WHEN TIME IS RUNNING OUT: E-STUDENTS UNDER PRESSURE WITH THE UOC *KRONOS* APPLICATION

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ABSTRACT

The *Kronos* teaching innovation project enabled the creation and implementation of a web application, integrated into the virtual campus of the Open University of Catalonia (UOC), for carrying out time-limited exercises asynchronously. Developed in the framework of APLICA 2010 and with the support of the Vice-Rectorate of Research and Innovation, *Kronos* represented a means for overcoming one of the disadvantages of virtual education, as compared with face-to-face education.

While a conventional environment easily allows students to be tested for certain skills using time constraints, in an e-learning environment like the UOC's, which guarantees communication between student and lecturer despite connections being made at different times and in different places, it is extremely complex to carry out exercises that require the precise time of execution to be controlled.

Kronos fully respects the asynchronous philosophy of the university's educational model so that students can test certain knowledge or skills under time constraints and lecturers can have more tools available to them to monitor learning progress.

This paper analyses the results of the tool's implementation in the Creative Thinking and Speaking and Writing courses of the Degree in Communication, during which assignments were given to be solved in twenty minutes and six hours, respectively. These assignments were designed to assess creative flow, on the one hand, and memorising and oratory, on the other. The results reveal that students have a similar pattern of caution despite different time constraints and that academic performance is, on average, the same or higher under time pressure, as compared with other tests set during the course.

KEYWORDS

time pressure, time factor, innovation in teaching, e-learning, creative thinking

INTRODUCTION

Based on the premise that the concept of time is one of the most polysemic in education (Romero, 2010), e-learning has above all been defined by the temporal flexibility it offers to lecturers and students and consequently by the need to effectively regulate the time devoted to teaching and study.

Although its importance has never been questioned (Gros, Barberà & Kirshner, 2010), research that specifically takes into account the time variable is still scarce and time management is generally understood within a decision-making and prioritisation process (Demeure et al., 2010). This fact is even more evident when study prospecting focuses on time as a variable that can aid in the learning process, beyond being considered a control mechanism (as occurs in research on automatic processes, which are more specific to the field of computing).[1]

In line with its role in contributing to learning, the *Kronos* project was conceived with the overall aim of "defining, designing and evaluating a tool to help students work on the time management competency during academic activities". This tool could be included, independently and at the discretion of lecturers, in assignments for which a time constraint or pressure is relevant, and it would respect the asynchronous philosophy of the UOC's educational model.[2]

The *Kronos* application pilot was launched during the first semester of the 2010-2011 academic year in the framework of the Creative Thinking course, a core subject of the Degree in Communication. Following some minor technical adjustments, it has been used continuously to assess, in a maximum of twenty minutes, the creative flow of students once they have learned a variety of idea generation techniques discussed during the course. At the end of each semester, a survey is sent to students who have undergone continuous assessment so that they can evaluate the usefulness of the tool.

Given the level of satisfaction reported by students as well as the applicability of *Kronos* to other subjects and learning objectives, it was considered appropriate to use it again for the Speaking and Writing course during the first semester of the 2011-2012 academic year. This time it was used for a memorising and oratory skills exercise and students were given six hours to complete it. Students were later given the same survey as the one used for the Creative Thinking course with the additional goal of analysing the differences between subjects, type of exercise, time constraints and academic performance.

Regarding this latter point, it is interesting to corroborate that a certain degree of time pressure can improve some aspects of scientific performance, including innovation (Andrews & Farris, 1972). Although the work by these authors referred to a five-year panel study on the performance of scientists and engineers in relation to working time, its conclusions are relevant to this analysis in that the concept of "innovation" can be extrapolated to the creative product that was requested in the Creative Thinking exercise and the "other aspects of scientific activity" to the memorising and communication skills set the for Speaking and Writing course:

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1. Koutsabasis et al. (2011) claim that asynchrony in e-learning improves personal time management.
2. The UOC model, understood within the Coldeway DT-SP quadrant, i.e., at different times and in the same place (virtual campus classroom), according to Barker and Brooks (2005). This aspect should be underlined, since one of the institutional constraints was that the application should be integrated into the campus.

"Perhaps research management saw the reduction of time constraints as an appropriate way to encourage further creativity. However, our data suggest that innovation prospered under time pressure just as did other more routine aspects of scientific performance" (Andrews & Farris, 1972, p. 195).

PRE-KRONOS: DESIGNING THE TOOL

Since it was founded in 1995, the UOC has consolidated an e-learning model that allows for a satisfactory asynchronous relationship between the student and lecturers, tutors, administrative staff and fellow students. However, when evaluating certain competencies of students under time constraints, especially in the context of adapting studies to the European Higher Education Area, this asynchronous model posed an obstacle, which, as noted above, has been overcome thanks to the *Kronos* application.

The goal during the first phase of the teaching innovation project was to achieve a comprehensive and consensual specification of the features that the new tool should have in order to be as helpful and transversal as possible. To ensure this, an online semi-structured questionnaire was designed and sent to teaching staff in the departments of Arts and Humanities and Information and Communication Sciences.[3]

A total of 67 responses were received from all university studies (it was specified in the questionnaire that it could be distributed freely). Based on the results, a background document was drawn up with the objectives,

constraints and needs to be covered by *Kronos*. It also took into account reservations expressed about the students' expected perception of the supposed benefits of a tool for monitoring and managing the time they take to complete an exercise. The following statement illustrates some of the reservations expressed, which turned out to be unfounded, as we will see from students' comments below:

"The time factor is a very necessary and natural parameter in face-to-face classes; in a telematic context, time display tools may be considered intrusive and therefore be rejected, so I think it is important to explain to students their usefulness and how they will be beneficial to them".

The Educational Technology team began a process of functional benchmarking and looked for suppliers to design and develop the new application. After discarding the option of adapting any existing free software tools, they proceeded to create an entire web application that would interact between the virtual classroom and the continuous assessment activity log (which is where exercises are commonly submitted and includes the exact date and time that students upload their files). In this simple manner, the *Kronos* application could detect when an activity was given in late (time difference between download and delivery) and it would not be a problem if the *Kronos* screen closed or the campus session expired after the assignment brief was downloaded.

KRONOS: THE PILOT

Once the application was designed, the pilot version was launched in the three Creative Thinking classrooms of the Catalan campus

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3. The survey was conducted through Google Docs and its design and content is available at https://spreadsheets.google.com/viewform?hl=es&formkey=dEhFdm93NWtNazhHNVhZV1htSEUzTWc6MA#gid=0

(with a total of 201 enrolled students) and the Spanish campus classroom (with 23 students). Training was provided to the four consultants who would be using the application, and two environments that were already in place were employed to test the outcome of using different time constraints for the same exercise. Given that the number of Catalan campus students was much higher, and thus so were the chances of incidents occurring, they were given a maximum of twenty minutes; meanwhile, the Spanish campus students were given only fifteen minutes.[4]

The operating sequence of *Kronos* has the following steps, according to the view from the student's virtual classroom: a) students access the assignment brief as usual; b) students are given automatic access to the application and the timer is activated the instant the assignment brief is loaded; c) before the clock shows that the time is up (00:00:00 value), students must load the finished exercise in the activity log, just as they would do for any other activity.

There were no problems with the server or technical issues affecting the proper functioning of the application during the pilot test, but it was found that cheating could occur if lecturers followed the usual teaching routines.

Students typically download the assignment brief from the classroom calendar on the appropriate day, almost automatically, without reading the instructions that the consultant may have written on the board. For the exercise

performed with *Kronos*, students were given instructions, both on the board and in the download window, to work on the learning unit materials before reading the assignment brief. In addition, they were told that the work could be carried out at any time, but that it should be done during a quiet moment and without interruptions, as it would have to be given in within a certain timeframe.

Despite the warning, five Catalan campus students accessed the application during the initial hours and were able to read the assignment brief. Some of them reported this to their consultant (claiming that it had been a "mechanical" act), but others were discovered subsequently through the *Kronos* log data.[5] To prevent them from disclosing the contents of the assignment brief to their peers, the exercise was removed from the application and students were told that it would be made available to them again within a few days (during which they should study for it) and they were reminded again of the mechanics. Finally, four new assignment briefs were prepared and loaded to the application as each of the exercises were given in.

The original assignment brief was left in the Spanish Campus classroom and students spent an average of 13.5 minutes (of the 15-minute limit) on the exercise. In the Catalan campus classrooms, the average time spent was 17.14 minutes (of the 20-minute limit), so the pattern of caution was similar in the two environments.

On completion of the continuous assessment, the tool assessment phase began with a semi-

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4. The five-minute difference did not represent a significant drawback for the Spanish campus students (since the exercise could be done in less time), but if we consider that the total number of students who felt that the time given to complete the exercise was insufficient accounted for 59%, it should be noted that this figure represents 57.3% of the Catalan campus students and 72.78% of the Spanish campus students (a difference that is consistent with the difference in time, although it is not statistically significant).
5. The classroom view of the consultant (virtual lecturer at the UOC) shows the time spent by each student on the exercises and gives access to graphs with the statistics of the dates and times the exercises were given in.

structured online questionnaire for students to fill in.[6] A total of 79 students responded, which accounts for 35.27% of the total.

An analysis of the data revealed that:

❯ 25% of Catalan campus students confused the maximum time set for the exercise and selected the 15-minute option.

❯ 14% reported technical problems while downloading the assignment brief and attributed them to their own computers or to a lack of specific software. Taking this into account, the assignment brief is now given in a PDF file and graphic elements that may slow down the loading process have been minimised.

❯ 17% declared that the mechanics of the exercise were not clear enough. Responses to the open question on suggestions for improvement revealed that too much information was the main cause for confusion.

❯ Students believed that lecturers used the *Kronos* tool "to evaluate contents under time constraints," "to evaluate certain competencies" and "to identify knowledge gaps" in that order.

❯ Students regarded "know-how under time pressure", "time management" and "creative capacity" to be the competencies that can be assessed using *Kronos*.

❯ The tool was ranked positively by 88% of users in the overall assessment and more than half (53%) of the respondents offered suggestions for improvement.

POST KRONOS: IMPLEMENTATION IN ANOTHER COURSE

Once the application had been used during two semesters of the Creative Thinking course, it was decided that it would also be used in the three Catalan campus classrooms of the Speaking and Writing course, with a total of 90 enrolled students.
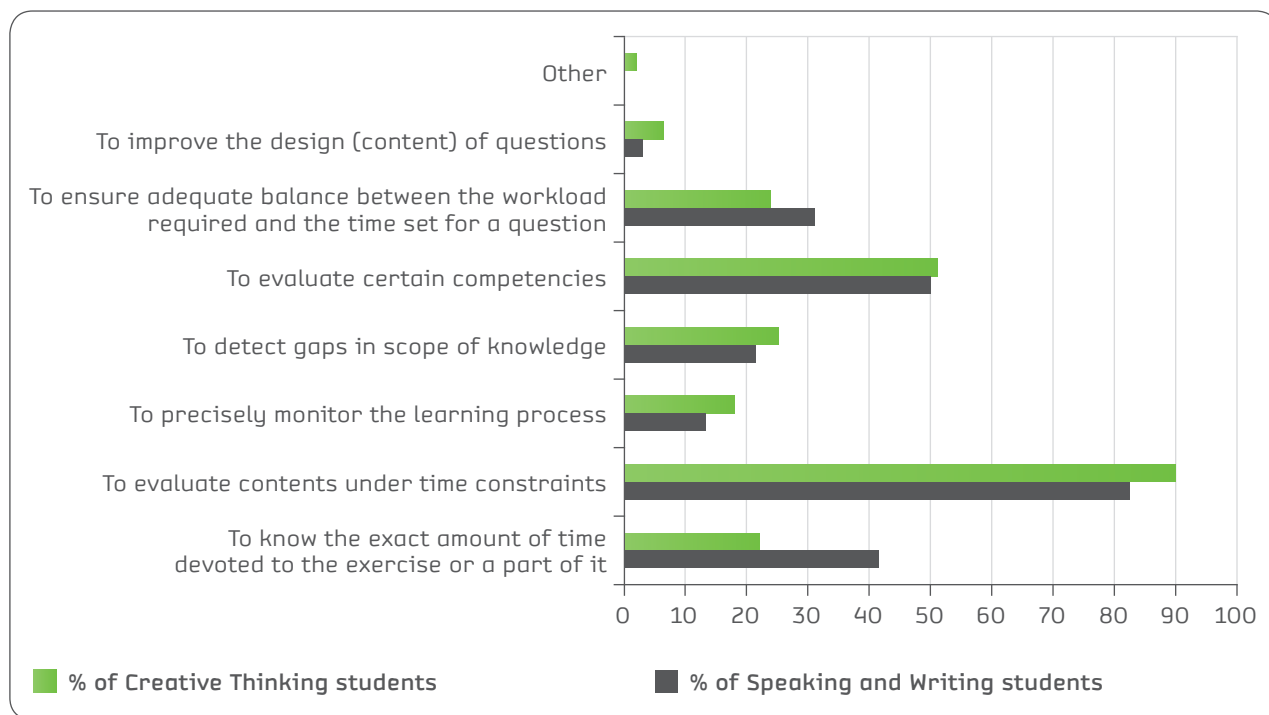
This time, an exercise was proposed in which students had up to six hours to memorise a text (and they had to film themselves as proof that the task was being performed correctly). To prevent cheating, the assignment brief model was changed as exercises were loaded to the corresponding application. At the end of the continuous assessment, the survey given following the pilot test was replicated and a comparative analysis was made with the results from the two courses. The main variable to consider was the notable difference in the time constraints given.

This time, 40% of students took part in the survey, almost 5% more than for the previous course. In comparison with the pilot test analysis, the following was noted:

❯ The students who performed the exercise on time devoted an average of 4.84 hours to it, and 81% accurately recalled that the time limit was six hours (the rest hesitated between four and five hours).

❯ The same percentage felt that they had been given enough time to complete the exercise, but no one said they had been given too much time. The 19% who said they needed more time should be contrasted with the 29.5% of the total of all classrooms who went over the time limit set for the exercise; therefore, it can be concluded that, despite going over the set time limit, some students considered that they had been given sufficient time, and thus somehow acknowledged a time management or technical error or an unforeseen occurrence during the exercise.

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6. The student survey was also managed through Google Docs and is available at https://spreadsheets.google.com/viewform?hl=es&formkey=dHhBYzBoLWsxMS1BRXlDSlpqenpUSWc6MQ#gid=0

Figure 1. Lecturers' reasons for establishing or limiting the time for performing an exercise

■ % of Creative Thinking students   ■ % of Speaking and Writing students

❯ 8% of students recalled experiencing problems while downloading the assignment brief due to technical problems.

❯ All students felt that the mechanics of the exercise had been well explained.

❯ Regarding the main reasons for using the *Kronos* tool, the students on this course coincided on the first two with those given by students on the previous course ("to evaluate contents under pressure" and "to evaluate certain competencies"). However, the third reason they chose was "to know the exact amount of time devoted to the exercise or a part of it", an option that is consistent with the type of exercise performed and the total amount of time given (Fig. 1).

❯ As regards the competencies to be evaluated, the first two coincided: "know-how under time constraints" (although it is indeed curious that in this course, which had a much longer timeframe, it accounts for 89%, 26% more than it did in the Creative Thinking course) and "time management". The third reason selected was "problem solving", an option that is reasonable and consistent with the specificity of the exercise (Fig. 2).
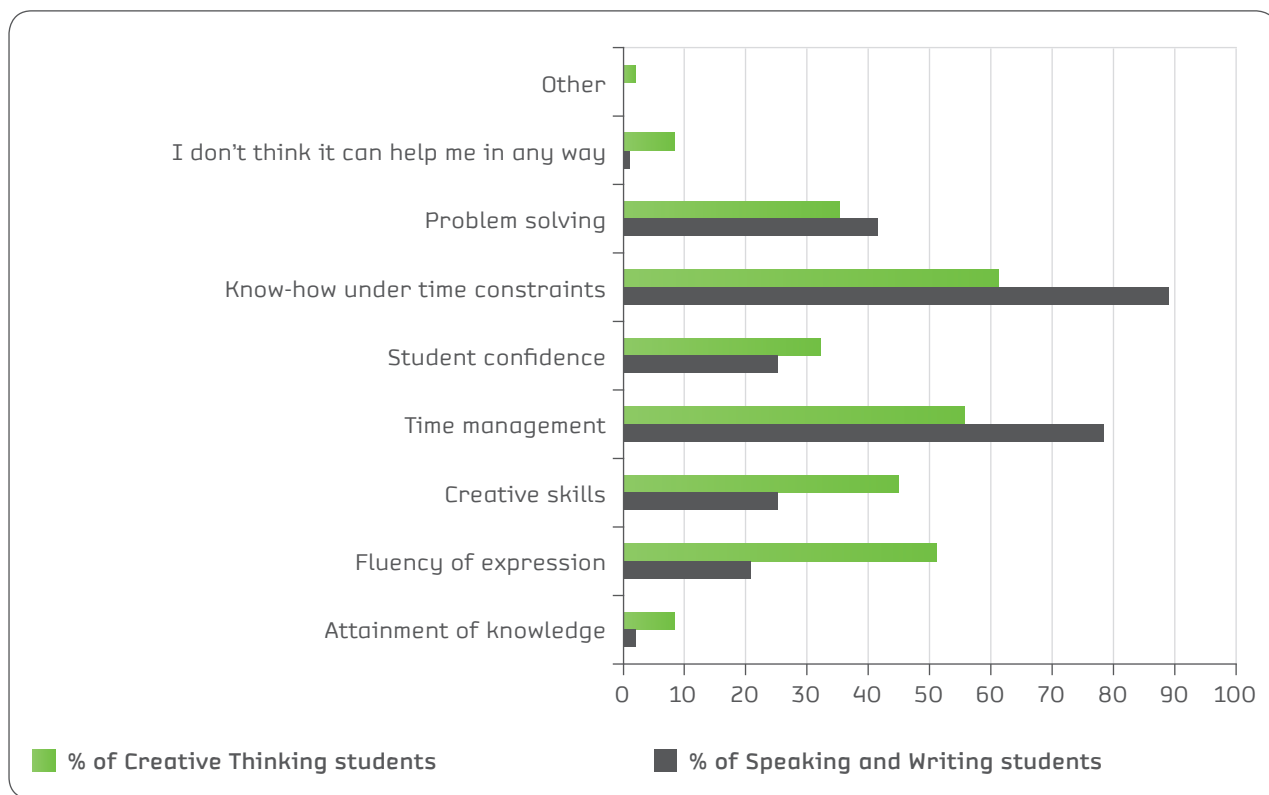
❯ The tool is ranked positively by 95% of users in the overall assessment.[7]

Apart from the analysis based on data from the questionnaires, and with the intention of contrasting the relationship between time pressure and performance, the marks obtained by each student in the *Kronos* exercise were compared with their final continuous assessment mark. The results are in line with research conducted by Andrews and Farris (1972), which suggests that a certain time
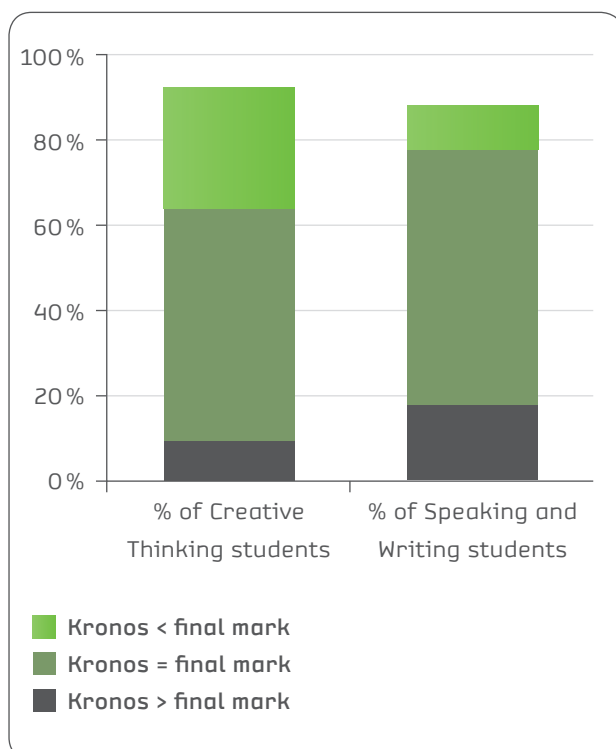
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7. The survey given to students on the Speaking and Writing course is available at https://docs.google.com/spreadsheet/ccc?key=0Alx587Y03df9dEE5cHYxTEFkOHVCSUZPYVloODNpeGc#gid=0

Figure 2. Competencies to be evaluated under time constraints.

Figure 3. Performance in the Kronos exercise
compared with that in the continuous assessment.

pressure can improve various aspects of
scientific performance, including innovation.
In other words, time pressure has a positive
relationship with innovation and performance,
contrary to the general assumption that
scientists require a relaxed environment in
order to carry out their work.

Twenty-two percent of students on the Creative
Thinking course received a lower mark for the
time-limited exercise than for the continued
assessment of the course; this percentage
was lower (12%) for students on the Speaking
and Writing course. As shown in Figure 3, a
neutral relationship (i.e., the *Kronos* mark is
the same as the final mark) is dominant, but the
percentage of students on the latter course
who got better marks with *Kronos* is more than
double the percentage of those who received
worse marks.

CONCLUSIONS AND CONSIDERATIONS

Given the similar levels of student participation in these surveys, the comparative analysis that is the purpose of this study is feasible and allows us to reach valuable conclusions for the future implementation of the *Kronos* tool (for exercises with different teaching objectives or with different temporal parameters). To summarise, the main conclusions can be included in these key points:

❯ **Similar caution in terms of time management.** There was a similar pattern of caution independently of the time given to do the exercise. Thus, it can be said that the vast majority of students are cautious and manage their time responsibly so that they do not need to exceed the time limit. Students on the Creative Thinking course were given 20 minutes and used an average of 17.14 (ratio of 0.85); students on the Speaking and Writing course were given six hours and used an average of 4.84 (ratio of 0.8).

❯ **Pressure without precision.** None of the students thought they had been given too much time to do the exercise (the majority considered that the pressure was "sufficient"), but it is striking that between 19% and 25% of students were mistaken when it came to remembering how much time they had been given to do the exercise.

❯ **Assumption of responsibility.** Since the percentage of students exceeding the given time for completion is higher than those who deemed that they had not been given enough time, it can be deduced in these cases that students were aware that their time management had been inadequate.

❯ **Time pressure is not negative; many people like it.** In global terms, time pressure has a neutral relationship with academic performance. Furthermore, contrary to the preconceived idea that some lecturers expressed in the questionnaire used to design the application, students find the somewhat stressful experience of carrying out a time-limited test stimulating, as they are accustomed to more conventional dynamics in the virtual environment. For example, one student said:

"I must say that I thoroughly enjoyed the experience. I'm still thinking about it today and I am still coming up with new ideas, not only for this exercise but for all the other ones as well… I have a continuous flow of ideas with no end in sight".

The comparative analysis has provided insights with which to continue working, although future replications of the study should take into account the following limitations and considerations:

❯ The reliability of research on the relationship between time pressure and performance would likely increase if the results of a group under time constraints were compared with those under the usual pressure for the same type of test.

❯ The analysis should separate the results according to the objectives of the exercise. As shown, in the exercise that measured creative flow, more students maintained or worsened their performance compared to those who improved it; in the memorising exercise, on the other hand, the students with worse results under time constraints were a minority as compared with those whose results were the same or better.

❯ The total time to complete the exercise should also be taken into account, since the pressure varies if you are given twenty minutes or six hours. Therefore, a future line of research might maintain the same time pressure and change other variables (for instance, the teaching objective).

❯ Finally, consultants should define evaluation criteria. For instance, they should determine whether an exercise given in late should be

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given a fail mark or establish a timeframe scale for raising or dropping marks.

In addition, it would be convenient to verify whether the degree of time pressure acceptance of each student relates to a particular result, i.e., whether the students who improve their performance with a time-limited test are the same ones who enjoy racing against the clock in other areas of life.

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