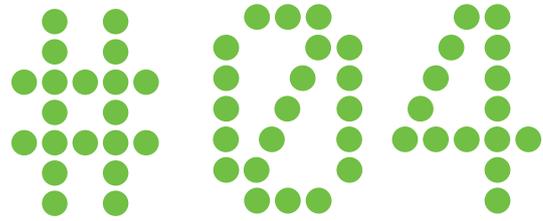


Sgreccia, N. (2012). Monitoring of the online interventions in an experience of collaborative learning with future teachers of Mathematics. *eLC Research Paper Series*, 4, 27-36.



MONITORING OF THE ONLINE INTERVENTIONS IN AN EXPERIENCE OF COLLABORATIVE LEARNING WITH FUTURE TEACHERS OF MATHEMATICS

Natalia Sgreccia

.....
sgreccia@fceia.unr.edu.ar
Faculty of Exact Sciences,
Engineering and Surveying
of National University of
Rosario and National Council
of Scientific and Technical
Researches (Argentina)

Monitoring of the online interventions in an experience of collaborative learning with future teachers of Mathematics

ABSTRACT

This paper analyses the temporal distribution of the asynchronous interventions made by a group of seven trainee mathematics teachers during online collaborative work carried out for two months in mid-2011.

As part of the Residence subject within the degree in training mathematics teachers at the National University of Rosario (Argentina), students have to prepare a report giving details of their experience of observing mathematics classes during first-semester courses on engineering degrees (or similar) and also correct their partners' work.

A set of weekly activities was drawn up to organise the task for the Residence subject. The space used was Google Docs, whose features include access to the history of revisions made

to each document, including the date, time and person working on a particular report. We used this history of revisions to analyse students' time management at four levels and tried to characterise the degree of systematisation in the process of developing their own work and peer correction.

From the results, we can conclude that this systematisation was achieved for the group overall. But there was no correspondence between what was actually done and the set weekly activities, because the interventions were concentrated in the last two weeks of the experience. One way of improving this lack of correspondence would be to get the Residence teachers and trainee mathematics teachers together at the start of the task week to prepare the set of weekly activities.

Sgreccia, N. (2012). Monitoring of the online interventions in an experience of collaborative learning with future teachers of Mathematics. *eLC Research Paper Series*, 4, 27-36.

KEYWORDS

collaborative learning; online asynchronous interventions; students' time management; trainee mathematics teachers.

INTRODUCTION

Collaborative tasks provide good opportunities to construct meaning together. However, educational practice shows that students often have difficulties in managing their time properly during these tasks (Álvarez, López-B & Hernández, 2010).

Students need to employ strategies to regulate their cognitive and social interaction and, particularly in the case of online asynchronous interventions, this interaction relies on the use of written discourse, which is the basis for collectively understanding, co-regulating, making proposals, negotiating and constructing meaning (Wegerif, 2006).

We agree that time management is a decision-making process - involving ordering, prioritising, organising, selecting, and so on - as regards time use. People in general and students in particular decide on their time use depending on the degree of flexibility allowed by the task and their own time constraints (Demeure, Romero & Lambropoulos, 2010). In this sense, students' time management is an important factor in supporting collaborative activities, where the times of different people who have to work together are involved. Students' coordination in collaborative learning requires additional organisational effort (Kirschner, Paas & Kirschner, 2009).

Collaborative work does not mean work performed by a team in which each member completes a certain section separately. Instead, it involves an organisational structure that allows team members to work together (Guitert

& Giménez, 2000). The domain for this type of work constitutes a powerful tool for future mathematics teachers, because they will continue constructing knowledge by socialising professionally with peers (Noyes, 2004). In this regard, a student who participated in the experience we describe in the next section says: *Collaborative work allows us to broaden the panorama because on some occasions you might not always have the answer or solution to a certain question or problem, but a colleague does.*

THE CONTEXT OF THE STUDY

This study is based on four core elements (Barberá, 2010): *Subject*, the recipients of the research results would be mainly teacher trainers; *Contextual*, the educational level being addressed is higher; *Technological*, the technological tools involved are 2.0 ones; *Structural*, the selected research plan is of a course.

We analysed the students' time management in collaborative learning by online asynchronous interventions on the Residence course for the degree in training mathematics teachers at the National University of Rosario (Argentina) in 2011.

Residence is an subject in the fourth and final year of the degree. The residents - people who are taking the Residence course - have to train as observers and teachers at secondary and higher levels. The subject also has a weekly face-to-face meeting (on Friday morning) lasting two and a half hours, where the residents socialise



Sgreccia, N. (2012). Monitoring of the online interventions in an experience of collaborative learning with future teachers of Mathematics. *eLC Research Paper Series*, 4, 27-36.

with their partners and the teachers of the subject, discuss their previous and current experiences and plan the next ones. At this point we mention a comment by a resident: *I tried to add questions and comments to my partners' documents in the same way in which they contributed to mine and I hope I managed it. I feel we all do excellent work together, because we work not only online but also face to face.*

We include this paper in one of the four tasks that the residents have to carry out in the subject and it is about their fieldwork in the higher level of education. The third part of the total time of the subject (300 hours) is allocated to this training and it is carried out over approximately two months, from the middle of April to the middle of June.

The technological tool used was Google Docs. This application allows access from any computer and makes it easy to collaborate by sharing a document with others as observers or collaborators. Sharing content using this application is simple, allows peer review of academic materials, may facilitate collaboration and affords collective generation of knowledge (EDUCAUSE, 2008). Google Docs is free, it is available online and it is ranked third in the Top 100 Tools for Learning 2011 (Hart, 2011).

With this tool, the residents work on their own individual reports and make comments on their partners' reports (using colour-coding to make it easy to distinguish different people's comments). One resident said: *When I corrected and read the corrections, I could appreciate aspects and situations in the classes which otherwise I might not have noticed and which were important for helping me reflect and analyse, and thus helped contribute to better teaching management.*

Each resident's report is broken down into different parts: presentation of the curricular space where the fieldwork is carried out;

synthesis of the observed classes; description of the activities carried out as teacher; self-evaluation of the performance; and final reflections where alternatives are considered. The residents created a document for each part and received weekly suggestions on how to order their work by Residence teachers.

METHODOLOGY

To analyse the students' time management, we use the time multilevel model proposed by Demeure et al. (2010): *Level 1*, the collaborative activity duration as such; *Level 2*, the weekly level; *Level 3*, the time use during the day. We also introduce another step: *Level 4*, the elapsed time between someone's two consecutive online interventions.

In this study we ask: *How did the residents manage their time at these four levels? What degree of correlation was there between the proposed weekly activities and what the residents actually did?*

We consider the online interventions in Google Docs made by the seven residents (R1... R7) who took the subject in 2011. We use "quantity of interventions" as the unit for measuring the residents' time spent on this work. We count these interventions by using the revision history of the tool which, in this sense, is the instrument to collect the data. We process it by using the free statistics software R-project.

By looking at some of the features of these seven residents, we can say that at that time they were taking other degree subjects (three of them were studying one more subject and the other four were studying two other subjects). Four of them work as private teachers for pupils who want to improve their mathematics grades at secondary schools, two residents have other jobs and one has familiar commitments.

RESULTS AND DISCUSSION

Following the four aforementioned levels, we analyse the residents' time management in preparing their reports, and the related collaborative tasks, on their fieldwork.

LEVEL 1: THE COLLABORATIVE ACTIVITY DURATION AS SUCH

The period for the carrying out the work was from 15 April to 17 June, a total of ten weeks. In Table 1 we show the quantity, and respective percentage, of the online interventions during that period.

In total, 1437 online interventions were made during the period in question. 256 (17.8%) were made by the teachers of the subject, i.e. 1181 interventions correspond only to the residents. On average, each resident made approximately 170 interventions, with a minimum of 133 (R1 and R5) and a maximum of 239 (R2). In general terms, we can say that the quantity of interventions was satisfactory in all cases.

Talking about her time management, R1 said: *I don't think I was very well organised when*

correcting my partners' work or writing the summary of the observed classes. I couldn't manage my time. Since I was also taking other subjects, I neglected these activities when I was getting close to an exam. This is a weakness, and this work made me realise how important it is to continue with each subject every day, because this not only affected me but damaged my partners' work.

A question that emerges from this study is: *What would be a suitable way to balance*

Table 1. Online interventions during the period in question.

Person	Interventions	
	Quantity	Percentage
R1	133	9.26
R2	239	16.63
R3	152	10.58
R4	168	11.69
R5	133	9.26
R6	147	10.23
R7	209	14.54
Subject teachers	256	17.81
Total	1437	100.00

Table 2. Residents' interventions on their own work and their partners' work.

Resident	Interventions			
	Their own work	%	Their partners' work	%
R1 (n1=133)	67	50.38	66	49.62
R2 (n2=239)	138	57.74	101	42.26
R3 (n3=152)	85	55.92	67	44.08
R4 (n4=168)	114	67.86	54	32.14
R5 (n5=133)	83	62.41	50	37.59
R6 (n6=147)	92	62.59	55	37.41
R7 (n7=209)	127	60.77	82	39.23
Total (n=1181)	706	59.78	475	40.22



the interventions of all the participants in a collaborative group and thus prevent extreme (too much / too little) performances?

In this level we also look at the time each resident allocates to their own work and to their partners' work, as an indicator of the collaboration between peers (Table 2).

From the seven residents' 1181 interventions, approximately 60% correspond to interventions on their own work, whereas the remaining 40% is on their partners' work. These percentages were similar for all the residents, and two residents could be picked out: R1 (with 50% of interventions on her own work and 50% on her partners' work) and R4 (with 70% and 30%, respectively).

We can therefore say that, although there is a slight tendency to intervene more on their own work than on their partners' work, the residents did not neglect peer collaboration.

A question that emerges is: *What range of these percentages (their own work / their partners' work) would enable us to infer that genuine collaborative work was being carried out?*

LEVEL 2: THE WEEKLY LEVEL

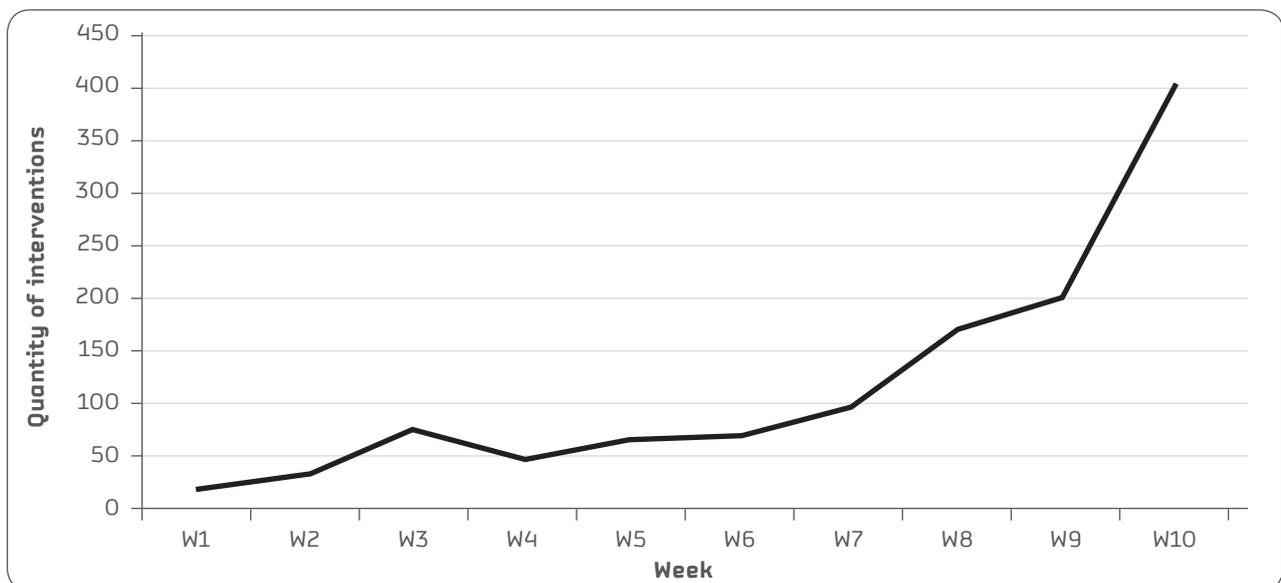
At this level we focus on analysing the quantity of residents' interventions during each of the ten weeks (W1... W10) that the experience lasted (Figure 1).

We can see that 604 interventions (51.1%) were made during the last two weeks of the period, 402 (34.0%) of which were made during the last week. In contrast, during the first two weeks only 51 interventions (4.3%) were recorded: 18 in the first week and 33 in the second one.

Although they recognised that there was likely to be greater participation in the last part of the period, the Residence teachers made suggestions of how residents could organise a relatively homogeneous weekly distribution of tasks. However, the residents paid scant attention to these suggestions.

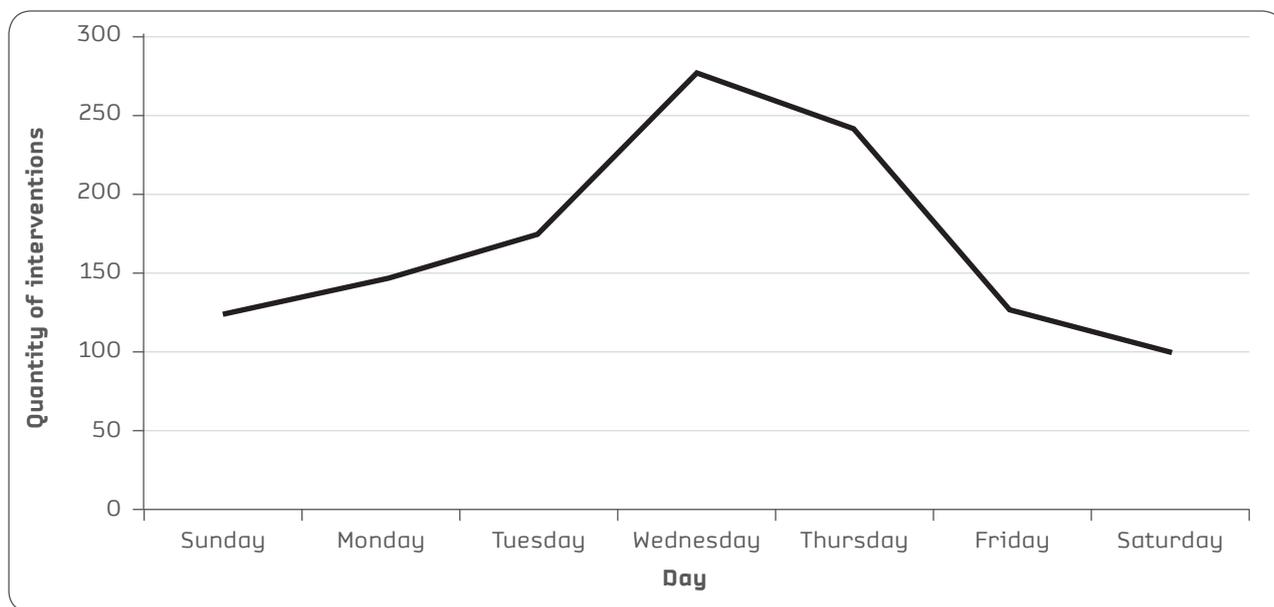
When the deadline drew near, the work increased dramatically in intensity, although we don't think the depth of understanding is the same for long and short periods of time. In this sense, R4 said: *This way of preparing work was a new experience for me. At the beginning it was*

Figure 1. Weekly distribution of the residents' interventions.



Sgreccia, N. (2012). Monitoring of the online interventions in an experience of collaborative learning with future teachers of Mathematics. *eLC Research Paper Series*, 4, 27-36.

Figure 2. Distribution of residents' interventions by day of the week.



not easy. Reading my partners' work and giving my opinions and points of view called for more time than I had. I would like to have had more time, or managed it better, to achieve the weekly objectives and enrich my knowledge.

In some cases the residents carried out activities which were stipulated for previous weeks. They said they had needed to optimise the balance between their academic times and their personal constraints, and in all cases they promised to do it. This delay created a vicious circle: until a resident completed certain parts of their report, their partners (and teachers) could not correct their work, i.e. intervene.

A question that emerges from this study is: *What feasible ways and tools could help students manage their academic times more efficiently?*

Another aspect to consider at this level is the distribution of residents' interventions by day of the week (Figure 2).

We can see that most of the residents' interventions occurred during week days (Monday to Friday). Wednesday and Thursday

were the days with most interventions (274 - 23.2% and 241 - 20.4%, respectively). We ask: *What impact did the fact that the face-to-face class for the subject was on Friday have on this distribution?*

Regarding the weekends, 222 interventions (18.8%) were recorded: 99 on Saturday and 123 on Sunday. In particular, residents R2 and R7 worked quite hard at weekends, clocking up 83 interventions (34.7% of his total) and 55 interventions (26.3% of her total), respectively.

LEVEL 3: TIME USE DURING THE DAY

At this level we consider the number of residents' interventions by time of day (00.00 to 23.00) (Figure 3).

We can see that the time with most interventions is 00.00, followed by 19.00. One possible explanation is that the residents worked on this task when they had finished their other activities of the day, both before and after dinner. The two times of greatest frequency are 12.00 and 16.00, times



Figure 3. Distribution of residents' interventions by time of day.

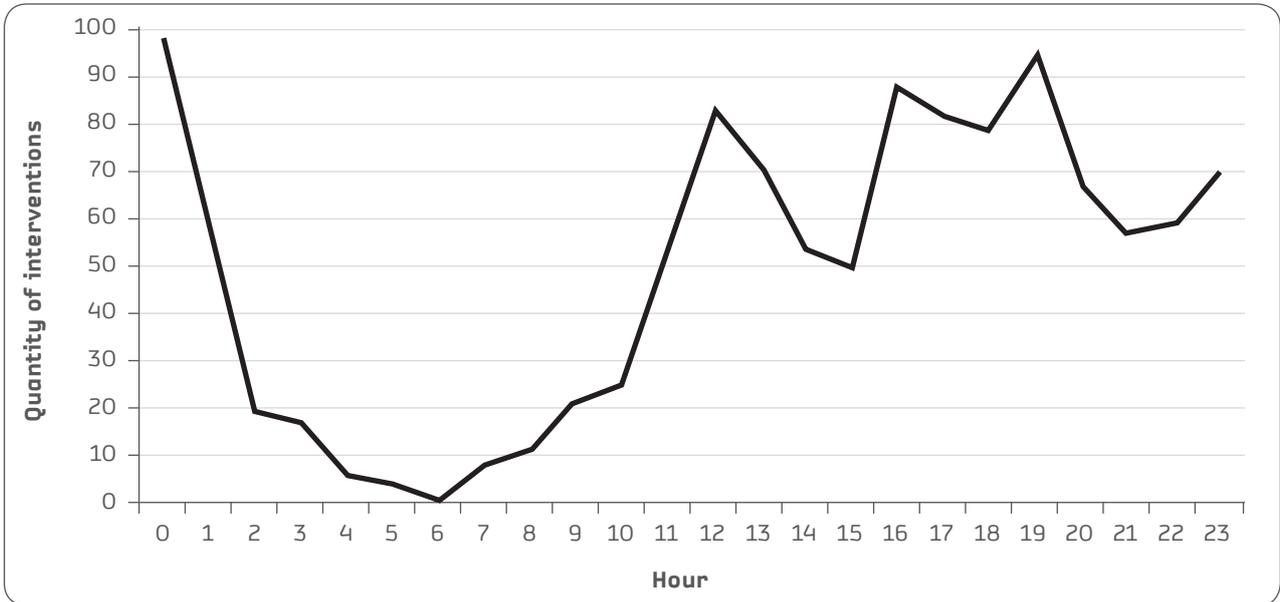
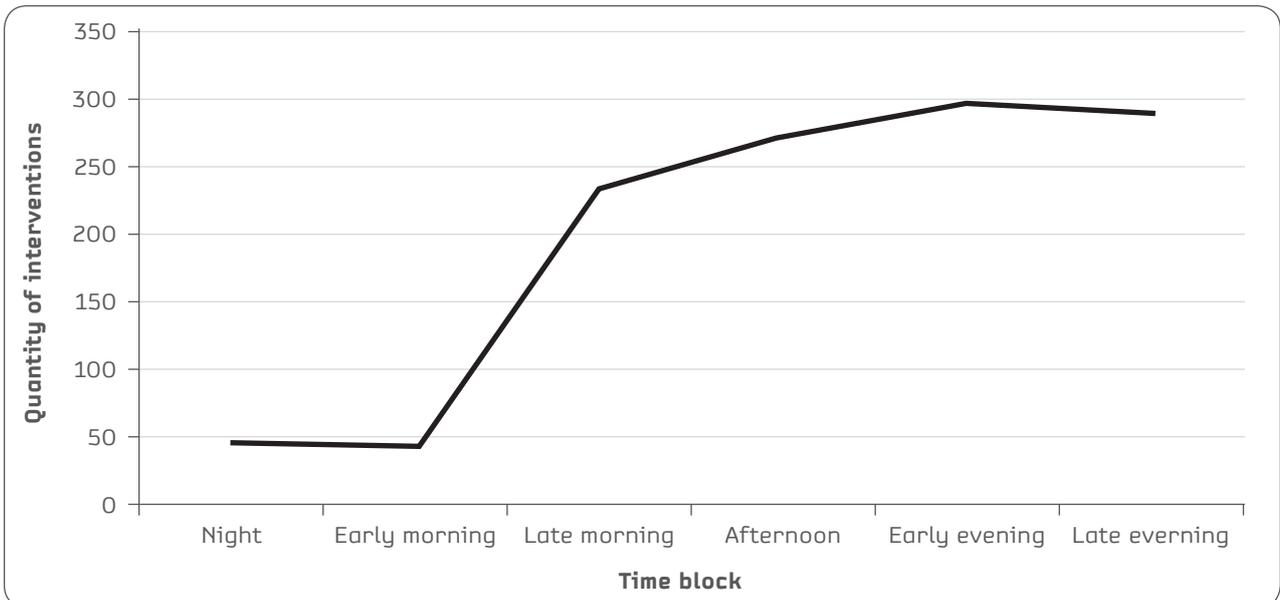


Figure 4. Distribution of the residents' interventions according to the six time blocks.



before and after lunch, respectively. We also noted that 109 interventions (9.23%, more than at any other time of the day) were very late at night, from 01.00 to 06.00.

By using the classification proposed by Nie & Hillygus (2002), viz. *Night*, from 02.00 to 05.59; *Early morning* (06.00 - 09.59); *Late morning*

(10.00 - 13.59); *Afternoon* (14.00 - 17.59); *Early evening* (18.00 - 21.59); *Late evening* (22.00 - 01.59), the distribution of the residents' interventions according to these six time blocks is the following (Figure 4):

Around the half the interventions (588 - 49.79%) occurred at the evening (both early and late).

Sgreccia, N. (2012). Monitoring of the online interventions in an experience of collaborative learning with future teachers of Mathematics. *eLC Research Paper Series*, 4, 27-36.

Very few interventions (41 - 3.47%) were in the early morning. This could be because at this time block the residents are carrying out their fieldwork, or studying another subject for the degree, or sleeping after being up late the previous evening.

A question that emerges is: *How can we help students acquire good online work habits and avoid them working out of phase?*

LEVEL 4: ELAPSED TIME BETWEEN TWO CONSECUTIVE ONLINE INTERVENTIONS OF A PERSON

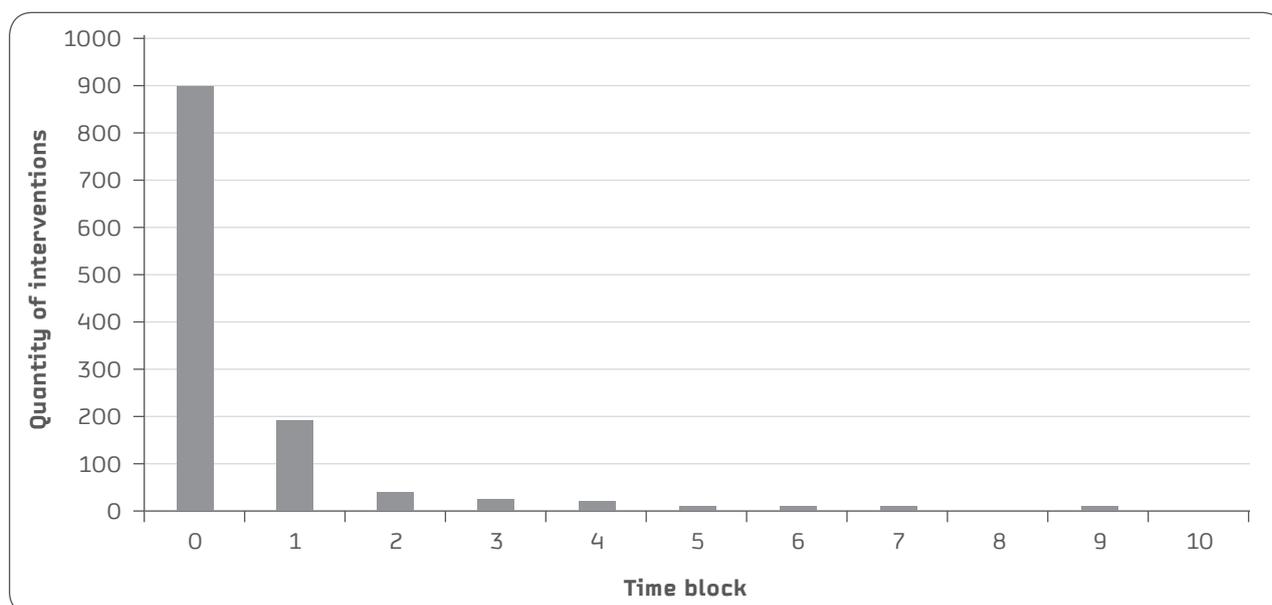
As a fourth level of analysis we study the elapsed time (measured in days) between a resident's two consecutive online interventions (Table 3).

As the median indicates, for each resident (and for the group in general), at least the half

Table 3. Elapsed time between each resident's two consecutive interventions.

Resident	Elapsed time (in days)			
	Average	Minimum	Maximum	Median
R1	0.48	0	6	0
R2	0.26	0	4	0
R3	0.42	0	9	0
R4	0.38	0	10	0
R5	0.47	0	9	0
R6	0.43	0	7	0
R7	0.29	0	5	0
In general	0.37	0	10	0

Figure 4. Distribution of the residents' interventions according to the six time blocks.





the elapsed times between two consecutive interventions by each resident was 0 days. This means that on at least half of the occasions an intervention and the next one by the same resident was made on the same day. On average, each resident takes less than a day (even less than half a day) between one intervention and their next one. The maximum was ten days between two consecutive interventions, but on most of occasions the elapsed time was less than one day (Figure 5). Figure 5. Elapsed time between residents' two consecutive interventions

CONCLUSIONS AND IMPLICATIONS FOR PRACTICE

As far as the temporal component of future teachers' interventions is concerned, we can conclude that the group managed to systematise the process of developing their own work and peer correction. But in general the residents did not manage to achieve a correspondence between what was actually done and the proposed weekly activities.

The findings of this study agree with the following statements made by Demeure et al. (2010, p.5) on postgraduate e-learners: "the time-on-task increased from the beginning of the activity", "they work more on weekdays than during weekends", and disagree with: "they tend to work during 'conventional' hours of the day".

By using the six time blocks (Nie & Hillygus, 2002) we can see that the residents did not work on the collaborative tasks at conventional hours of the day (Steward, 2000), from 09.00 to 17.00, for example.

In terms of the decisions about ordering, prioritising, organising and selecting in the process of time management (Demeure et al., 2010), we argue that these factors should

be emphasised to explain results such as those at Level 2 of this study. These aspects are important for collective learning, where students "not only have to find time for their learning activities, but also for establishing collective organisation, which implies a certain level of interdependence" (Demeure et al., 2010, p.7).

Working collaboratively calls for coordination, assumption of responsibilities and perseverance throughout the task (Álvarez et al., 2010; Kirschner et al., 2009). In the words of R5: *I think this work requires a lot of time and it made the task difficult for me, because some weeks I did not have enough time. I tried to follow the weekly tasks, but it proved to be very difficult. Nevertheless, as it was collaborative work, I tried to balance correcting my partners' work with making progress on my own work. Sometimes I got behind with the corrections because my partners did not make enough progress with their work (because they were correcting other people's) and at other times they got behind because I could not make any progress (because I was correcting their work). So it was quite difficult and I got quite concerned by this situation. But, as the weeks passed and I saw something similar was happening to my partners, I calmed down and thought that all this was part of this way of working.*

The residents also noted an improvement in their written discourse, which was the basis of their reports (Wegerif, 2006), as R3 mentioned: *For each resident I could see differences between the early and final productions in Google Docs. Every time I took a summary of the observed classes, I corrected from the first class up to the last one that the resident had put up. The suggestions and contributions from the Residence teachers were a useful guide for familiarising myself with this new way of working. At the same time I found it difficult, not only because of the hours spent on the task, but*

Sgreccia, N. (2012). Monitoring of the online interventions in an experience of collaborative learning with future teachers of Mathematics. *eLC Research Paper Series*, 4, 27-36.

also because I had to concentrate very hard on preparing, understanding and analysing each part.

As a way of constructing professional knowledge (Noyes, 2004), we recommend this way of working for trainee teachers. In terms of the organisational structure for working together (Guitert & Giménez, 2000), the findings of the study raise questions for Residence teachers and future studies: *Were appropriate activities set each week? Is there a suggestion that students were not really working systematically during the whole period, but rather just meeting a deadline?*

We think that a better understanding of the features we set out in this paper, at the respective four levels of analysis, could lead to specific proposals and strategies for improving time management in online collaborative learning. One of them, especially in the context of teacher training, could be for residents and Residence teachers to design the weekly activities together at the beginning of the task. This could be a useful educational opportunity and might raise awareness of the possible and desirable circumstances of online collaborative learning.

Acknowledgement. Noemí Ferreri, for her work on data processing.

References

- Álvarez, I., López-B., D. & Hernández, E. (2010). Interaction patterns over time in online discussion. *eLC Research Paper Series*, 1, 31-47.
- Barberà, E. (2010). Time factor in e-learning: eLC Research Programme 2009-2012. *eLC Research Paper Series*, 0, 12-15.
- 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.
- EDUCAUSE (2008). *7 things you should know about Google Apps*. EDUCAUSE Association. Retrieved May 20, 2011 from: <http://net.educause.edu/ir/library/pdf/ELI7035.pdf>
- Guitert, M. & Giménez, F. (2000). El trabajo cooperativo en entornos virtuales de aprendizaje. In J.M. Duart & A. Sangrà (Eds.). *Aprender en la virtualidad* (113-134). Barcelona: Gedisa.
- Hart, J. (2011). *Top 100 Tools 2011*. Centre for Learning & Performance Technologies. Retrieved January 6, 2012 from: <http://c4lpt.co.uk/top-100-tools-for-learning-2011/>
- Kirschner, F., Paas, F. & Kirschner, P.A. (2009). A cognitive-load approach to collaborative learning: United brains for complex tasks. *Educational Psychology Review*, 21, 31-42.
- Nie, N. & Hillygus, D. (2002). The impact of Internet use on sociability: Time-diary findings. *IT & Society*, 1, 1-20.
- Noyes, A. (2004). Where have all the maths teachers gone? In A. Noyes (Ed.) *Proceedings of the British Society for Research into Learning Mathematics*, 24(3), 21-26.
- Steward, B. (2000). Changing times - the meaning, measurement and use of time in teleworking. *Time & Society*, 9(1), 57-74.
- Wegeriff, R. (2006). A dialogic understanding of the relationship between CSCL and teaching thinking skills. *Int. Journal of Computer-Supported Collaborative Learning*, 1, 143-157.
-