www.uoc.edu>.

²Shown next are extracts from the students' activities, which we have not included so as not to expand too much on this extract.



INTERACTION PATTERNS OVER TIME IN ONLINE DISCUSSION

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Interaction patterns over time in online discussion

ABSTRACT

The following study aimed at exploring and understanding how higher education students develop interconnections and interaction patterns over time during an online collaborative task using a form of online discussion. A micro-genetic study was carried out by zooming in into four groups of students that showed extreme grading results in their final product. The study took place in a Psychology course at the Universitat Oberta de Catalunya (UOC) where 63 students participated in a two-week online discussion using two different interactive tools. These

two different types of online discussion did not appear to affect students' interaction patterns, but groups using the Annotation tool did focus more on cognitive matters, while the space for discussion at the UOC had a more balanced focus on both social and cognitive dimensions. Continuous and meaningful feedback also proved to provide important conditions for this type of online collaborative task, which requires students to construct and maintain a shared conception of a problem over time.

KEYWORDS

Peer-feedback; Online discussion; Socio-cognitive regulation; Higher Education.

INTRODUCTION

The collaborative nature of an asynchronous online discussion forum, as student-centered peer e-learning, provides good opportunities for joint construction of meaning.

Nevertheless, educational practice shows that students - individually and as a group - often have difficulties to manage their time properly during a collaborative task and teachers suspect that much of students' 'talk' is procedural or off-task". The use of peer feedback in an online learning environment offers a number of distinct advantages, including: increasing the flow of feedback, providing new learning opportunities for both givers and receivers of feedback, humanizing the environment, and building a community (Corgan, Hammer, Margolies and Crossley, 2004; Ertmer et al, 2007).

As collaborative learning is a coordinated activity that consists of a continued attempt to construct and maintain a shared concept of a problem, it has a highly co-regulatory nature (Lipponen, Rahikainen, Hakkarainen and Palonen, 2002). This provides both opportunities as well as challenges to the collaborative learning process. Devoting efforts to create and maintain a shared conception of a problem can be a valuable and powerful learning activity in itself. However, the time and effort that is thus consumed cannot be devoted to processing the learning material itself. As stated by Dixon, Dixon and Axmann (2008), participating in threaded discussions demands a significant amount of time to read, reflect upon and respond, and they have highlighted this as one of the major difficulties.

The term "learning" is commonly taken as referring to individual cognitive processes by

which individuals increase their own knowledge and understanding. The collaborative aspect, on the other hand, explicitly extends learning to groups of individuals interacting together. Students not only have to externalize, share and discuss their thoughts but they also need to employ strategies to regulate their cognitive and social interaction (Jonassen, Davison, Collins, Campbell and Bannan, 1995; Stahl, 2003).

Working with others efficiently in order to solve a cooperative task depends greatly on the ability to self-regulate behavior. Self-regulated learning is a cyclic, recursive and active process encompassing motivation, behavior and context (Winters, Greene and Costich, 2008); which consists of carrying out a task without having to be directed by anyone else, making decisions on their own, being able to seek and take on help and even knowing when and how to request it.

In a text-based online environment this process becomes even more problematic, as students have to rely purely on the use of physical and semantic artifacts (Stahl, 2003). In addition, students tend to transfer the strategies employed in face-to-face environments, which have been shown to be less effective in virtual environments (Delfino, Dettori and Persico, 2008; Whipp and Chiarelli, 2004).

Our theoretical perspective coincides with a socio-cultural approach to learning, where e-feedback must be regarded as a joint activity, presupposing interactions between actively participating students and teachers (Dysthe, 2007). As we have pointed out, in online asynchronous environments - especially in cooperative and in collaborative learning



tasks - educational interaction relies on the use of written discourse. This semantic artifact is the basic tool to collectively understand, co-regulate, make proposals, negotiate and construct meaning (Järvela and Hakkinen, 2002; Lipponen et al., 2002; Mercer & Littleton, 2007; Zimmerman and Tsikalas, 2005; Wegerif, 2006). In this sense, students' written-discursive activity is partly responsible for their ability to achieve higher levels of inter-subjectivity and, therefore, advance towards 'shared' and ever more complex representations of the contents and tasks of the joint activity.

According to Vygotsky's perspective, learning is more a matter of participation in a social process of knowledge construction than an individual endeavor. "Knowledge emerges through the network of interactions and is distributed and mediated among those (humans and tools) interacting" (Cole and Wertsch, 1996, cited by Lipponen et al, 2002, p.3).

By means of language and social interaction, in line with the socio-cultural approach to learning, behavior regulation becomes increasingly more self-regulated. Students' regulation process evolves over time and interactional patterns - on social and cognitive dimensions- arise. The time dimension of students' collaboration represents an important issue when solving tasks of this kind. Working collaboratively demands coordination, assumption of responsibilities and perseverance throughout the task. In this context and in order to construct and maintain a shared concept of a problem, a continuous and meaningful feedback is required.

Temporality, however, does not only come into play in quantitative terms (e.g., duration, rates of change), but in its order of appearance. Since human learning is inherently cumulative, the sequence in which experiments are

encountered affects how one learns and what one learns (Ritter, Nerb, Lehtinen and O'Shea, 2007). Because of computer-supported collaborative learning (CSCL), researchers are privileged in the sense that they have direct access to processes as they unfold over time (via tracking).

While in other scientific studies one can find many theoretical models to support the analysis of construction of meaning during collaborative tasks in online and asynchronous learning environments in higher education (i.e. Gunawardena, Lowe and Anderson, 1997; Singh, Hawkins and Whymark, 2007), there is comparatively little research that makes use of the information contained relating to the order and duration of events (Reimann, 2009).

The studies analyzing the construction of meaning during collaborative tasks have encountered variations in how students communicate (provide feedback) in order to share and co-construct meaning during the development of such tasks. In relation to the 'time' dimension, Zumbach and Reimann (2003) observed that providing feedback to group members on interactional aspects was much more effective in the early stages of groups' lifetimes than later and that, hence, this information should be phased out over time in order to reduce the cognitive load (the "costs").

In this line, research carried out by López-B (2009) explored the strategies employed by students to regulate their behavior in a university's virtual learning environment, whilst carrying out cooperative learning tasks with argumentative demands, from a double perspective - the social angle of cooperation - and joint construction of meaning - the cognitive angle. This author found that students alternate and combine strategies to regulate the social and cognitive dimensions of their performance during their interactions.

The study presented in this article aims at continuing and extending the previously mentioned study by giving response to the following central research question: how do learners engage with others, and how do they develop interconnections and interaction patterns over time during an online discussion?

The first objective set was to identify the regulation strategies employed by students when participating during an online debate, which focused on the critical understanding of a scientific text.

Secondly, and understanding these strategies as 'peer feedback', we proceeded to explore the possible impact of them, in the quality of student's final product. Additionally, we set up a third and last objective with an exploratory character: compare the development of the groups' work regarding the technological tool used for discussion.

The next section gives more details about the characteristics of the analyzed collaborative task, as well as the methodology applied for collecting and analyzing data for this study.

METHODOLOGY

The study took place at the Open University of Catalonia (UOC) in an online psychology course with 63 students in their third year or beyond. Students were randomly divided over twelve groups, six of them using the debate space provided by the virtual campus of the UOC (N=33) and the other six groups using the external Annotation tool (AT) (N= 30).

The debate area of the UOC's virtual campus has the structure of a regular discussion forum, with discussion threads and the possibility to attach documents. The Annotation tool (AT, www.annotationtool.com) offers a virtual and asynchronous environment to facilitate collaborative discussions over specific documents. In this tool users interact by making annotations (comments) over certain segments of a document and by reacting on each others' comments. Each annotation made begins a discussion thread and the resulting hierarchy has the same structure as the one in a discussion forum.

Using one of the aforementioned tools, each group independently discussed a scientific article from the course readings, focusing around three teacher-generated questions about the contents of the article. Then, each group analyzed and discussed a case study, applying the previously-constructed knowledge, and created a written report. Finally, an overall evaluation of the whole activity was made by grading each group's written report. The following grading scale was employed for the evaluation:

A) BEST UNDERSTANDING

Contextualizing statements that reframed the situation by considering the circumstances under which the situation will or will not hold (i.e., a qualifier) or by comparing a given situation to a new one that is similar in significant respects (i.e., an analogy).

Reasoned interventions showing consensus by integrating their own reflections with the information offered by the others (*Integration aimed at consensus*).



B) HIGHLY SATISFACTORY UNDERSTANDING

Hypothetical or abstract propositions. Reasoned interventions offering proposals, alternatives and/or complements to the information exchanged, with the intention of reaching an agreement (*negotiating meaning*).

C) QUITE SATISFACTORY LEARNING WITH UNDERSTANDING ON A DECLARATIVE LEVEL

Textual propositions that referenced information presented in the text. Non-argumentative interactions offering information with textual content or expressing points of view on the content to be analyzed, without making any reference to previous statements.

D) NON-SATISFACTORY LEARNING

Misunderstanding of the ideas in the text. Ideas unrelated to the text. Literal copy of paragraphs without any comments.

In order to create a valid and reliable assessment of students' reports, we relied on the teachers' professional expertise, which was used to apply these criteria in previous courses as well.

To analyze students' interaction, we employed a microgenetic method, which can illuminate the path, rate, breadth, variability, and source of change (Flynn, Pine and Lewis, 2006; Siegler, 1995). To observe how students' interactions evolved over time, we are presenting data from only four of the twelve groups. Taking into account that the main interest of this study is related to the exploration of the possible impact of students' interaction patterns throughout the collaborative discussion and in the quality of

students' written reports, we selected those groups with extreme grading results in their evaluation, two for each virtual environment, to emphasize the differences. A total of 21 students were distributed over 2 subsets. Each subset contained two groups: a) groups with highest grades (G-A) using the UOC environment represented by 6 students (5 female and 1 male) and the one using the AT represented by 5 students (4 female and 1 male); b) the groups with lowest grades (G-B) using the UOC environment was made up of 6 female students and the one using the AT of 5 students (4 female and 1 male). A more descriptive study comprising the complete data information can be consulted in Hernández, Álvarez, López-B and Van der Pol (2010).

The microgenetic qualitative analysis of students' interactions started from the subject units contained in each message (in line with Henri, 1992). To categorize these subject units, we used a previously developed and validated coding scheme (López-B, 2009) that identifies a total of 14 categories for the social and the cognitive aspects of regulation. These categories went through a process of definition, adjustment, re-definition, combination, exclusion or precision until achieving the present uniform system (see appendix for a full description of the categories). The coding scheme was created from a combination of a deductive analysis and an inductive one.

For the first analysis, different research studies and literature referring to (a) face-to-face and virtual education that have contributed with definitions of categories in cooperative discourse (i.e. Arvaja, Salovaara, Hakkinen and Järvelä, 2007; Boakaerts and Minnaert, 2006; Dillenbourg and Fischer, 2007; Järvelä and Hakkinen, 2002; Vauras, Iiskala, Kajamies, Kinnunen and Lehtinen, 2003; Volet, Summers, and Thurman, 2009; Wegerif, Mercer

and Dawes, 1999); (b) categories, models and characteristics of behavior regulation in cooperative and written argumentative tasks (i.e. Angeli, Valanides and Bonk, 2003; Salonen, Vauras and Efklides, 2005; Reznitskaya, Kuo, Glina and Anderson, 2008; Weinberger and Fischer, 2006; Zimmerman, 1997) were revised.

The inductive analysis resulted from the exploration of data, where categories emerged. Together with the external judges it was established what would signal agreement: concurrence on the identification of codes in

the same subject units. Each of the judges categorized this independently, taking into account that each subject unit had to be coded either into one category or, in special cases, into a combination of two categories. In this process, each coding discrepancy was resolved through discussion, ideas were exchanged on the least precise categories, some definitions were improved and others were complemented with more examples. The judges agreed on the codification of 55 subject units, representing an 81% agreement.

RESULTS AND DISCUSSION

Next, and following the corresponding objectives set for this article, we will share the most significant findings from this exploratory study. Table 1 summarizes the results of the content analysis.

		Cognitive Feedback								Social Feedback							
		SRL				Shared Regulation				SRL				Shared Regulation			
Groups with better scores	Week	G-AUOC	%	G-A AT	%	G-A-UOC	%	G-A-AT	%	G-AUOC	%	G-A AT	%	G-A-UOC	%	G-A AT	%
	1	2	13%	0	0%	2	10%	0	0%	0	0%	0	0%	0	0%	0	0%
	2	2	13%	0	0%	1	5%	0	0%	0	0%	0	0%	0	0%	0	0%
	3	0	0%	2	11%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	4	1	7%	3	17%	3	14%	2	10%	1	11%	1	14%	1	11%	0	0%
	5	1	7%	0	0%	2	10%	4	19%	1	11%	1	14%	2	22%	1	17%
	6	4	27%	1	6%	1	5%	2	10%	0	0%	0	0%	2	22%	1	17%
	7	3	20%	3	17%	3	14%	5	24%	4	44%	0	0%	0	0%	2	33%
	8	1	7%	0	0%	3	14%	0	0%	0	0%	0	0%	2	22%	0	0%
	9	1	7%	0	0%	4	19%	0	0%	2	22%	0	0%	2	22%	0	0%
	10	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	11	0	0%	3	17%	0	0%	4	19%	0	0%	2	29%	0	0%	0	0%
	12	0	0%	3	17%	0	0%	0	0%	0	0%	1	14%	0	0%	1	17%
	13	0	0%	0	0%	2	10%	0	0%	1	11%	0	0%	0	0%	0	0%
	14	0	0	3	17%	0	0%	4	19%	0	0%	2	29%	0	0%	1	17%
Total (TU)	15	100%	18	100%	21	100%	21	100%	9	100%	7	100%	9	100%	6	100%	
Groups with worst scores	Week	G-B-UOC	%	G-B-AT	%	G-B-UOC	%	G-B-AT	%	G-BUOC	%	G-B-AT	%	G-B-UOC	%	G-B-AT	%
	1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	2	1	20%	0	0%	0	0%	0	0%	1	33%	0	0%	1	25%	0	0%
	3	1	20%	0	0%	1	11%	0	0%	0	0%	0	0%	0	0%	0	0%
	4	0	0%	3	38%	0	0%	1	8%	0	0%	1	50%	0	0%	1	25%
	5	0	0%	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	1	25%
	6	2	40%	3	38%	2	22%	4	31%	0	0%	1	50%	1	25%	1	25%
	7	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	8	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	9	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	10	1	20%	0	0%	1	11%	0	0%	0	0%	0	0%	0	0%	0	0%
	11	0	0%	0	0%	0	0%	1	8%	0	0%	0	0%	0	0%	0	0%
	12	0	0%	0	0%	2	22%	0	0%	1	33%	0	0%	1	25%	0	0%
	13	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	14	0	0%	1	13%	3	33%	7	54%	1	33%	0	0%	1	25%	1	25%
Total (UT)	5	100%	8	100%	9	100%	13	100%	3	100%	2	100%	4	100%	4	100%	

Table 1. Summary of results observed

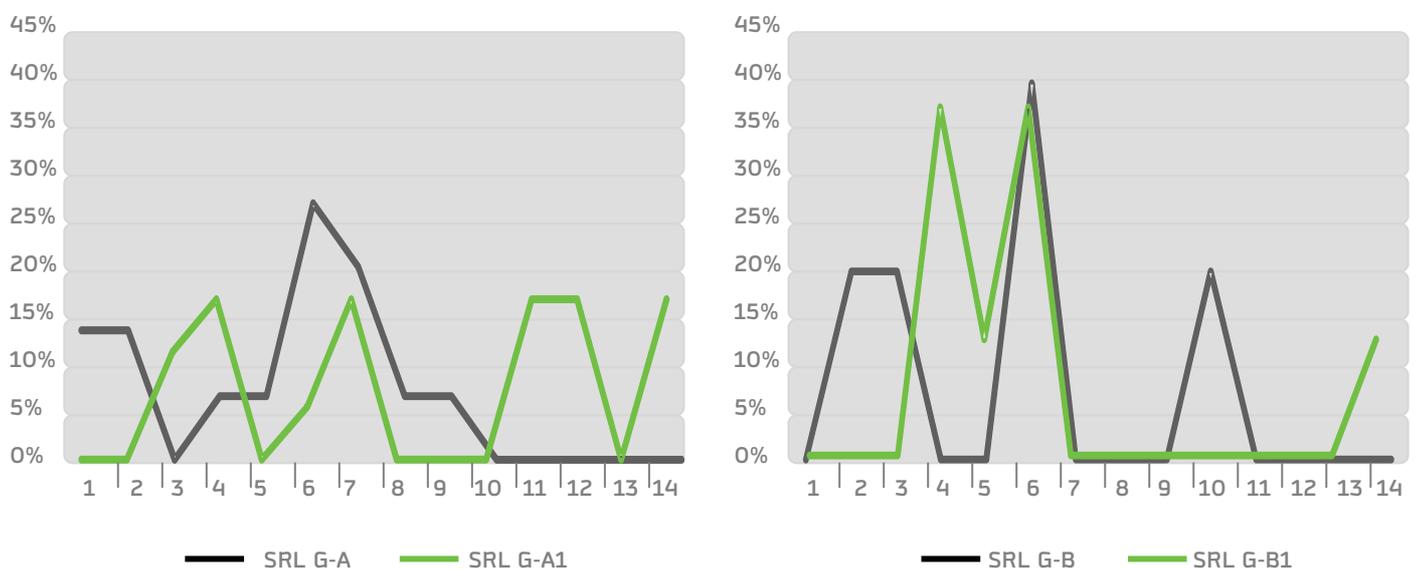
Notes: Groups with letter 'A' represent the ones with highest grades. The subscript 'AT' distinguishes the groups that have used the Annotation Tool as a communication support. The gray shadow highlights the days where a discussion took place.

Results will be presented following the regulations modes in the cognitive and social dimensions.

A) INTERACTION ASSOCIATED TO SELF-REGULATED LEARNING (SRL) IN THE COGNITIVE DIMENSION OF CO-REGULATION

As regards the groups with highest grades, regular individual contribution is maintained in both cases. See figure 1.

Figure 1. Interactions associated to SRL in the cognitive dimension of co-regulation



Note: This type of feedback refers to Exteriorization.

Exteriorization favors the beginning of discussion threads and stimulates joint construction of meaning. It is important to notice that ‘*Exteriorization*’ does not necessarily mean contributions with essential or meaningful ideas. In the case of the groups with the lowest grades, for example, even though the frequency of this type of feedback is high, it is not related to a better construction of arguments, ending up most of the time in an accumulation of existing knowledge rather than in the negotiation or construction of new knowledge.

In the AT group (A1) this kind of feedback appears at the end of the first week and increases again at the end of the second week. This can be interpreted as a strategic interaction which ends up having a positive effect. On the one hand it seems to be a response to SRL in this case of ‘*Exteriorization*’, so that the group incorporates the individual contribution to the discussion, showing the students’ effort to maintain the necessary interdependence in the collaborative learning task the group is performing. Individual contributions - in this



case, ideas put into consideration through Exteriorization - are received by other students, leading the exchange through Elicitation strategies, which encourage Negotiation, construction of meaning and synthesis (*Integration of ideas aimed at consensus*). Thus, during collaborative discussion we see what Reznitskaya et al. (2008) calls 'flow of reasoning', a process that comes along with the improvement of the quality of reasoning.

In the groups with lowest grades in both environments, unlike the ones with the highest grades, we can observe an increase in this type of feedback at the end of the first week. This increase barely appears at the end of the second week for the group working with AT, facilitating the appearance of new topics that are not discussed and are left unfinished. In contrast, the group that worked in the UOC campus, although the individual contribution focuses on the first week, in the middle of the second one, students bring new ideas that can

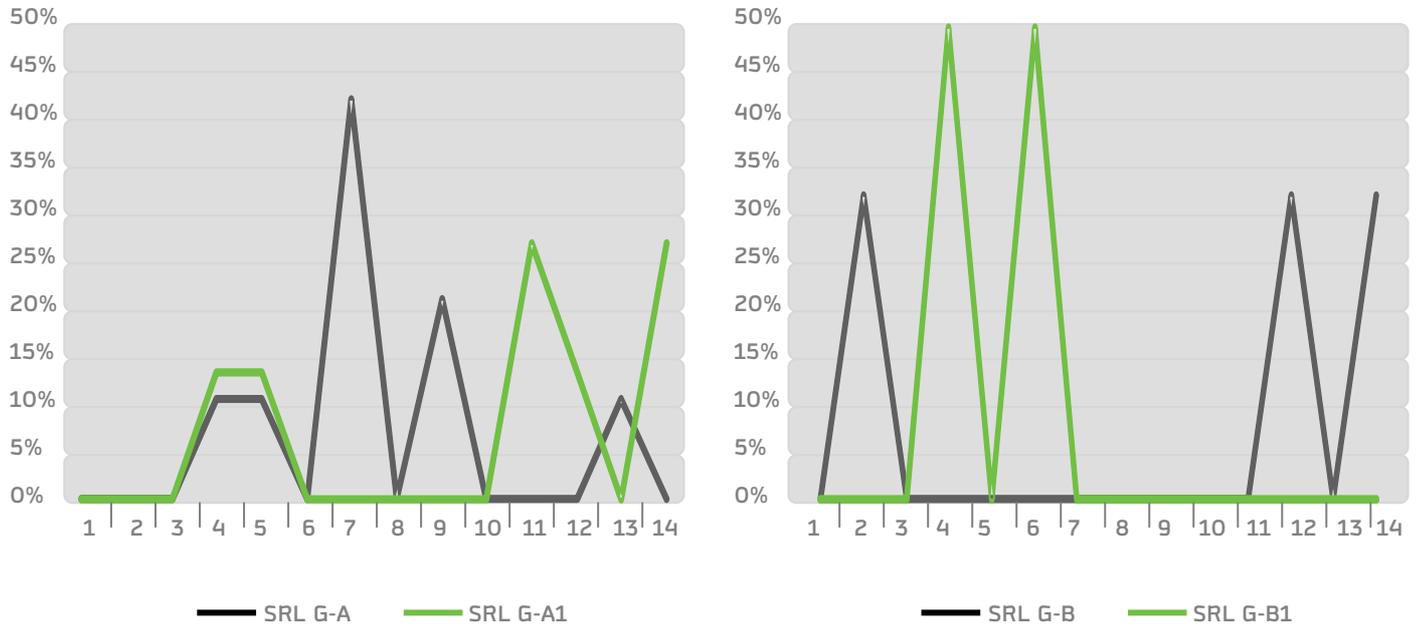
have a slightly more favorable effect, at least with respect to the amount of content that the group might collect. However, if these ideas or individual contributions are not interesting enough for the other participants and do not imply an elicitation, it seems that the topic is not worth discussing, and therefore these ideas end up as a collection of scattered, shallow ones. This may also explain the grades in the written report of these groups, which contained few ideas without reasoning.

We also observed that the UOC group (GA) starts in the first week and then has another increase in the middle. In contrast, the AT group (GA1) maintains this kind of feedback during the discussion. Overall, in this last group the number of subject units in this category is larger compared to the other groups. This can be explained by the nature and design of this tool, which lets users focus on specific content, confirming the results of Van der Pol, van den Berg, Admiraal and Simons (2008).

B) INTERACTION ASSOCIATED WITH SRL FOR GROUP CLIMATE MANAGEMENT IN THE SOCIAL DIMENSION OF CO-REGULATION

Students in best-performing groups offer more feedback (SRL) to their peers in order to keep up the social dynamics of the group. Students often report on what they are doing (Individual Monitoring) and bring their previous knowledge or experience to what is being discussed (Self-Evaluation) See figure 2. These strategies are truly useful for the group as they promote respect for others' opinions, shared responsibility concerning the learning task and help the students to awaken and / or maintain their attention and interest on what is being discussed.

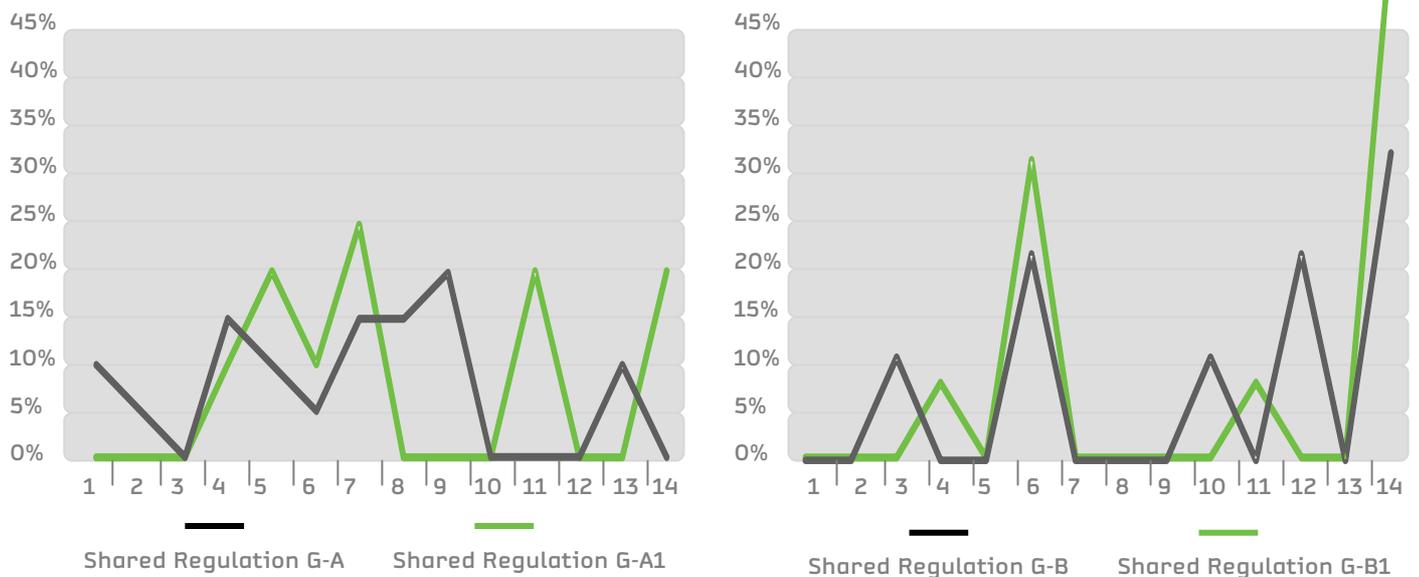
Figure 2. Interactions associated to SRL for group climate management



C) INTERACTION ASSOCIATED WITH SHARED REGULATION IN THE COGNITIVE DIMENSION

The analysis shows that this kind of feedback (shared regulation) is much more frequent in groups using the AT. Figure 3 makes this result more visible.

Figure 3. Interactions associated with shared regulation in the cognitive dimension



Note: These types of feedback refer to: Negotiation, Elicitation, Integration aimed at consensus.



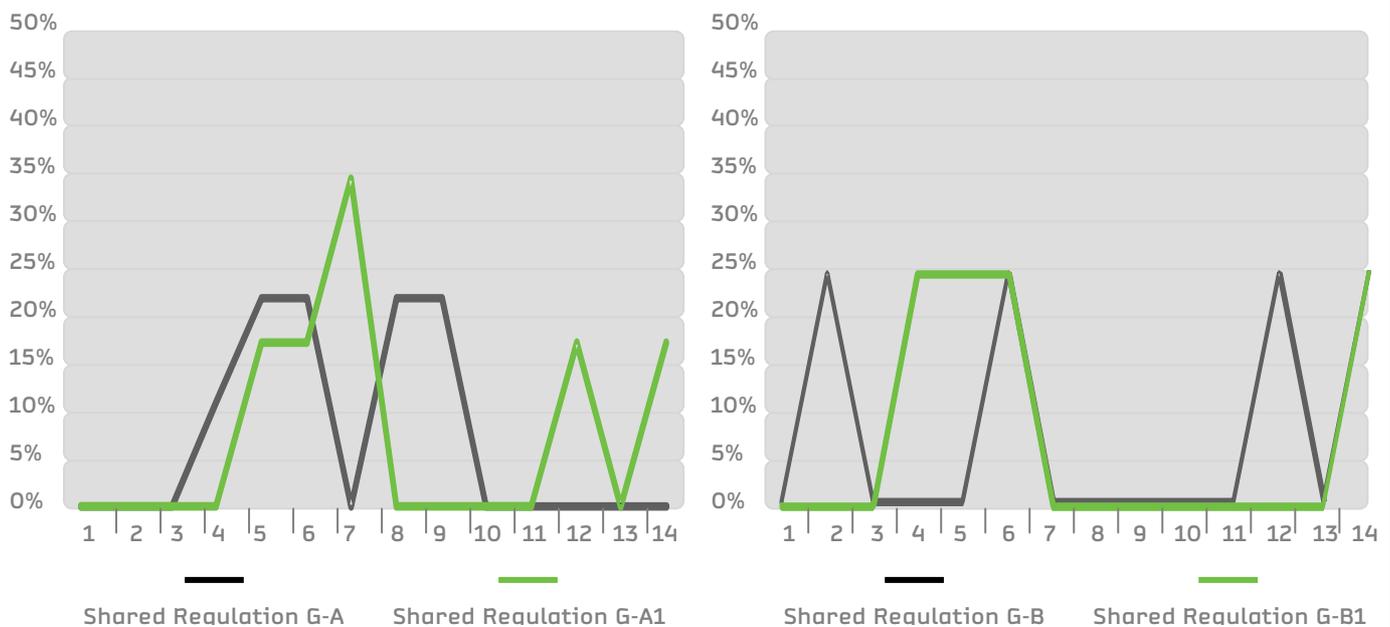
Regarding the groups with the highest grades (GA and GA1), the time range where these types of strategies can be observed is wider. As noted before, it appears later in the week, as feedback to individual contributions. However, the continuity of contributions over time for the groups with the lowest grades

(GB and GB1) makes the discussion more difficult. The time to perform the task is delimited and discontinuous contributions lead to open threads without conclusion, because students cannot negotiate or integrate ideas being discussed.

D) INTERACTION ASSOCIATED WITH SHARED REGULATION IN THE SOCIAL DIMENSION

Concerning this kind of feedback, students in better-performing groups (GA and GA1) show a more regular use of these strategies to regulate their interactions. See figure 4.

Figure 4. Interactions associated with the Shared regulation in the social dimension



During discussions, the strategy named "Mutual perspective" stood out among the messages involving the contribution of other group members. This strategy is in fact very favorable for joint construction of meaning in collaborative groups, especially in an online learning environment where written communication is the only signal that can guide action (Järvela and Hakkinen, 2002; Wegeriff, Mercer and Dawes, 2006). With this type of feedback each participant can not only add their contribution to the set of

inputs (interdependency), but they can use the 'message history' to "talk to others" when writing messages.

Also, the feedback associated with shared regulation in the social dimension is the most usual strategy in the UOC campus, which can probably be explained both by the greater familiarity of students with this tool, as well as by its collaboratively-oriented design. As stated by Stahl (2003), in order to engage in collaborative activities, students must come to

recognize the meanings of artifacts, and interpret these meanings from their own perspectives.

Finally, it should be noted that there are some differences in the application of the peer-feedback strategies between the groups analyzed, especially for shared regulation in the cognitive dimension.

Groups working with the AT show higher single employment rates and combinations of this type of feedback; a call for reasoned-participation from others (Elicitation) makes Negotiation and Integration of ideas easier.

Regarding the modalities of feedback that students employ to regulate the group's social

activity, there are also some differences between the groups according to the communication tool they used. Regarding students' SRL, Monitoring and Self-evaluation prevails (monitoring stands out significantly in the UOC campus, particularly in the group with higher grades). In the AT, the group with lower grades did not employ this kind of feedback. If there is no other signal, the absence of such a message could be interpreted as an "absent student", which could discourage and even frustrate participants during the collaborative task affecting group's climate management.

CONCLUSION AND IMPLICATIONS FOR PRACTICE

In our study, we hypothesized that groups with better grades in their final written report - demonstrating a higher quality of reasoning - were also the groups that maintained continuous and focused interactions in their discussion space. Through the microgenetic explorative analysis of the four groups with highest and lowest grades it was possible not only to confirm this hypothesis, but also to observe the interaction patterns followed by the groups in order to achieve such a result.

The most notable interaction strategies observed in the groups with best grades combined social and cognitive SRL in a balanced and in a continuous way, such as: Individual Monitoring, Self-evaluation and Exteriorizing; and shared-regulation such as: Mutual perspective, Negotiation, Elicitation, and Integration aimed at consensus. In contrast, the interaction patterns in the groups with lower grades showed not only a less strategic combination of social and

cognitive self- and shared regulation but also a very discontinuous interaction. All this has an effect on constructing and maintaining a shared concept of the issue discussed. The most notable interaction strategy employed by these groups was 'Exteriorizing' as a cognitive self regulation; and Negotiation and Elicitation for the shared regulation.

The strategic combination of social and cognitive regulation strategies found by the groups with best grades, which are possible through the continuity of their interactions, coincides with the results found in a previous study of Lopez-B (2009).

The virtual environment which supported groups' discussion did not seem to affect the way students engaged in the activity, but the results show that groups using the tool for annotations focused more on providing feedback on cognitive matters, and therefore the employment of such strategies, while the space for discussion at the UOC had a more



balanced employment of strategies in both social and cognitive aspects through a collaborative discussion.

We have noted a lack of feedback related to planning, in contrast to the majority of studies along the SRL lines (Zimmerman and Tsikalas, 2005). We consider that this may be related to specific characteristics of the task, since it was a short-term task, an extremely detailed one, and it was also an experimental situation.

Results suggest some implications for practice in online learning environments.

First, from the different strategies employed according to the technological tool, one can assume that it is important to know which behaviors are promoted by each one in order to ask the students to use them. Thus, as the Annotation tool focuses more on cognitive than on social regulation, it seems easier to use it to make the students go straight to the task objective. This could be especially useful, for example, when students have scarce previous knowledge, when the time for the task is short, or even in groups with lower social skills. In addition, having the opportunity to choose between two different tools for discussions could be a chance for teachers to attend to students' differences in cognitive styles.

Second, as both relational and content-related strategies seem to be necessary for a better performance, combining both tools (or at least their functionalities) seems to be the best way

to succeed in collaborative discussions demanding a written document as a final product. The forum could be used to schedule and to regulate the procedure, and at the same time the annotation tool could serve to perform in the content-related part of the task. Ideally, both functions would need to be integrated in one single tool.

Third, despite the tool being used, groups with higher grades show more cognitive feedback. The ones using the UOC's space show this feedback in specific moments and the ones using AT show it throughout the task. It could be interesting to train students in giving specific cognitive-oriented feedback by means of, for example, exercises where the student has to ask relevant questions about a text, or even using a template training specific strategies.

Finally, even though our results show that self- and shared continuous regulation correlate with better performance, students did not plan their discussion well. We believe more planning activities could increase the continuity of students' interaction, therefore we suggest teachers ask the students to plan and pace their activity, in order to promote regular feedback. Usually, questions and formulations only include explicit objectives and materials, but few say something about procedural instructions. Giving students more orientation in this point could possibly contribute to a better performance in online collaborative learning.

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APPENDIX

CATEGORIES AND DESCRIPTORS

Categories of social regulation with descriptors

Regulation modes

Descriptor

External:

Structuring the task (OrT): Questions and suggestions on the organization, procedure, roles, resources, timing, format text, control of the task, etc.

Social Reinforcements (RS): Emotive interventions supporting the ideas or performances of others because they positively impact on cognition or motivation of the rest of the group.



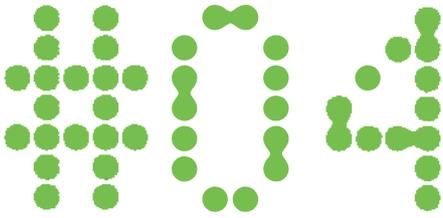
- Self-:**
- Self-evaluation (AeV): Interventions showing assessment of previous knowledge or experience; which may contribute to the successful completion of the task or showing what solving the task will mean in terms of meeting the demands of their daily context.
 - Situating the learning process itself (SA): Students understand the objective of the task, relate it to previous knowledge and consider what they need to do in order to achieve the objective.
 - Individual Planning (PI): Students consider the available time and resources they have, in order to determine their contribution and voluntarily take on responsibilities.
 - Monitoring participation (MI): Controlling management of their own participation.
- Shared:**
- Call for accountability/ participation from others (IR): Interactions requesting help or collaboration from their peers, in keeping with the organization and development of the task.
 - Mutual perspective (PM): Interactions communicating a mutual agreement, an idea is considered, evaluated and reinforced.
 - Short and quick consensus (Ccr): Interactions showing agreement or neutrality with a suggested idea.

Categories of cognitive regulation with descriptors

Regulation modes

Descriptor

- External:**
- Clarifying the task (ExT): Non-argumentative interactions around the common objective. The objective of the task is analysed, clarified, reformulated, and reviewed.
- Self-:**
- Exteriorising (EX): Non-argumentative interactions offering information with textual content or expressing points of view on the content to analyse, without making any reference to previous statements.
- Shared:**
- Elicitation (Eli): Interventions which directly or indirectly demand a reaction from another peer, in keeping with the content of the task.
 - Negotiating meaning (NS): Reasoned interventions offering proposals, alternatives and complements to the information exchanged, with the intention of reaching an agreement.
 - Integration aimed at consensus (IoC): Reasoned interventions showing consensus by integrating their own reflections with the information offered by the others.



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FORMATIVE E-FEEDBACK IN COLLABORATIVE WRITING ASSIGNMENTS

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Formative e-feedback in collaborative writing assignments: the effect of the process and time

ABSTRACT

Writing is one of the most common activities in higher education, and is essential if we are situated in virtual learning environments based on written communication. However, the fact that it is a customary activity does not mean that it is specifically taught or that guidance is given to help students in the academic writing process (Lonka, 2003). In fact, the opposite often happens; students are already expected to know how to write in different contexts. Nevertheless, students require specific support from teachers and their peers to enable them to deal with the processes and products of academic communication. Feedback could be one type of support, seen as a joint activity which entails active interaction between students and the teacher, including how students receive and

utilise the feedback (Dysthe, 2007), but not all kinds of feedback are effective.

This study thus explores the impact of formative e-feedback on students' texts written collaboratively in an online learning environment and also it explores when the e-feedback takes place in a way which contributes to the inclusion of more complex arguments in academic texts. A proactive reaction by the students was caused in response to feedback. This happened when they received messages questioning their work but also suggesting changes, in addition to correction. The pattern that seems to generate quality changes in collaborative text revision processes is initiated by teacher elaboration feedback, which generates

discussion among the students and, as a result, leads to contextualised changes to the text.

Proposing regular feedback that requires discussion among the students turns out to be

an essential strategy to encourage high quality revision of texts written collaboratively in an online learning environment.

KEYWORDS

e-Feedback; Writing; Collaborative task; Higher education; Online learning environment; Timing of feedback.

INTRODUCTION

Writing is one of the most common activities in higher education and is essential in virtual learning environments based on written communication. According to Teberosky (2007), the text "is a construction of constructions, the result of an act of communication, whose discourse has the purpose of arguing with, convincing and persuading the scientific or academic community" (p.18). However, the fact that it is a customary activity does not mean that it is specifically taught or that guidance is given to help students in the academic writing process (Lonka, 2003). In fact, the opposite often happens; students are already expected to know how to write in different contexts.

Moreover, writing is a task which requires high cognitive skills, including the student knowing how to self-regulate their own learning process (Bangert-Drowns, Hurley and Wilkins, 2004). According to Dysthe (2001), "learning to become a better writer happens in the same way as learning to become a better thinker. Writing is thinking-made-tangible". Or as Professor Anna Camps explained (2007, p.10), "Listening to and monitoring students during their preparation of a research paper illustrates this coming together of tensions and enables us to

understand the complex way in which knowledge is constructed through writing. Doing a thesis and learning to research a particular field of knowledge will not mean producing content and adjusting it to the characteristics of a type of text previously established by the scientific community, but will mean learning to participate in the exchanges typical of this community, appropriating the discourse genres inherent in it and, at the same time, learning to have a voice in this field of tensions involved in complex learning processes". We wish to place an emphasis on the epistemic function of writing and, therefore, on how to contribute to the construction of knowledge. Students therefore require specific assistance from teachers and their peers to enable them to deal with the processes and products of academic communication. This is one of the challenges faced by universities: equipping students with the appropriate knowledge and tools to communicate in academic and scientific contexts (Castelló et al., 2007). It is a challenge which is emphasised in the European Space for Higher Education.

However, writing is not necessarily associated with an individual activity; at many points of the academic process students are required



to face the task of writing collaboratively. It is one of the interdisciplinary skills which we must also help to develop in the university field.

Within the framework of the tasks of collaborative writing, producing a text with other people poses one of the most complex challenges, as writing activities are usually self-planned, involve personal initiative and constant effort. One of the objectives of collaborative writing is to encourage the exchange of thoughts and ideas with others and to make peer assessment with a formative function possible (Topping, Smith, Swanson and Elliot, 2000).

According to the socio-constructivist approach, we believe that argumentative strategies define the quality of a collaborative text. We therefore wish to highlight the contributions of Reznitskaya, Kuo, Glina and Anderson (2008), which are summed up in the description of the Argument Schema Theory (AST), in which during a discussion the participants organise the information (preparing relevant arguments) and then recycle this information in order to prepare new arguments. It is thus assumed that knowledge emerges from group debate during cooperative tasks, is fundamentally dialogical and makes reference to social influences on the development of reasoning.

Furthermore, being skilled in writing processes offers clear advantages in comparison with oral communication, as it requires and at the same time enables planning and reflection on the discourse itself (Garrison and Anderson, 2003). A teaching and learning environment based on written communication allows the difficulties posed by face to face environments for the collaborative construction of a text to be overcome. This circumstance can be exploited by the teachers and students collaborating in the writing.

As we have pointed out, the development of academic, and specifically collaborative writing skills, requires specific educational support, such as feedback. In this case we will take a look at e-feedback, the focus of this article. The concept of e-feedback makes reference to the feedback offered in a virtual learning environment. We define it not only as a response given to an activity but also as a joint activity which involves active interaction between the students and the teacher, including how students receive and utilise the feedback (Dysthe, 2007). Furthermore, our focus generally assumes that feedback is a type of support received by the student which should encourage learning regulation processes (Espasa, 2009). It is therefore considered that feedback must contain a formative component which focuses it on the improvement of the learning process. Authors such as Chickering and Ehrmann (2008), Gibbs and Simpson (2004) and Dysthe et al. (2010), underlined the necessary condition that feedback should be given immediately in order for it to provide a response to this formative and epistemic function. It is precisely this time factor which forms the focus of interest of this article. Along these lines, Gibbs and Simpson (2004) pointed out that one of the conditions for evaluation to contribute to learning is for "feedback to be timely, in that it is received by students while it still matters to them and in time for them to pay attention to further learning or receive further assistance".

More specifically, it can be defined on the basis of the idea proposed by Narciss (2008). This author identified three dimensions in relation to feedback: the function it performs (functional dimension), the characteristics it has with regard to the content it transmits (semantic dimension) and the characteristics it adopts on a formal level (structural dimension). For further details on the conceptualisation of feedback and the

development undergone by this concept see the article by Professor Espasa in this research paper series. Based on a previous study (Alvarez, Espasa and Guasch, in press), and taking into account the idea proposed by Wolsey (2008), we have characterised the teacher's feedback in relation to the type of content (semantic function) that it must transmit:

- A) Clarification: elucidation of ideas, reformulations, completing an idea in relation to the content.
- B) Affirmation/negation: stating whether something is true or not.
- C) Argumentation: includes well-argued reflections, personal opinions or observations regarding the content in a well-argued manner, justifications, explanations, etc.
- D) Personal Opinions: ideas or interpretations on the content, linked to their own personal experiences.
- E) Correction: Comments regarding the rules to be followed, the assignment requirements, the content.
- F) Question: request for explanation, clarification.
- G) Suggestion: advice on how to proceed or progress. Invitation to explore, expand or improve the work.

The results of the aforementioned study,

METHODOLOGY

The study is focused on the analysis of a collaborative writing activity in an online learning environment. It involved 83 students of a two-year postgraduate course on e-learning at the Open University of Catalonia.

focused on collaborative academic writing activity in an online environment in a university context, make it clear that feedback given by the teacher is focused on content, over and above a focus on their interventions in the text structure (parts in which it must be structured) or the style (grammar, language, etc.).

However, for different reasons this educational support is not sufficiently shared among the teaching community, nor is it sufficiently adapted so as to contribute to the development of skills to collaboratively construct an academic text through the Internet. These reasons include, among others, a lack of empirical evidence to explain what this support should be like, an approach to teaching in virtual contexts which sees learning as an exclusively individual and independent process, or the fact that the method of teaching is simply transferred from a face to face environment to a virtual environment (Kirschner, Sweller and Clark, 2006).

This research is intended to answer the question of what it should be like and when e-feedback takes place in a collaborative writing task which contributes to the inclusion of more complex arguments in academic productions, giving special importance to the process and the time at which feedback is provided in a writing activity developed in a virtual learning environment.

This University has been fully online since its foundation (more information about its pedagogical and assessment models can be found on the university's website: <http://www.uoc.edu>). It can be seen as a



representative university where the whole teaching and learning process is on an online platform.

The educational activity is based on the development of several continuous assessment assignments (such as collaborative or individual essays, case studies, problem-based learning, discussions, etc.) through the virtual campus. As part of the course which forms the object of study of this research, collaborative learning case study techniques are frequently used.

The study took place during the second assignment of one of the courses, specifically during the evaluation of the results of the assignment, which consists of writing a critical essay on the in-depth study of a case based on innovative projects applying Information and Communication Technologies, over a period of two weeks.

The aim of this type of activity is for the students to submit a second version of the assignment being evaluated, presumably improved as a result of the feedback. In this study we also analysed the changes made to the second version of the work under review, with the objective of assessing the changes and/or improvements made to the arguments in the revised assignment.

CONTEXT

Teacher and students' feedback and their assignments have been analysed. For the analysis of feedback, the unit of analysis was defined as an episode, corresponding to an extract of joint activity (segment of interactivity), which shows a certain participation structure and maintains a discursive unity. The episode was made up of the teacher's intervention and the students' response to the feedback received.

The teacher feedback categories correspond to the characteristics presented in the introduction.

To establish the reliability of the coding system, one of the students groups was selected at random and evaluated by four external judges (researchers/teachers in a virtual university). One of the judges was the course teacher and was therefore familiar with the content.

To evaluate the quality of the texts, we used the categories proposed by Reznitskaya et al. (2008), which were produced to assess the quality of jointly-constructed arguments. In essence, attention is paid to how ideas are supported by relevant arguments, highlighting four different forms:

- 1) Textual: ideas are extracted more or less literally from previous readings,
- 2) Hypothetical: statements referring to probable actions,
- 3) Abstract: generalisations on causes and/or consequences of certain behaviours and,
- 4) Contextualising: statements that reframe the situation by considering the context, audience, etc.

With these criteria in mind, the teacher checked the students' assignments and later repeated this analysis with the second version of the assignment, taking into account that the evaluation was performed so as to offer an opportunity to improve the text (formative assessment). In order to analyse the changes made to the text, a tool from Microsoft Office Word was used. This software compares versions of the same document and identifies areas where differences can be found.

RESULTS AND DISCUSSION

The results presented here are just part of a broader study. For a more extensive and complete version of the results Alvarez, Espasa and Guasch (in press) can be consulted. Nevertheless, the key contribution highlighted in this article is the importance of the temporal dimension of feedback. Within the framework of a collaborative writing assignment in a virtual environment, if feedback, given immediately after the first version of the text has been handed in, also semantically has certain characteristics (which are explained below), it will entail improvements in the quality of the text.

Firstly, it would seem relevant to highlight the results which correspond to the teacher's feedback when the assignment is first handed in, and the response from the students to the feedback received (see table 1). As it is expected that this feedback will influence the student's learning and entail an improvement of the argumentative text, the teacher offers

it within a short period of time after the text has been handed in. A formative function of the evaluation is thus facilitated as it will give students the chance to modify, correct and, in short, improve their arguments, revising the text on the basis of the content of the teacher's feedback, prior to its final evaluation.

The students' response was categorised as follows.

- A) No response or comment on teachers' feedback.
- B) Confirmation of feedback received.
- C) Comment on teachers' feedback.
- D) Suggestion to make changes in the text.
- E) Discussion between students and with the teacher about the feedback received.

Table 1. Percentage of teacher feedback and student responses

Teacher feedback	Episodes (N)	Estudent responses				
		No Response	Confirmation	Comment	Suggestion for changes	Discussion of changes
Clarification/ Affirmation/ Negation/ Opinion	21	60%	5%	30%	0	5%
Correction	55	5%	45%	10%	30%	10%
Suggestion	57	9%	9%	12%	47%	23%
Correction and/ Or Question + Suggestion	14	0	0	20%	8%	72%



The results of the table show that the responses vary depending on whether they received informative feedback (i.e. correction, clarification or expressing agreement or disagreement with the ideas presented) or more complete feedback in which, apart from corrections there were also suggestions or questions by the teacher to encourage learning. In the case of informative and corrective feedback, most students either do not react to the intervention or merely confirm it. In relation to feedback which includes suggestions by the teacher (proposing the extension of a piece of information, or revising a concept, sentence or idea, etc.), students understand that they must suggest changes, improve their arguments and therefore propose modifications in the text. Lastly, when the teacher corrects, he or she also asks a question (i.e. Are you sure that this proposal is sufficiently clear?) and suggests how the error or problem could be addressed. The students react by discussing with each other how to improve the quality of the argumentative ideas in the text (72% of episodes).

These results, beyond the interest in finding out the students' reaction to the teacher's interventions, would not have any implications for teaching or research, were it not for their impact on the changes which these types of responses cause in assignments written jointly by the students.

When the students' response to the feedback received and the changes made to the text are analysed, a significant relationship appears ($r=.341$, $p \leq 0.01$). This means that students' assimilation of feedback has an impact on the changes they make to the texts. When the request is for confirmation or a comment or suggestion for a specific change in the text, the students simply add the information that they are asked for (textual and hypothetical

arguments). 63% of the episodes are made up of textual and hypothetical arguments, and any episodes with contextualising arguments. However, it is important to indicate the change which occurs when the students discuss with each other the suggestions received from the teacher. More than 50% of the episodes are made up of abstract and contextualising arguments (the highest levels in the categorisation by Reznitskaya et al.). In this case, there is a significant inclusion of abstraction and also more contextualised arguments. These results make clear the need for this type of feedback to be given immediately after the end of the collaborative online discussion, at the time when the text or report on the discussion is handed in and prior to its evaluation if this is the product which gives an account of the learning undertaken. Our results do not enable the benefits of immediate feedback to be confirmed. However, according to the literature in this field (Chickering and Ehrmann, 2008; Gibbs and Simpson, 2004), it can be said that in the case of a collaborative writing assignment, when the feedback is immediate and performs a formative function, improvements in the final version of the text are seen. It can thus be confirmed that the epistemic nature of feedback has a direct influence on the improvement of the texts and makes the task of writing easier, even more so if it is undertaken collaboratively.

Shown below is an example of how the teacher's feedback, based on comments and suggestions on the assignment produced jointly by the students during the critical study of a case, leads to a discussion on the content in the collaborative group, which ends up generating more complex arguments (the last level of categorisation) to improve their report (the argumentative text which is being revised).

Illustration 1. Example of the process followed by the teacher and students during feedback.

Teacher feedback Comments + suggestions	Students' text (The limitations of the text are highlighted)
	<p>7. Una labor muy importante por parte del responsable que no aparece contemplado, al menos explícitamente, es la de asegurar la calidad. No hay constancia de que exista buena comunicación entre los miembros, que se cumplan fechas de entrega, que exista un trabajo colaborativo de apoyo, ayuda, respaldo...</p> <p>8. Falten estrategias de motivación del grupo de trabajo.</p> <p>Elaboración de un prototipo</p> <p>El producto del proceso de producción es, pues, los materiales del curso preparados para la prueba piloto. Una vez que el curso se crea, es importante hacer pruebas piloto con un grupo representativo de estudiantes diversos, profesores del posgrado y los responsables. La prueba piloto proporcionará información valiosa acerca de qué funciona y qué no funciona.</p> <p>Se observa que esta primera propuesta está centrada demasiado en la transmisión de información. Se aprecia que los usuarios utilizan las herramientas de comunicación (debates, foros) de manera intuitiva pero sin ser conscientes de su importancia y significado.</p> <p>Nuevamente en la aplicación de la prueba piloto se aprecia que no existen unas pautas claras acerca del diseño del proyecto. De hecho, la creación del tutorial surge ya en un estadio avanzado del proyecto a instancia de una colaboradora que ha probado el entorno. La implementación de éste surge a través del procedimiento ensayo-error y a través de las sucesivas fases de evaluación, monitoreo y seguimiento.</p>

Revised text by the students
Inclusion of: information + examples / evidence + conclusions

7. Una labor muy importante por parte del responsable que no aparece contemplado, al menos explícitamente, es la de asegurar la calidad. No hay constancia de que exista buena comunicación entre los miembros, que se cumplan fechas de entrega, que exista un trabajo colaborativo de apoyo, ayuda, respaldo...

8. Falten estrategias de motivación del grupo de trabajo

A la vista, de los puntos débiles que hemos detectado en el equipo de producción, derivadas de la fase anterior de diseño, el fallo principal es que el equipo de producción no trabaja de forma colaborativa: no se ha establecido los roles de los miembros, no tiene un plan fijado de actuación, ni una meta, es más no están motivados para este trabajo.

Elaboración de un prototipo

El producto del proceso de producción es, pues, los materiales del curso preparados para la prueba piloto. Una vez que el curso se crea, es importante hacer pruebas piloto con un grupo representativo de estudiantes diversos, profesores del posgrado y los responsables. La prueba piloto proporcionará información valiosa acerca de qué funciona y qué no funciona

Se observa que esta primera propuesta está centrada demasiado en la transmisión de información. Se aprecia que los usuarios utilizan las herramientas de comunicación (debates, foros) de manera intuitiva pero sin ser conscientes de su importancia y significado.

Nuevamente en la aplicación de la prueba piloto se aprecia que no existen unas pautas claras acerca del diseño del proyecto. De hecho, la creación del tutorial surge ya en un estadio avanzado del proyecto a instancia de una colaboradora que ha probado el entorno. La implementación de éste surge a través del procedimiento ensayo-error y a través de las sucesivas fases de evaluación, monitoreo y seguimiento.

En conclusión, podemos decir que se detecta que este proyecto no ha sido asumido como propio por el equipo completo, ni se ha valorado por partes de todos los canales de comunicación (por desconocimiento). La UPESA ha debido crear y motivar a este equipo, estableciendo un grupo colaborativo que asuma el proyecto como propio y dándole una formación básica previa sobre e-learning.

Adding information:
Explains some background information which is important for the further development of the central ideas.

Contextualised idea:
Adding a statement that reconstructs the idea, and synthesizes the idea, with regard to context, audience, etc.



These results corroborate and illustrate the initial presumption in relation to the value of the group context for the joint construction of meaning; in this case argumentation. Through their exchanges, and especially through discussion, the students are able to improve their argumentative schema, re-work the

information and produce new ideas. Indeed, knowledge resulting from group discussion during collaborative assignments is essentially dialogical and reveals social influences during the development of reasoning.

CONCLUSION AND IMPLICATIONS FOR PRACTICE

This study explored the impact of formative e-feedback on students' texts written collaboratively. It was formative feedback because students had the chance to receive feedback during the writing process, and afterwards were able to make modifications within the stipulated time.

A proactive reaction by the students was produced in response to feedback. This happened when they received messages questioning their work but also suggesting changes, in addition to correction. When the message of the feedback is only corrective or simply expresses an opinion of the teacher, it does not seem to generate any responses in students other than, basically, confirmation. The pattern of activity which seems to generate changes in quality (Reznitskaya et al. 2008) in the revision processes of collaborative texts thus begins with elaboration feedback by the teacher, which generates discussion among the students and therefore ends up causing contextualised changes in the texts. Proposing requests which require discussion among the students ends up being a fundamental strategy for promoting a revision of the quality of texts produced collaboratively in an online formative environment.

This study therefore highlights the importance of student participation in the assessment process. In writing collaborative tasks, feedback designed as an interactive

and communicative process promotes student involvement in the learning process. As a result, through the evaluation, they can improve their skills for writing together. Nevertheless, this design makes sense if the students are made aware beforehand that they will have an actual chance to submit a revised version of their text based on the feedback discussion. That is to say, the evaluation is seen as an opportunity for learning, with a focus on its formative function.

In relation to the temporal dimension of feedback, the results obtained in this research enable us to confirm that in order to facilitate the learning of writing associated with a collaborative discussion in a virtual environment, the time sequence of study activity must provide for immediate feedback at the end of the discussion, when the students include the knowledge produced during the exchange in a text. During this time, which forms part of the study activity, the students again take up the content of their discussion, reflected in the texts that they produced, and revise it with the help of the teacher's comments (feedback on the writing). This time lag enables students to reflect on their learning, particularly with regard to the quality of the ideas expressed in their texts. They can then make any appropriate changes in order to hand in a text which better reflects the constructed

jointly knowledge. The importance of allowing for a time in which students can revise the initial text and have the option of handing it in again is crucial to promoting the epistemic function of writing, particularly in collaborative work. In conclusion, the results obtained in this exploratory study confirm the initial theoretical presumptions in relation to the definition of feedback. That is to say, it

includes an elaboration component which offers the students information which goes beyond mistakes and/or correct answers. It is a form of feedback that includes guidelines on how to improve the assignment. This type of feedback is really an educational support, as we could consider it as appropriate, timely and constructive feedback.

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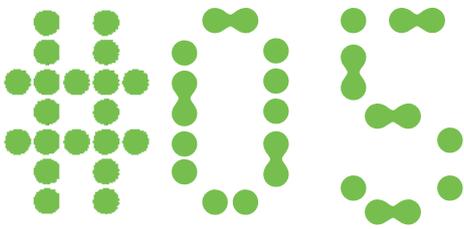
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TEMPORAL STRUCTURE AND FLEXIBILITY

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Temporal structure and flexibility in distance work and learning

ABSTRACT

Autonomy in work organisation and temporal flexibility are viewed as two major advantages of remote work and distance learning. However, in the field of telecommuting, temporal flexibility may be restricted by organizational or social constraints. Moreover, flexibility is usually indirectly and subjectively measured. This paper proposes an objective and replicable technique to measure scheduling and the temporal flexibility of tasks. Twelve teleworkers participated in a

study using this technique. Results showed that telecommuting leads to a lengthening of predicted work duration relative to legal work duration. Temporal flexibility was not very high and varied according to tasks. The less flexible tasks were scheduled first by teleworkers and served as anchors around which they scheduled their other activities. Finally, the scheduling technique presented here may also be useful for studying temporal factors in distance learning.

KEYWORDS

Time flexibility; Measurement technique; Scheduling; Telecommuting; Temporal structure.

INTRODUCTION

The development of distance learning using new communication technologies presents multiple advantages for students. Students view temporal flexibility as a major factor for choosing this kind of learning (Romero, 2010). With distance learning, students feel it may be easier to accommodate the various need of work, family and study. A parallel can be made with telecommuting. Although presented as a new way of working that is advantageous both to companies and employees, the reality of distance working is quite the opposite. While workers reported a positive feeling about perceived autonomy and job satisfaction, for example (Gajendran & Harrison, 2007), finding an appropriate balance between different life domains was neither easy nor instantaneous (Metzger & Cléach, 2004). In this paper, we will focus on the temporal dimension of remote working. A major problem with previous research on telecommuting lies in the methodologies chosen to study those situations (Steward, 2000). For the most part, these studies have used questionnaires or interviews in which subjects give their subjective impressions. An objective and replicable method is lacking, especially for measuring temporal flexibility. This paper proposes such a method, inspired by scheduling models taken from work on Artificial Intelligence. After defining the temporal characteristics and requirements of remote working, we will review the main results of studies on time management in telecommuting. Then we will present a study that uses a replicable technique to accurately measure temporal flexibility. After discussing the main results, we will examine how this technique may also be useful in the domain of online learning.

Telecommuting, like online learning, implies

distance from the place where the result of the work is expected (organization or academic centre). For telecommuting, depending on the employee's contract, the duration of distance work may vary from 1 or 2 days per week to 100% of work time. In all cases, working outside the company implies greater autonomy in the management of work time. According to Macan (1994), time management requires three important factors:

- 1) Setting goals and priorities,
- 2) Making lists, planning, scheduling ("mechanics of time management"),
- 3) Preference for organization.

In fact, distance learning or working requires not only that an employee manage his or her own working time, but also that they coordinate with others' schedules. The idea of being able to communicate with each other at any time and in any place may raise problems not only for personal time but also for compatibility with others' time. When the work is done from home, which is not always the case for teleworkers but certainly more frequent for online learning, another constraint is the family's schedule (children, spouse). Temporal flexibility, viewed as a major advantage in remote working, is in fact limited by organizational and social constraints (Konradt, Schmook & Maleke, 2000). Moreover, there is often a gap between stated and real flexibility (Steward, 2000). Teleworkers feel privileged because of their situation, so they count work hours differently: they do not count short breaks or their overtime. In fact, more than flexibility, the reality of teleworking is often a



significant extension of work duration (Metzger & Cléach, 2004). Another source of the difference between real and perceived flexibility may be linked to a confusion about terminology. Often, temporal flexibility is confused with reactivity. Teleworkers generally appreciate being able to react to unforeseen events or emergencies, which is obviously reactivity. Temporal flexibility is a priori associated with fewer temporal constraints, but as will be seen later, this lightening or even removal of constraints is not usually associated with success in teleworking. Lastly, as already mentioned, flexibility is most often measured subjectively, and this may lead to various interpretations. On the whole, remote working generally leads to greater autonomy in time management and more temporal flexibility. However, there are organizational and social constraints that may reduce this flexibility, and there are also differences between 'objective' and perceived flexibility, which raises the question of how teleworkers manage their time.

Teleworkers are a very heterogeneous population. Although it is difficult to establish a precise definition, a teleworker may be considered to be an employee who works outside of his or her firm relatively regularly and during a variable period of time. Contact with the firm and colleagues is made through telecommunication (email, phone, internet, etc.) (Metzger & Cléach, 2004). Some teleworkers are volunteer for this kind of work, but it is not always the case. The experience is generally less positive when this option is forced on the employee.

The temporal distribution of work in these situations is generally fragmented. Teleworkers report frequent interruptions for doing domestic tasks like the laundry or cleaning (e.g. Tietze & Musson, 2002). Those little breaks are not seen as problematic because the perceived flexibility enables them

to complete the work at other times. Consequently, as already mentioned, the counting of work time is very different for telecommuters. Usually, they do not count short breaks or meals, but neither do they count overtime. The duration of work for a day is often much longer than a traditional day of work (Metzger & Cléach, 2004; Steward, 2000). This perceived flexibility in fact leads to a lengthening of the working period, especially in the evenings and on weekends. The main difficulties mentioned with telecommuting are social isolation and overlapping of work and family spheres (Konradt, et al., 2000; Steward, 2000). However, a meta-analytic review of 46 studies (Gajendran & Harrison, 2007) showed that telecommuting had small but beneficial effects on work-family conflicts: a negative correlation appeared between telecommuting and work-family conflict. Despite the fragmentation of work, teleworkers perceive working from home as being very effective (Tietze & Musson, 2002). Their engagement in work is intensive because of the absence of interruptions which are frequent in the traditional office. In fact, interruptions may be accepted if they can be controlled by the worker and do not come from others in an unexpected manner. Teleworkers have the feeling that they do more work in less time. The decision of how to use this "extra-time" differs depending on the person. Some teleworkers feel obliged to invest this time in more work (this is compatible with the extension of work duration). The conditions for success with teleworking appear to relate less to the elimination of temporal constraints and more to a modification of them. Boundaries and constraints are necessary for working successfully at home. In the study by Tietze and Musson (2002), respondents to the interviews said that they had self-discipline and routine behaviours associated with the beginning and ending of work. A temporal structure is a necessity to succeed in the

management of work time, even though the boundaries may be blurred. Steward (2000) found three organization modes for teleworking:

- 1) Conservation of a traditional practice from 9 am to 5 pm for example ;
- 2) Working out of phase, without temporal structure: working all day or through the night; and
- 3) Establishing a new temporal structure allowing the integration of the different life domains (work, family, leisure).

The second mode of telecommuting often leads to failure. The first may cause tensions with family life, while the third is the most efficient but would appear to be less easy to put into practice (cf. Metzger & Cléach, 2004).

Almost all studies about telecommuting have used interviews and questionnaires about the lived experience of teleworking. Participants explained their usual organization a posteriori after the work had been done. While there may be autonomy in time management, it may be important to have information about the planning and scheduling of tasks (cf. Macan, 1994). Given the prominence of maintaining a temporal structure for the success of telework, it is important to analyze whether temporal flexibility actually occurs in teleworking or whether it is merely a perception of workers. Here we present a technique that may provide information about those two points. This 'temporal constraints scheduling technique'¹ (TCST) (Valax, 1998) was used with twelve teleworkers.

METHODOLOGY

PARTICIPANTS

Twelve teleworkers participated in the experiment. Seven of them practiced 'nomad' telecommuting, for example, working in several teleworking centers, in their firm, at customers' workplaces, or at home. Five of them practiced 'pendular' telecommuting - that is, working between the firm and a teleworking center. The first mode of telecommuting may be considered as full-time telecommuting whereas the second is more occasional. All the participants worked in the field of Information and Communication Technologies.

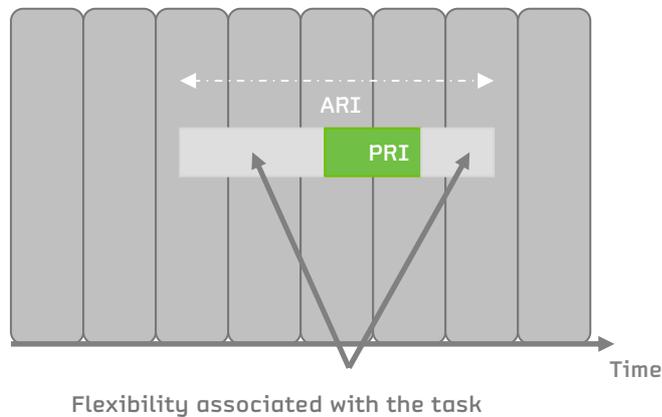
MATERIAL

We used the TCST which consisted of presenting a time scale to the participants. They had to schedule a particular task. The participant had to graphically represent a given task by two interlocked intervals . See figure 1:

- A) An Admissible Realization Interval (ARI), symbolizing the distance between the earliest start date and the latest possible end date of the task. The ARI thus represents the different possible places they could locate this task on the scale.
- B) A Probable Realization Interval (PRI), representing the most probable position on the time scale and the estimated duration of the task.



Figure 1. Temporal Constraints Scheduling Technique (TCST): graphical representation of the Admissible Realization Interval (ARI) and the Probable Realization Interval (PRI) for a given task.



The difference between ARI and PRI represents the flexibility of the task.

PROCEDURE

Before gathering the schedules of tasks, we needed first to define the tasks done by the participants. Semi-directive interviews enabled us to define the main tasks. Nine tasks were taken into consideration and categorized into three types:

- 1)** Production tasks (leading to invoicing) including writing (W) notes or files for the client, services carried out on behalf of the clients (S), and appointments (AP) with clients;
- 2)** Maintenance tasks (necessary for production tasks) including using Mediated Information and Communication (MIC): emails, Internet searches, meetings (M) with colleagues or superiors, administrative (Adm) tasks, auto-training (AT) with technology;
- 3)** Peripheral tasks like travelling (Tv) or lunch (L).

After defining the tasks, participants had to schedule each of the nine tasks for future days. They were given a graph with a horizontal time axis, divided into hours, and a vertical axis where they defined tasks to be carried out (among the nine that were present

on the top of the graph). They had to schedule the tasks on this daily graph, determining the ARI and the PRI for each task. A neutral example was presented first. In total, the schedules of 27 days were analyzed (13 for 'nomad' and 14 for 'pendular'). Data was collected in the telework centers.

To characterize the temporal requirements of the tasks, we also asked participants to evaluate each task on a scale of one to five based on three aspects:

- 1)** To what point the task requires the participation of other people (e.g., meetings),
- 2)** To what extent the task is divisible into smaller segments that can be done at different times (i.e., responding to emails),
- 3)** To what extent the task can be interrupted and taken up again later without much difficulty (i.e., reading emails as opposed to reading a report).

RESULTS AND DISCUSSION

We will first present the average duration of tasks for a day, then the temporal requirements estimated by subjects for each task, and, lastly, the flexibility of the tasks.

The task durations are represented by the PRIs. The sum of those durations for a medium day is equal to 11h30mn. Medium duration was lower for 'nomad' (10h05) than for 'pendular' (12h47) telecommuting. The majority of the time was devoted to production and maintenance tasks (79.7%). The PRI duration for each task was analyzed according to the type of task and the kind of telecommuting (nomad vs pendular). The only aspect that had a significant effect on PRI duration ($F(2,179) =$

29.15, $p < .0001$) was the type of task involved. Production tasks took the longest amount of time, followed by maintenance, followed by peripheral tasks. The type of telecommuting had no effect on PRI duration ($F(2,179) = 2$, NS), nor did the interaction between task and telecommuting ($F(2,179) = 0.42$, NS).

Participants had to rate the tasks from one (not much) to five (very much) according to the three aspects of temporal requirements mentioned previously: the 'collective nature,' 'divisibility,' and 'interruptibility.' As can be seen in table 1, the temporal requirements varied according to the task.

Table 1. Average estimation (five-point scale) of temporal requirements of tasks based on three dimensions: collective, divisible, interruptible. (W = Writing, S = Services, AP = Appointment, MIC = Mediated information and Communication, M = Meeting, Adm = Administration, AT = Auto-training, Tv = Travelling, L = Lunch).

Tasks	Temporal Requirement		
	'Collective'	'Divisible'	'Interruptible'
Production			
W	1,7	4	4
S	3,6	2,9	3,3
AP	5	1,4	1,5
Maintenance			
MIC	2,1	4	4,1
M	5	2	1,7
Adm	3	3,7	3,6
AT	1	3	4,5
Peripheral			
Tv	1	1	1,4
L	4,6	1,3	1,5



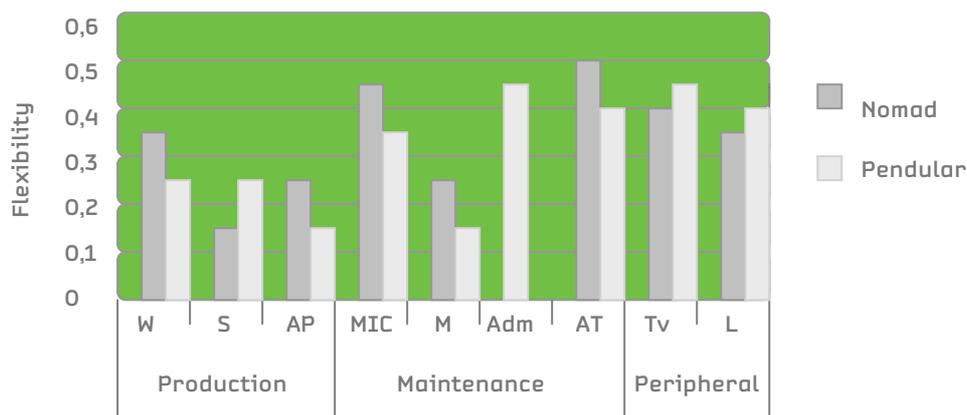
The collective dimension refers to appointments, meetings and lunches. The participants rated appointments, meetings and lunches as the most 'collective' of the temporal requirements, while writing, self-training and travel were rated the least collective.

The less collective tasks were writing, self-training and travel. The 'divisible' dimension concerns writing, using mediated information and communication. The less divisible tasks were peripheral ones (travelling and lunch). The 'interruptible' dimension characterizes the same kind of tasks as the 'divisible' ones, with self-training in more. Tasks most difficult to suspend were appointments, meetings and peripheral tasks.

Temporal flexibility of tasks is represented by

the ratio between the PRI (Probable Realization Interval) duration and the ARI (Admissible Realization Interval) duration. Flexibility (Fx) for each task unit was calculated using the formula: $Fx = 1 - (PRI - ARI)$. When $Fx = 0$, $PRI = ARI$, flexibility is minimal, when $Fx = 1$, $PRI = 0$, flexibility is maximal. As previously stated, variance analysis showed only a significant effect of the type of tasks on flexibility ($F(2,179) = 11, p < .0001$). The type of telework ($F(1,179) = 0.12, NS$) and the interaction ($F(2,179) = 1.78, NS$) had no effect. Average flexibility is equal to 0.35, which is rather low. Production tasks are less flexible (0.24) compared to maintenance (0.36) and peripheral tasks (0.42). Figure 2 shows some differences between the two types of teleworking.

Figure 2. Average flexibility according to tasks (W = Writing, S = Services, AP = Appointment, MIC = Mediated information and Communication, M = Meeting, Adm = Administration, AT = Auto-training, Tv = Travelling, L = Lunch) and type of telework (Nomad, Pendular).



In addition, the most flexible tasks are MIC (Mediated Information and Communication), administration, self-training and the two peripheral tasks: travelling and lunch. The least flexible ones were services carried out of behalf of clients, appointments, and meetings.

The purpose of this study was to test an 'objective' technique for analyzing time management of telecommuters who, at first glance, seem to have considerable autonomy in organizing their work. We wanted to see how participants actually planned their work tasks and whether there was a real temporal

flexibility in their planning. After discussing these points, we will examine what this study can contribute to research on temporal factors in online learning.

We compared two types of telecommuting: nomad (full-time teleworkers in several locations) and pendular (occasional teleworkers in two different locations). There was very little difference between these two kinds of teleworkers. The average duration of the projected work time exceeds the legal duration (10h36 instead of 7h00), and this is compatible with previous studies (Metzger & Cléach, 2004 ; Steward, 2000). Thus, it seems clear that telecommuting leads to an extensive period of work. Temporal flexibility of tasks is generally limited; however, some tasks present more flexibility than others.

Another interesting result emerged from participants' explanations. During the scheduling phase, participants were encouraged to explain what they were doing. An analysis of their explanations revealed that a number of rules governed their creation of schedules. One of these rules was to first schedule the less flexible tasks (like services for clients, appointments and meetings) and then, in a second phase, to locate the remaining tasks in the available time intervals. This kind of strategy shows the importance of having a temporal structure. Indeed, in a study on the planning of daily tasks, Valax (1986) showed that the temporal structures constructed and used by a population of farmers are characterized by pivotal tasks which had a fixed duration and location. These tasks, which provided the overall structure for the plan, served as temporal markers for the scheduling of other

tasks. In various domains, like the dating of memories (e.g. Friedman, 1993), or dynamic environment management (Carreras, Valax, & Cellier, 1999), temporal frames structured by reference points have shown their usefulness in temporal management. Moreover, sociologists claim that behaviour based on routines (structured and regular patterns) is of primary importance to develop a sense of self and identity (Tietze & Musson, 2002).

Considering the link between flexibility and tasks, our results showed that the least flexible tasks were generally the ones that had the most spatial and temporal requirements (like the collective tasks). In addition, these least-flexible tasks were also the ones that were most central to the actual nature of the job itself (i.e., production tasks as opposed to emails or lunches). The more the participants considered the tasks to be flexible, the more they also considered them to be divisible and interruptible. It seems clear that the cognitive requirements of tasks need to be taken into account in planning when and where they will be carried out. The fragmented character of work at home mentioned in the introduction may be valid for some specific tasks but is not applicable to all tasks.

The results of this study offer arguments that support Steward's hypothesis (2000) that flexibility is more a "feeling" that teleworkers have than an objective reality of the situation. However, our study is based on a relatively small sample and further research is needed before firmly establishing our conclusions. Nevertheless, the technique presented here may be a useful tool for comparing different studies.



CONCLUSION AND IMPLICATIONS FOR A PRACTICE

Telecommuting and online learning share common characteristics, such as the autonomy of work organization, the need to communicate with others (whether peers or instructors), and sometimes the need to work with other people at the same moment (synchronicity). The question about the optimum timing for scheduling discussions or feedback for effective learning are better answered in the literature on education than in the literature on time psychology. Indeed, we are mostly interested in this case in time as a dependent variable rather than an independent one; we study more how people perceive, manage or represent time than how time impacts on other activities. The psychological research on time may help studies about online learning in providing methods for measuring temporal factors. The TCST presented here allows researchers to studying planning, scheduling, and flexibility, and it can also be used to compare the predicted and actual accomplishment of tasks. These results on flexibility have two important consequences for online learning. The first concerns the low flexibility that was observed. As a large percentage of online learners already have busy schedules (work, family, etc.), the temporal flexibility offered by online learning may only result in an increased workload for these students. The second

important result relates to the link between flexibility and the cognitive requirements of tasks. To be able to plan tasks relative to learning, people have to set goals and priorities (cf. Macan, 1994), to break these down into subtasks and then to schedule these subtasks. This scheduling needs to take into account task requirements, and especially whether the task is divisible or interruptible. In fact, some tasks with a high cognitive requirement (such as writing a paper) may be difficult to suspend and easily disrupted by interruptions. These kinds of tasks are not very flexible and because of this, they need to be scheduled at specific times. Finally, the need for a temporal structure for successful teleworking may also be applied to online learning situations. In every case, “out of phase” learning prevents the student from exchanges with others. The question of sharing a temporal frame with others is difficult and has not yet been sufficiently studied (Romero, 2010). The need to coordinate and make a compromise between different temporal structures (work, home, study, other’s planning...) remains a major difficulty. More research needs to be done on this collective aspect of time management to enhance the group activity in distance work and learning.

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Footnotes

¹Technique d'ordonnement par contraintes temporelles.

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