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Analyzing the effects of emotion management on time and self-management in computer-based learning

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Abstract

Emotional learning involves the acquisition of skills to recognize and manage emotions, develop care and concern for others, make responsible decisions, establish positive relationships, and handle challenging situations effectively. *Time* is an important variable in learning context and especially in the analysis of teaching-learning processes that take place in collaborative learning, whereas *time management* is crucial for effective learning. The aim of this work has been to analyze the effects of emotion management on time and self-management in e-learning and identify *the competencies in time and* self-management *that are mostly influenced when students strive to achieve effective learning*. To this end, we run an experiment with a class of high school students, which showed that increasing their ability to manage emotions better and more effectively enhances their competency to manage the time allocated to the learning practice more productively, and consequently their learning performance in- terms of behavioral engagement and achievement, and partly, in terms of cognitive engagement and self-regulation. Teacher affective feedback was proved to be a crucial factor to enhance cognitive engagement.

Keywords: Affective Learning, Emotion Management, Time and Self-Management, Behavioral Engagement, Cognitive Engagement, Self-Regulation, Achievement Orientation.

1. Introduction

Learning is the process of acquiring knowledge, skills, values and attitudes, through study, education or experience. This process produces a change in the behavior of a person from the result of experience by the association between a stimulus and its corresponding response. Nowadays, from a socio-constructivist view, learning depends on the context and the social negotiation and interaction with others. Moreover, computer-based learning has become a usual way of learning since the expansion of internet and the enormous facilities it offers in online and blended learning. Under this frame, computer-based learning environments have to foster learning that is self-regulated, constructive, context-sensitive and often collaborative.

Many studies have focused on the consequences of emotion management on computer-based learning. Brave & Nass (2002) show that a great variety of emotions play important role in every computer-related situation. Negative emotions require mental or behavioral adjustment, whereas positive emotions urge students to explore the computer- based environment and direct the actions that they take in it. Vuorela & Nummenmaa (2004) also argue that emotion regulation is important to effective functioning in web-based learning environments, whereas effective emotion regulation can enhance social interactions in a virtual environment (Tu & McIsaac, 2002; Gross & John, 2003). More recently, a detailed review of emotion regulation in Intelligent Tutoring Systems showed that emotion management during computer-based learning may produce more optimistic emotions as well as better learning gain (Malekzadeh et. al, 2015).

According to Bach & Forés (2007), this has significant implications for teaching and learning. Therefore, teacher expectations have a significant impact on student outcomes, which shows why these expectations need to be positive as well as realistic. Teachers should provide the necessary time, space and support to students in order to make them reflect on the learning strategies that were used and on the way these strategies have influenced students' learning. If students' experiences have been negative, teacher should follow a scaffolding approach that moves students progressively to attenuate the impact that those negative experiences have had in their motivation to learning (Belland, Kim, & Hannafin,

2013). In general, a learning environment should provide the means to identify and nurture personal interests and intrinsic motivation of students. Emotions have a diagnostic value for teachers, because they reveal underlying cognitions, commitments and concerns. Teachers who are aware of what motivates their students and are sensitive to their emotions may use this information in a useful way to improve their learning process. Moreover, teachers' own behavior, teaching practices and evaluation may trigger specific emotions in students, which in turn affect the quality of learning that takes place (Boekaerts, 2010). Fortunately, emotional regulation can reduce the negative responses and serves as a containment mechanism (Niven, Totterdell, & Holman, 2009). Several strategies have been developed to regulate emotions (Moyal, Henik, & Anholt, 2014).

Taking all the above into account, we use the term "emotional management" to include the methods and tools to handle two very important tasks in affective learning: emotion awareness and emotional feedback (Feidakis, Caballé, Daradoumis, Gañán, & Conesa, 2014). Moreover, we use the term "time management" - which really means 'self-management' since we manage ourselves to make the most of time - as a key element for student learning development (Garrison, 1997). Time and self-management competencies are key factors for improving students' self- regulating learning and thus for enhancing learning performance in web-based courses (Cobb, 2003). That goes back to Bandura (1982) social learning theory where self-efficacy is considered a key element for learning success. Self-management is the main factor for students' self-efficacy, stimulation of motivation and insurance of balanced social life (Ivanova, 2011). Self-efficacy arises from the gradual acquisition of complex *cognitive* and *behavioral* skills (Bandura 1982) whereas other researchers, such as Locke, Frederick, Lee, and Bobko (1984), found that the magnitude of self-efficacy was positively related to *goal setting*. Moreover, a key skill in self-management is *self-regulation* which concerns the ability of a student to organize, manage and address several elements of their learning for themselves (Zimmerman, 2008). As a consequence, among the competencies that affect students' performance, this research mainly considers these four competencies: behavioral and cognitive engagement, self-regulation, and achievement orientation.

In fact, students' performance is enhanced when motivation is translated into behavioral, emotional, and cognitive engagement (Fredricks, Blumenfeld, & Paris, 2004; Reeve, 2013). In a school context, positive behavioral engagement means actively participating in academic activities according to classroom norms; positive emotional engagement means exhibiting interest and happiness during academic activities; positive cognitive engagement means actively deploying strategies to understand content, solve problems, or otherwise use information (Fredricks et al., 2004).

Moreover, motivation, engagement, and self-regulation are the primary determinants of students' learning outcomes, and whether or not they will persist through challenging tasks (Harris, Graham, Mason, & Sadler, 2002). In particular, self-regulation is essential to the learning process and is recognized as an important predictor of student academic achievement (Jarvela & Jarvenoja, 2011). Finally, the achievement goal theory, which is developed within a social-cognitive framework, proposes that students' motivation and achievement-related behaviors can be understood by considering the reasons or purposes they adopt while engaged in academic work (Ames, 1992). As such, achievement orientation focuses on how students think about themselves, their tasks, their performance, and their well-being (Ryan & Deci 2000).

From all the above, we see that the concepts of emotion management as well as time and self-management are crucial for increasing learning performance. However, the relationship between emotion management and time and self-management in computer-based learning has not been sufficiently investigated yet by the research community.

The aim of this work is to analyze the effects of emotional management on time management in computer-based learning and identify *which are the competencies in time and self-management that are mostly influenced when students strive to achieve effective learning*. To achieve this, we focus our work on competencies that affect students' learning and development, such as behavioral and cognitive engagement, self-regulation, and achievement orientation.

In order to achieve this goal, Section 2 sets the base of our work by carrying out a comprehensive and critical analysis of the literature that deals with emotion and time management in learning. Then in Section 3, we present our approach at a conceptual design level, we set our research hypothesis and questions, and we explain how we address these questions through a real experiment in a class of high school students. Section 4 presents the results of the experiment. Next in Section 5, we discuss and analyze the obtained results with regard to the research questions set and we check the validity of our research hypothesis. Finally, we provide our conclusions and possible future work.

2. Theoretical background in emotion and time management in learning

2.1. Emotion awareness

Emotions are defined as subjective experiences which are dependent on the context in which they arise. They are experienced in various situations and serve a variety of functions in the academic environment including promoting or undermining behavioral and cognitive engagement, self-regulation of learning activities and achievement (Linnenbrink-Garcia & Pekrun, 2011). *Learning* involves three particular cognitive processes, attention, memory and reasoning; with respect to each of them, students' cognitive ability depends on their emotions (Frasson & Chalfoun, 2010). According to them, emotions can be used in the learning context to increase students' attention as well as to improve memory and reasoning. As a consequence, relationships between objects or ideas are made more easily while they promote efficiency and rigor in decision making and problem solving (Isen, 2000). Therefore, *emotional learning* involves the acquisition of skills to recognize and manage emotions, develop care and concern for others, make responsible decisions, establish positive relationships, and handle challenging situations effectively (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011).

In the recent years, research in *emotion awareness* in learning situations has focused on several issues that include: analysis of learning interactions to detect emotions through the application of a variety of methods, such as discourse analysis, sentiment analysis or opinion mining that allows non-intrusive automatic detection and extraction of emotions from student- created texts and dialogues (Daradoumis, Arguedas, & Xhafa, 2013a, 2013b); capturing the sentiments and the emotional states enclosed in textual information so that opinions and emotions embedded in them could play a key role in decision-making processes (Loia & Senatore, 2014); examining the impact of the so-called academic emotions (enjoyment, anxiety, pride, anger, hope, shame/fault, relief, boredom, hopelessness) on students' ways of thinking and information processing (Pekrun, Goetz, Frenzel, & Perry, 2011); embedding emotion awareness into e-learning environments "ecologically", by avoiding introducing obtrusiveness or invasiveness in the learning process (Feidakis et al, 2014); identifying patterns of emotional behavior by observing motor-behavioral activity (facial expressions, voice intonation, mouse movements, log files, sentiment analysis, etc.) (Arroyo, du Boulay, Eligio, Luckin, & Porayska-Pomsta, 2011; D'Mello et al., 2008; Heylen, Nijholt, & op den Akker, 2005; Mao & Li, 2009; Woolf, Burelson & Arroyo, 2007).

However, there is a gap in investigating the way emotion awareness is related to students' performance from the perspective of "time and self-management", that is, taking into account very important competencies which are related to successful learning, such as behavioral and cognitive engagement, self-regulation, and achievement. Limited research attempted to explore some aspect of this relationship, whereas there are virtually no empirical data on when or why relations exist (or do not exist). In one of these works, Subic-Wrana et al. (2014) examines the way emotion awareness influences emotion regulation strategies and self-reports of negative emotions. Their first findings suggested that conscious awareness of emotions may be a precondition for the use of reappraisal as an adaptive emotion regulation strategy. Few studies of emotion and achievement have largely focused on anxiety, but there has been little theoretical and empirical attention devoted to the treatment of other emotions (Valiente, Swanson, & Eisenberg, 2012). In another work, You and Kang (2014) examined the role of academic emotions (enjoyment, anxiety, and boredom) in the relationship between perceived academic control and self-regulated learning in online learning. Moreover, while the concepts of cognitive and behavioral engagement are well understood in the context of previous research (Fredericks et al., 2004), and it is evident that there is a strict interrelationship of emotion and cognition in learning situations (Robinson, 2013), there is a scarcity of research in the relationship between emotion awareness and behavioral and cognitive engagement. As a consequence, our work presents an initial effort to fill this gap.

2.2.Emotional feedback

Once the learners' affective state is recognized, they need to see some reaction from the teacher; an adaptation to their cognitive performance as well as to their feelings. The main objective of affective feedback is to motivate the respondent, to facilitate their learning process and, to some extent, to improve their mood (Mao & Li, 2009).

In particular, the teacher should be able to encourage active learning and collaborative knowledge construction, monitor and provide appropriate models of expression especially when it comes to negative emotions that are often more difficult to communicate in an appropriate manner. An effective emotional feedback allows the design of modular and reusable activities, adapted to the student learning style, thus providing a more grounded activity planning. As a consequence, the teacher should be

equipped with the necessary emotional skills for helping students react on time, especially in the case of negative emotions (e.g., anxiety), handle the time they have to carry out their learning activities more effectively either they work individually or in group, and know how to choose among a variety of technology resources and tools, and decide how and when to use them.

Despite the importance of emotional feedback, the number of scientific experiments reporting on successfully affective feedback strategies is quite limited. A reference work was published by D'Mello et al. (2011) presenting Autotutor, an ITS able to hold conversations with humans in natural language taking to account the learner's both cognitive and affective states. In another project, Sensitive Artificial Listener-SAL (Bevacqua et al., 2012) sustains an emotionally-colored interaction with users by collecting users' verbal and non-verbal behaviors and reacting appropriately pulling them towards specific emotional states.

Robison et al. (2009) have reported on the results of two studies that were conducted with students interacting with affect-informed virtual agents, evaluating somehow the agents' response to both positive and negative affective states. They classify affective feedback strategies into parallel-empathetic (exhibit an emotion similar to that of the target), reactive- empathetic (focus on the target's affective state, in addition to his/her situation) or task-based (change task sequence - supplementary to empathetic strategies).

In contrast, there is a fair amount of research on social support and feedback that includes information about what students did well (Labuhn, Zimmerman, & Hasselhorn, 2010), what they need to improve, and steps they can take to improve their work (Hattie & Timperley, 2007). This type of feedback can assist students in improving their academic achievement (Brookhart, 2011), it also can promote student motivation (Wigfield, Klauda, & Cambria, 2011) and self-regulation (Labuhn et al., 2010).

Taking into account that there are few studies that exploit computer mediated affective feedback strategies and their impact on students' performance or affective state, whereas the number of tools and strategies to design expressive avatars in response to learner's emotion detection is quite limited, the need for further research in this area is far from evident, especially concerning the relationship between emotional feedback and behavioral and cognitive engagement, self-regulation, and achievement.

2.3.Time and self-management

Time management is one of the crucial components which are helpful in students' online learning (Song, Singleton, Hill, & Koh, 2004). Research in time management in learning context has been reported long ago (Britton & Tesser, 1991; Macan, Shahani, Dipboye, & Phillips, 1990). Most of the studies investigated the correlations of time management with academic performance (grades) and, especially, stress. Misra & McKean (2000) found that time management behaviors had a greater buffering effect on academic stress than leisure satisfaction activities. In fact, anxiety, time management, and leisure satisfaction were all predictors of academic stress in their multivariate analysis. Their results showed that anxiety reduction and time management in conjunction with leisure activities may be an effective strategy for reducing academic stress in college students.

In other studies, Connolly et al (2003) suggested that time management is one of the factors that might encourage students to participate to a greater extent in online discussions. Other researchers (e.g., Reimann, 2009) examine the concept of time regulation, which is considered as part of learning regulation and is determined by productivity. In this context, Franco-Casamitjana, Barberà, and Romero (2013) defined a methodological design for analyzing time regulation patterns and learning efficiency in collaborative learning contexts in online education. In addition, faculty also needs development and support in time management (Alexander, 2001). An adequate time management is a necessary factor in facilitating and enhancing the teaching-learning processes and to improve *teacher workload* (Barberà, 2010).

Nevertheless, there are no clear research works that explore the relationship between emotion management and time and self-management in education, an issue that this study comes to explore and provide some answers.

2.4.Behavioral engagement, cognitive engagement, self-regulation and achievement orientation

Behavioral and cognitive engagement in education has been extensively investigated. In fact, Fredricks et al. (2004) proposed that school engagement is a multidimensional construct composed of behavioral, emotional, and cognitive components. Archambault, Janosz, Morizot, and Pagani (2009) assessed these three distinct dimensions of student engagement in high school and examined the

relationships between the nature and course of such experiences and later dropout. Also, Wang & Eccles (2011) explored these three trajectories in school and their differential relations to educational success. Another study provides a thorough examination of the relationship among affective, cognitive, behavioral, and academic factors of student engagement of 9 th Grade students (Burrows, 2010). Students' engagement and learning has been also linked to motivational factors, such as self-efficacy (& Pintrich, 2003; Walker, Greene, & Mansell, 2006). Regarding emotional factors, Reschly, Huebner, Appleton, and Antaramian (2008) found that frequent positive emotions during school were associated with higher levels of student engagement and negative emotions with lower levels of engagement. In addition, Tsai & Bagozzi (2014) examined the way cognitive, emotional and social factors influence students' contribution behavior in virtual communities which tend to be goal directed and specifically linked to the so called we-intentions.

Yet, student engagement is also related with another important component: achievement. Martin & Dowson (2009) examined the role of interpersonal relationships in students' academic motivation, engagement, and achievement. Knowledge sharing processes also affect students' achievement. Zhang, Ordóñez De Pablos, and Zhou (2013), Zhang, Ordóñez De Pablos, and Xu (2014) show how cultural values effect on explicit and implicit knowledge sharing within a multi-national virtual class and how knowledge sharing visibility impacts on incentive-based relationship in IT-based knowledge management systems. Further research investigated the associations between affective qualities of teacher–student relationships and students' school engagement and achievement (Roorda, Koomen, Spilt, & Oort, 2011). In fact, it has been shown that emotion is closely related to academic achievement (Gil-Olarte Márquez, Palomera Martín, & Brackett, 2006; Nelson, Benner, Lane, & Smith, 2004; Parker et al., 2004; Reyes, Brackett, Rivers, White, & Salovey, 2012). Kim, Park, and Cozart (2014) used motivation, emotion, and learning strategies, as predictors for achievement. They also found that emotions such as boredom, enjoyment, and anger significantly predicted students' achievement in a self-paced online mathematics course.

Finally, self-regulation and learning constitutes a very important research topic. Research shows that self-regulated students are more engaged in their learning (Labuhn et al., 2010). Self-regulated learners also perform better on academic tests and measures of student performance and achievement (Schunk & Zimmerman, 2007; Zimmerman, 2008). Often, self-regulated learning (SRL) is explained with motivation, emotion, and learning strategies (Abar & Loken, 2010). Several studies have demonstrated the role of emotion in SRL. Pekrun, Goetz, Daniels, Stupnisky, and Perry (2010) have shown that self-regulated learners have positive emotions, including hope, enjoyment, and pride in learning, whereas they control and regulate negative emotions, such as anger, anxiety, boredom, and frustration. Cho and Heron (2015) showed that significant differences in motivation and emotion were found in passing and non-passing students. Students who passed the course reported significantly higher task value and self-efficacy for learning.

This work aims at giving a new insight in the research of relationships that exist between emotion and time and self-management, especially as concerns the competencies *behavioral and cognitive engagement, self-regulation,* as well as *achievement* which are directly linked to students' performance in a computer-based learning context. This is explained in detail in the following sections.

2.5. Research hypothesis and goals.

Goal:

The goal of this work is to analyze the effects of emotional management on time and self-management in e-learning and identify *which are the competencies in time and self- management that are mostly influenced when students strive to achieve effective learning*.

Hypothesis:

"Increasing the ability of learners to manage emotions better and more effectively will positively influence their competencies in time and self-management in a computer-based learning context and, more specifically, their learning performance in terms of behavioral and cognitive engagement, self-regulation and achievement".

Research Questions

(1) How is "emotion awareness" related to "time and self-management" and thereby to "students' performance" in terms of behavioral and cognitive engagement, self- regulation, and achievement?

(2) How is "emotional feedback" related to "time and self-management" and thereby to "students'

performance" in terms of behavioral and cognitive engagement, self- regulation, and achievement?

(3) Does "emotional and time management" reduce student workload?

3. Design and methodology

3.1. Models and tools

Nowadays, learning environments are built from a constructivist point of view, where students take more control over their learning processes which are developed gradually over time, whereas teachers' work is highly demanding since it requires continuous monitoring, scaffolding and assessment of students' performance. Taking emotions into account, we need to provide teachers with different methods and tools to let them understand and analyze the emotional phenomenon and how it evolves over time.

To that end, we are based on an emotion analysis model (Arguedas and Daradoumis, 2013) which has its roots in the Activity Theory (AT) (Engeström, Miettinen, & Punamäki, 1999). Our approach describes an AT scenario where participants (teacher and students) work together and interact with specific objects to carry out goal-oriented activities, as shown in Figure 1.

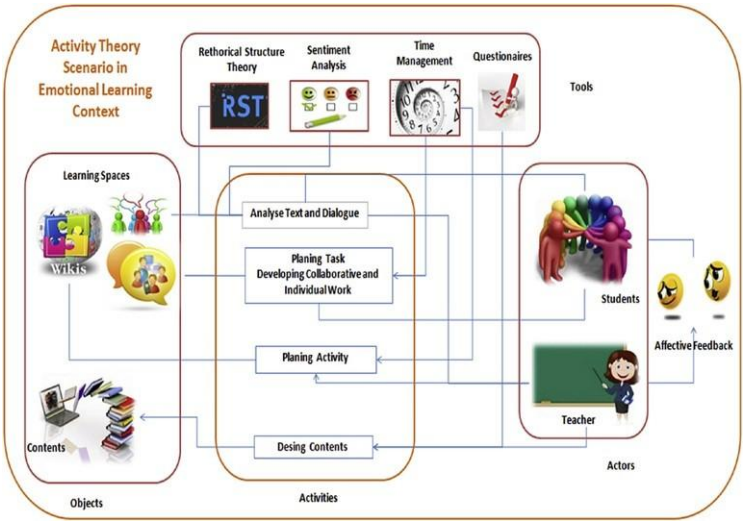

Figure 1: An Activity Theory Scenario in an Emotional Learning Context.

Given this AT scenario, our first step was to develop a discourse analysis method to analyze collaborative learning activities (that included written text and dialogues) in a non- intrusive way in order to identify and represent the students' emotions that take place during these activities. To achieve this, we employed a combination of tools such as Sentiment Analysis and Rhetorical Structure Theory (RST) (Daradoumis et al, 2013a). This endeavor has been complemented through a study of the role that Time Factor plays in the whole process and has been also supported by the design of specific questionnaires at the beginning and the end of the process. The result of this approach has been the identification of the emotional relations held between discourse units and a graphical representation of the emotional structure of discourse (as shown in Figure 2, Section 3.2). This provides the teacher with the necessary emotion awareness in regard of the way students' emotions appear and evolve over time, which enables him/her to offer students cognitive and affective feedback. Both emotion awareness and affective feedback can be closely related to the time factor and more specifically to the way emotion awareness and affective feedback can influence time and self-management and consequently student's performance in computer-based learning. This is an important issue that this work seeks to investigate as it is analyzed in the following sections.

3.2. Emotion Awareness

In order to provide emotion awareness among participants in the experimental group, we applied our Emotion Labeling Model at all conversations that took place in the group during the learning activity. The graphical representation of the emotional structure of the conversations produced was shown to both teacher and students of the experimental group. The conversation was split in different exchange types. In this way, the teacher was aware of students' emotions during their interactions in the virtual learning space (chat and forum), s/he could observe how students' emotions were changing and evolving in all

exchange types and could intervene on time. And students were aware of their own emotions and their peers. In contrast, the students of the control group were not supported by this facility and carried out their activity in a conventional way.

Figure 2 (a1, a2 and a3) shows the emotional structure of three conversation segments as it is depicted by the RST tool. It shows three emotion types (Happiness/Satisfaction, Shame, and Anger) that appear as the conversation evolves through exchange types (such as ascertain-information, elicit-information and give-information) produced by the participants. As we can also observe in these examples, emotion and cognition are closely linked (Frasson & Chalfoun, 2010).

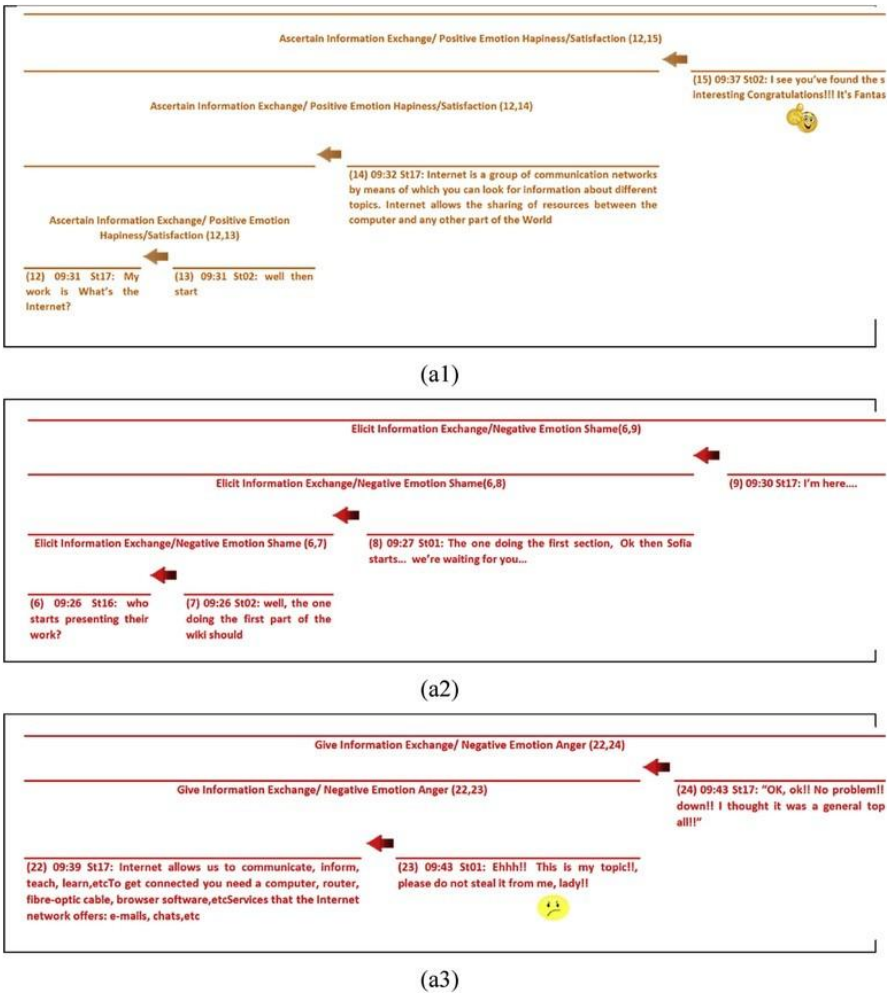

Figure 2. Representation of the Emotional Structure of conversation segments through RST during a chat carried out by students of the experimental group (a1, a2 and a3).

3.3. Participants and Procedure

Participants were a sample of 124 fourth-year high school students attending the subject "Introduction to computer science". Among students, 93 were girls (75%) and 31 were boys (25%). We divided students in 31 teams of four members and we chose 16 of these teams as the experimental group and the rest as the control group. Thus, the control group consisted of 60 students and the experimental group of 64 students. The number of teachers that participated in the experiment was two (2), one for the experimental and one for the control group. Each teacher provided and managed the same learning activity and tasks for both groups so that both groups had the same task characteristics in the experiment. The experiment was conducted for five weeks with a total of 15 sessions.

The procedure we followed was to design a scenario which is shown in Figure 3. First, the scenario included a collaborative learning activity which was implemented following the Problem-Based Learning method and the Jigsaw collaborative strategy. And then, the scenario provided several questionnaire types to both teachers and students, which are described in detail in the following section. The topic of the activity was "Introduction to Internet" and was carried out in the Moodle environment.

The activity designed by the teachers was arranged in several synchronous and asynchronous tasks such as wiki creation, forum debate and chat realization, where students were encouraged to

participate actively in building their knowledge. In this way, the teacher's role was reduced to guide and give support to the learning activity, by providing appropriate affective and cognitive feedback.

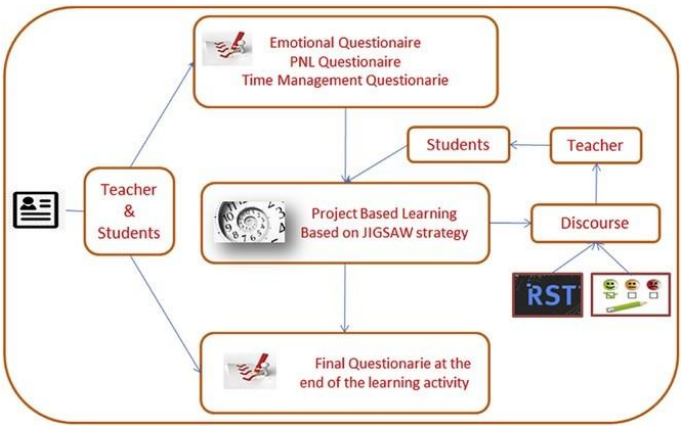

Figure 3. Our scenario based on PBL & Jigsaw strategy and supported by different questionnaire types.

Based on the Jigsaw collaborative strategy, the learning activity was divided in ten stages which in turn were grouped around five tasks to facilitate their implementation as we show below. For each task, the teacher provided all the necessary resources (documents and tools).

1. *First Task*: Division of the activity on topics and organization of groups (Initial chat)
2. *Second Task*: Individual development of each topic (Creation of the wiki)
3. *Third Task*: Meeting of "experts". Using the cognitive dissonance strategy, the teacher sets three questions about each topic of the activity to urge students to reflect upon specific issues of the activity (Use of an asynchronous forum)
4. *Fourth Task*: Meeting of the groups to determine how they will carry out the preparation and presentation of the final report. (Final chat)
5. *Fifth Task*: Preparation and presentation of the final report.

3.4. Research Instruments and Data Collection

At the beginning of the activity, we used three different questionnaire types: a VAK Learning Styles' Questionnaire of Lynn O'Brien (1990) to acquire participants' learning styles; a PEYDE's Questionnaire (Gallego & Gallego, 2004) to measure the initial level of participants' emotional intelligence; and, finally a questionnaire to measure how participants are managing time and self through organization, prioritizing, scheduling, etc. All participants, teachers and students, answered the three questionnaires. The data collected was used to set the teaching/learning profiles of the participants.

At the end of the learning activity of the experiment, we elaborated specific questionnaires aiming to obtain quantitative and qualitative data to measure and evaluate our research questions and hypothesis. We asked students from both groups (control and experimental) to fill in a specific questionnaire with closed and open-ended questions, with the aim of obtaining quantitative and qualitative data in order to respond the three research questions set. For the closed-ended questions we used a five-point Likert-type scale ranging from 1 (Almost never) to 5 (Almost always).

To this end, we defined specific indicators related, to Emotion Awareness (EA) and Teacher Affective Feedback (TAF) - that concern the issue of Emotional Management - and Time and Self-Management (TM). Indeed, these are the three axes that are bound to our research questions. Emotion Awareness includes indicators that concern positive and negative emotions, emotional states and behaviors that students experiment while performing their tasks both in the classroom and in the virtual environment. Teacher Affective Feedback involves indicators that concern the way teacher's attitude and interventions influence students' behavior and emotional states as well as the evolution of their learning process. Time and Self-Management indicators are connected to both EA and TAF and, for the sake of consistency, are the same for both axes. The three axes and their indicators that underlie the questionnaire are shown in Table 1.

Table 1. Indicators of the questionnaire and their tags used in statistical calculations

Tag	AXES/Indicators
EMOTION AWARENESS (EA)	

EA.1	Happiness/Satisfaction
EA.2	Sadness/Shame
EA.3	Fear/Anxiety
EA.4	Anger/Frustration
EA.5	Motivated
EA.6	Concentrated
EA.7	Unsafe
EA.8	Bored
EA.9	Showing Solidarity
EA.10	Giving Suggestions/Opinions
EA.11	Making Opposition
TEACHER AFFECTIVE FEEDBACK (TAF)	
TAF.1	Using dynamic methodologies that motivate students to learn
TAF.2	Attending students' feelings and emotions when there is a conflict in the group
TAF.3	Facilitating group discussion to manage emotions
TAF.4	Encouraging and motivating students' individual work, sharing it with the team
TAF.5	Solving students' questions and offering advice and suggestions
TIME and SELF MANAGEMENT (TM) wrt EA & TAF	
TM.1.EA	Self-regulating participation in the activity on time
TM.2.EA	Changing behavior (towards more positive) faster
TM.3.EA	Getting involved to create and share knowledge on time
TM.4.EA	Setting goals to achieve and measuring one's progress in reaching them
TM.5.EA	Lightening workload
TM.1.TAF	Self-regulating participation in the activity on time
TM.2.TAF	Changing behavior (towards more positive) faster
TM.3.TAF	Getting involved to create and share knowledge on time
TM.4.TAF	Setting goals to achieve and measuring one's progress in reaching them
TM.5.TAF	Lightening workload

Regarding the statistical techniques employed in the analysis of the questionnaire data, we used descriptive statistics, calculating relative frequencies (%), as well as graphics to represent reality objectively. We also used bivariate correlation and analysis of variance to find relationships between the variables under study for each of the questions of our study.

4. Results

4.1.Setting the participants' profile

We first present the data obtained from the three initial questionnaires, which concerned participants' (teachers and students) learning styles, level of emotional intelligence, as well as time and self-management skills. The skills explored were the abilities to plan, delegate, organize, direct and control.

a) Teachers

Regarding the teachers, the VAK style was 41.33% visual, 32.33% auditory and 26.33% kinesthetic (Figure 4). The levels of emotional intelligence showed an 87.50% in Problem Solving Ability, 90.00% in Relationship Ability, 92.50% in Empathy, 90.00% in Emotional Control and 90.00% in Emotional Awareness (Figure 5). Finally, the level of time and self-management was at a Good Level 87.50% (Figure 6).

b) Students.

First, with regard to the learning style of students that participated in the experimental group, 58% of them were visual, 25% auditory and 17% kinesthetic. In the control group, 42% of the students were visual, 33% auditory and 25% kinesthetic, as shown in Figure 4.

Second, with regard to the levels of emotional intelligence of the Experimental Group students, the results showed a 60.42% in Problem Solving Ability, 60.21% in Relationship Ability, 61.04% in Empathy, 59.79% in Emotional Control and 61.88% in Emotional Awareness. In the Control Group, the results showed a 60.00% in Problem Solving Ability, 60.00% in Relationship Ability, 61.46% in Empathy, 62.08% in Emotional Control and 61.67% in Emotional Awareness, as shown in Figure 5. No significant differences were shown in this aspect for both groups.

Finally, as concerns time and self-management skills in the experimental group, the results we

obtained were: Middle Level 66.67% and Good Level 33.33%, as shown in Figure 6. In the Control Group we had Bad Level 8.33%, Middle Level 33.33% and Good Level 58.33%. As such, it will be interesting to see how "emotion and feedback awareness" will improve or not students' time and self-management skills in the experimental group, as it is sought by our research questions.

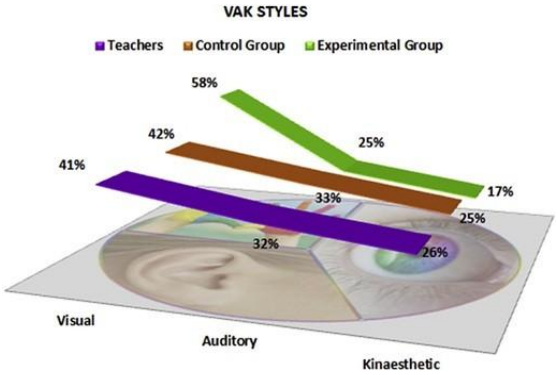

Figure 4. Graphical representation of VAK learning style in Experimental Group, Control Group and Teachers

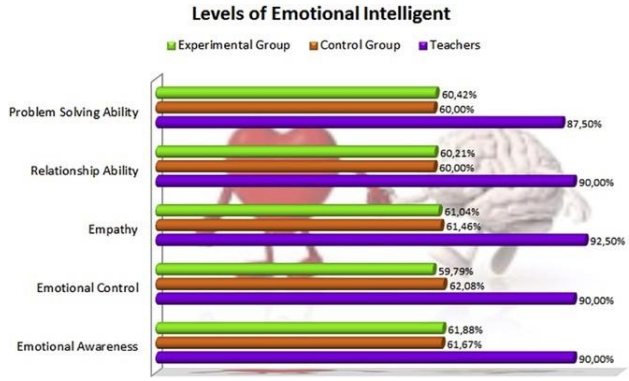

Figure 5. Graphical representation of Levels of Emotional Intelligent in Experimental Group, Control Group and Teachers

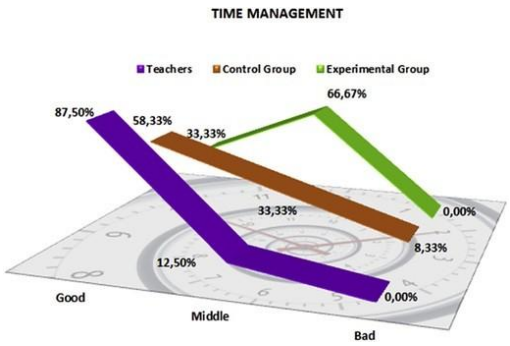

Figure 6. Graphical representation of Time Management in Experimental Group, Control Group and Teachers

4.2. Descriptive statistics and the Cronbach's alpha coefficient.

We applied a descriptive statics method that also examined the skewness and kurtosis of each variable in order to check for multivariate normality. The absolute values of skewness and the absolute values of kurtosis did not exceed a univariate skewness of 2.0 and a univariate of kurtosis of 7.0; it was assumed that there was no critical problem regarding multivariate normality. The only case where the values of skewness and kurtosis have exceeded a univariate skewness of 2.0 (2,883) and a univariate of kurtosis of 7.0 (10.022) occurred for the item of EA.3 (fear) in the control group.

Table 2 shows the results of the descriptive statistics obtained by both control and experimental groups (*n=60* and *n=64*). The Cronbach's alpha coefficients of the scale used were 0.793, 0.767 and 0.779 with regard to EA questionnaire items (Table 2(a)), TAF questionnaire items (Table 2(b)) and TM questionnaire items (Table 2(c)), respectively.

Table 2. Descriptive statistics of (a) Emotion Awareness – EA, (b) Teacher Affective Feedback – TAF and (c) Time and Self Management – TM (Data concern students both in Control and Experimental Group).

	Control Group (CG) (n=60 students)						**Experimental Group (EG) (n=64 students)**					
A) Descriptive statistics of Emotion Awareness – EA												
	Mean	**SD.**	**Skewness**	**Kurtosis**	**Min.**	**Max.**	**Mean**	**SD.**	**Skewness**	**Kurtosis**	**Min.**	**Max**
EA.1	3,55	1,126	-,276	-,767	1	5	3,58	,962	-,363	-,273	1	5
EA.2	1,65	,971	1,570	1,988	1	5	1,65	,860	1,086	,173	1	4
EA.3	1,37	,758	2,883	10,022	1	5	1,62	,825	1,391	1,560	1	4
EA.4	2,27	,936	,202	-,828	1	4	2,20	1,054	,930	,703	1	5
EA.5	3,43	1,015	-,165	-,281	1	5	3,10	1,020	,190	-,149	1	5
EA.6	3,35	1,087	-,256	-,209	1	5	3,42	,944	-,689	-,004	1	5
EA.7	1,53	,873	1,240	1,506	0	4	1,87	,911	,829	-,109	0	4
EA.8	2,82	1,112	,070	-,605	1	5	2,40	1,108	,687	,102	1	5
EA.9	3,32	1,000	,264	-,496	1	5	3,57	,890	-,357	,141	1	5
EA.10	3,25	1,159	-,173	-,575	1	5	3,10	,986	,013	,296	1	5
EA.11	2,23	1,212	,772	-,240	1	5	2,60	1,153	,297	-,559	1	5
B) Descriptive statistics of Teacher Affective Feedback – TAF												
	Mean	**SD.**	**Skewness**	**Kurtosis**	**Min.**	**Max.**	**Mean**	**SD.**	**Skewness**	**Kurtosis**	**Min.**	**Max**
TAF.1	3,13	,833	,288	,449	1	5	3,32	,854	,177	-,521	2	5
TAF.2	2,97	1,057	-,199	-,578	1	5	3,28	1,180	-,130	-,829	1	5
TAF.3	2,75	1,002	-,203	-,611	1	5	2,92	1,154	,031	-,571	1	5
TAF.4	3,70	,889	,189	-1,011	2	5	3,45	1,156	-,078	-1,213	1	5
TAF.5	3,70	1,109	-,527	-,766	1	5	3,77	1,198	-,570	-,794	1	5
C) Descriptive statistics of Time and Self Management – TM												
	Mean	**SD.**	**Skewness**	**Kurtosis**	**Min.**	**Max.**	**Mean**	**SD.**	**Skewness**	**Kurtosis**	**Min.**	**Max**
TM.1.EA	3,10	,969	,025	-,006	1	5	3,13	,792	,293	,919	1	5
TM.2.EA	3,03	,956	-,068	-,327	1	5	3,42	,962	-,346	-,010	1	5
TM.3.EA	3,13	,892	,175	-,217	1	5	3,18	,892	,217	-,052	1	5
TM.4.EA	3,33	1,036	-,245	-,231	1	5	3,55	,954	-,402	-,151	1	5
TM.5.EA	3,17	1,181	,112	-,815	1	5	3,32	1,052	-,073	-,379	1	5
TM.1.TAF	3,20	,860	,258	,276	1	5	3,28	,698	1,193	1,656	2	5
TM.2.TAF	3,32	,854	-,669	,398	1	5	3,57	,851	-1,069	,655	1	5
TM.3.TAF	3,73	1,163	-,458	-,756	1	5	3,97	1,041	-,491	-1,060	2	5
TM.4.TAF	3,08	,962	,065	-,449	1	5	3,33	,965	,193	-1,149	2	5
TM.5.TAF	3,20	1,070	,185	-,653	1	5	3,43	1,041	,305	-1,034	1	5

The values obtained from the descriptive statistics performed convey the following information:

The mean of EA exceeded the value three (3.0) for the following items: EA.1-Happiness/Satisfaction (which concerns students' emotion): 3.55 in the Control Group (CG) and 3.58 in the Experimental Group (EG); EA.5-Motivation (CG 3.43 – EG 3.10) and EA.6- Concentration (CG 3.35 – EG 3.42), which concern mental states; and, EA.9-Solidarity (CG – EG 3.57) and EA.10-provide suggestions (CG 3.25 – EG 3.10), which concern behaviors. This indicates that students had experienced high positive emotions, mental states and behaviors both in the experimental and control group.

The mean of TAF exceeded the value three (3.0) in the Control Group (CG) for the following items: TAF.1 (3.13), TAF.4 (3.70) and TAF.5 (3.70), whereas in the Experimental Group (EG) this happened for the items: TAF.1 (3.32), TAF.2 (3.28), TAF.4 (3.45) and TAF.5 (3.77). This indicates that students in both groups had perceived that the teachers have used dynamic methodologies that motivated them to learn, has encouraged and motivated them in their individual work sharing it with the team, and has solved their questions offering advice and suggestions. However, unlike CG students, EG students had perceived that the teacher has attended their feelings and emotions when there was a conflict in the group (TAF.2). Moreover, as regards item TAF.3, students in EG had perceived in a greater degree (2.92) that the teacher has facilitated group discussion to manage emotions than students in CG (2.75).

The mean of TM exceeded the value three (3.0) in both CG and EG for all the items, as shown in Table 2. However, all item values in EG are higher than the ones in CG, especially for certain items that we need to make a specific mention. As regards Emotion Awareness (EA), these items are: TM.2.EA (Changing behavior towards more positive faster), TM.4.EA (Setting goals to achieve and measuring one's progress in reaching them) and TM.5.EA (Lightening workload). As regards Teacher Affective

Feedback (TAF), the distinguishing items are: TM.2.TAF (Changing behavior towards more positive faster), TM.3.TAF (Getting involved to create and share knowledge on time), TM.4.TAF (Setting goals to achieve and measuring one's progress in reaching them) and TM.5.TAF (Lightening workload). This indicates that Emotion Awareness is to some extent related to "Time and Self-Management" and subsequently to "students' performance" in terms of behavior and achievement, whereas Teacher Affective Feedback is more closely related to "Time and Self- Management" and subsequently to "students' performance" in terms of behavioral and cognitive engagement as well as achievement. Moreover, both Emotional Management (EA and TAF) and Time and Self-Management (TM) are related to student workload.

Finally, we present the correlations between variables TM & EM (EA and TAF) that were found in the experimental group in Tables 3 and 4 respectively.

Table 3. Correlations between Time and Self-Management & Emotion Awareness of Experimental Group Students (n=64)

Pearson Correlations										
	EA.1	EA.2	EA.4	EA.5	EA.6	EA.7	EA.8	EA.9	EA.10	EA.11
TM.1.EA	,113	-,021	-,191*	,211*	,139	,096	-,079	,106	,147	,015
TM.2.EA	,314**	-,005	-,011	,359**	,352**	,115	-,034	,391**	,240**	-,038
TM.3.EA	,127	,027	-,099	,150	,147	,122	-,022	,155	,129	-,174
TM.4.EA	,307**	-,006	-,107	,554**	,412**	,143	-,128	,275**	,298**	-,015
TM.5.EA	,236**	-,035	,161	,252**	,353**	,038	,012	,364**	,252**	-,104
* Correlation is significant at the 0.05 level (2-tailed)										
** Correlation is significant at the 0.01 level (2-tailed)										

Table 4. Correlations between Time and Self-Management & Teacher Affective Feedback of Experimental Group Students (n=64)

Pearson Correlations					
	TAF.1	**TAF.2**	**TAF.3**	**TAF.4**	**TAF.5**
TM.1.TAF	,129	,142	,053	,190*	,140
TM.2.TAF	,082	,332**	,186*	,271**	,278**
TM.3.TAF	,000	,259**	,007	,232*	,215*
TM.4.TAF	,146	,267**	,147	,343**	,224*
TM.5.TAF	,187*	,228*	,195*	,246**	,188*
* Correlation is significant at the 0.05 level (2-tailed)					
** Correlation is significant at the 0.01 level (2-tailed)					

Firstly, a significant positive correlation was found between EA and TM. In particular, we found higher correlations between:

- Happiness/Satisfaction as emotion *caused* TM.2.EA (r .314, p<.01), TM.4.EA (r .307, p<.01) and TM.5.EA (r .236, p<.01)
- Motivation as mental state *caused* TM.1.EA (r .211, p<.01), TM.2.EA (r .359, p<.01), TM.4.EA(r .554, p<.01) and TM.5.EA (r .252, p<.01)
- Concentration as mental state *caused* TM2.EA (r .352, p<.01), TM.4.EA(r .412, p<.01) and TM.5.EA (r .353, p<.01)
- Be supportive as behavior *caused* TM2.EA (r .391, p<.01), TM.4.EA(r .275, p<.01) and TM.5.EA (r .364, p<.01)
- Give feedback and suggestions as behavior *caused* TM.2.EA (r .240, p<.01), TM.4.EA (r .298, p<.01) and TM.5.EA (r .252, p<.01).

Secondly, a significant positive correlation was found between TAF and TM. In particular, we found higher correlations between:

- TAF.2 (Teacher attending students' feelings and emotions when there was a conflict in the group) *caused* TM.2.TAF (r .332, p<.01), TM.3.TAF (r .259, p<.01), TM.4.TAF (r .267, p<.01) and TM.5.TAF (r .228, p<.01),
- TAF.4 (Teacher encouraging and motivating students' individual work, sharing it with the team)

caused TM.1.TAF (r .190, p<.01), TM.2.TAF (r .271, p<.01), TM.3.TAF (r .232, p<.01), TM.4.TAF (r .343, p<.01) and TM.5.TAF (r .246, p<.01),

- TAF.5 (Teacher solving students' questions and offering advice and suggestions) *caused* TM.2.TAF (r .278, p<.01), TM.3.TAF (r .215, p<.01), TM.4.TAF (r .224, p<.01) and TM.5.TAF (r .188, p<.01),
- TAF.3 (Teacher facilitating group discussion to manage emotions) *caused* TM.2.TAF (r .186, p<.01), and
- TAF.1 (Teacher using dynamic methodologies that motivated students to learn) *caused* TM.5.TAF (r .187, p<.01).

5. Discussion

The purpose of this study was to analyze the effects of emotion management on time and self-management in computer-based learning and identify *which are the competencies in time and self-management that are mostly influenced when students strive to achieve effective learning*.

To this end, based on the results we obtained in Section 4.2 above, we proceed to discuss and provide a response to the research questions we set in the beginning of our study. For the sake of convenience, we repeat each question below:

- *How is "emotion awareness" related to "time and self-management" and thereby to "students' performance" in terms of behavioral and cognitive engagement, self- regulation, and achievement?*

First of all, all students (in both Control and Experimental groups) were happy with the learning activities they had to carry out since they experienced high positive emotions, mental states and behaviors during the implementation of these activities.

Our results show that the relationship between Emotion Awareness (EA) and Time and Self-Management (TM) mostly concerns behavioral and achievement orientation competencies. Students in Experimental Group (EG), who are endowed with EA capability, tend to change their behavior towards a more positive one, as well as to set goals to achieve and measure their progress in reaching them to a greater degree than students in Control Group (CG). However, EG students just show a slightly better performance in competencies such as cognitive engagement (getting involved to create and share knowledge) and self- regulation (of their participation in the activity) than CG students. This may be due to several factors that need to be further investigated and analyzed and which may be related to the students' own profile that we examined in the beginning of our study: learning styles, level of emotional intelligence, as well as their innate time self-management skills. Other factors may be related to maturation (Toga et. al, 2006), temperament (Fowles & Kochanska, 2000) and learning specific strategies for regulating behavior and emotions (Ochsner & Gross, 2005; Davis & Levine, 2013), among others.

Positive emotions (such as happiness/satisfaction), mental states (such as motivation and concentration) and behaviors (such as be supportive and helpful) had significant positive effects on behavioral engagement and achievement. As regards the other two competencies (cognitive engagement and self-regulation), they certainly had more positive effect on cognitive engagement, though "being helpful" (Giving Suggestions/Opinions) had a more positive impact on self-regulation (as shown in Table 3).

In contrast, negative emotions (such as sadness/shame, fear/anxiety and anger/ frustration) had a negative effect on self-regulation, especially in the case of anger/ frustration. In fact, the latter had a negative effect on all other competencies (behavioral and cognitive engagement, and achievement). Here, it is remarkable to observe that fear/anxiety had a very positive impact on achievement, since students in this situation were "pushed" to increase efforts in order to achieve their goals. As regards the negative emotional states (such as unsafe and bored), the first one had a rather positive impact on all competencies, especially for achievement, whereas the second one had a rather negative impact on all competencies, being more unfavorable to achievement. Finally, negative behaviors (such as making opposition) had a rather negative impact on all competencies, except self-regulation, which means that self-regulation may be slightly favored by confronting situations. We observed that this was especially evident in EG students (who were aware of their behavior).

- *How is "emotional feedback" related to "time and self-management" and thereby to "students' performance" in terms of behavioral and cognitive engagement, self- regulation, and achievement?*

Our results show that Teacher Affective Feedback (TAF) adds a new element to Time and Self-Management (TM) competencies. In particular, TAF contributes to students' performance in terms of behavioral and cognitive engagement as well as achievement. Indeed, Students in Experimental Group

(EG), who explicitly received teacher's emotional feedback, were involved to create and share knowledge on time to a greater extent than students in Control Group (CG). As concerns the last competency, self-regulation, we observed that TAF certainly helped EG students more than CG students in self-regulating their participation in the activity; however, the difference between the two groups was not noteworthy. This means that TAF should be accompanied with further teacher capabilities, such as the fact that teachers should be familiar with the factors that influence a learner's ability to self-regulate (Wolters 2011). In the first instance, to promote self-regulation in classrooms, teachers must teach students the self-regulated processes that facilitate learning. In a study of high school students, Labuhn et al. (2010) found that learners who were taught self-regulation learning skills through monitoring and imitation were more likely to elicit higher levels of academic self-efficacy (i.e., confidence) and perform higher on measures of academic achievement compared to students who did not receive such instruction. Likewise, teachers should provide effective instructional strategies for encouraging self-regulation in the classroom (Andreassen & Braten, 2011; Tonks & Taboada, 2011).

Moreover, it has been shown that motivation can have a pivotal impact on students' academic outcomes and without motivation, self-regulation is much more difficult to achieve (Zimmerman, 2008). In this sense, the teacher in our experiment explored the way motivation is related to self-regulation. As shown in Table 4, the fact that the teacher was encouraging and motivating students' individual work, sharing it with the team (TAF.4) had a positive effect on students' self-regulation (TM.1.TAF). This finding is further reinforced by the fact that when students were motivated (EA.5) they were more receptive to self-regulate their participation in the activity (TM.1.EA), as shown in Table 3.

Other teacher interventions that had a significant effect on students' performance in terms of behavioral and cognitive engagement as well as achievement (TM.2.TAF, TM.3.TAF and TM.4.TAF) were TAF.2 (Teacher attending students' feelings and emotions when there was a conflict in the group) and TAF.5 (Teacher solving students' questions and offering advice and suggestions). Instead, the other two types of affective feedback (TAF.3: Teacher facilitating group discussion to manage emotions and TAF.1: Teacher using dynamic methodologies that motivated students to learn) that teacher used had less or no significant effect respectively, as shown in Table 4. Indeed, TAF.3 had a notable positive impact on students' behavior only. This means, that teacher should revise and reconsider these two types of emotional feedback and explore alternative ways to apply them.

- *Does "emotional and time management" reduce student workload?*

Our results showed that this question had a positive answer in all aspects. More specifically, as regards emotional management (that includes both emotion awareness and emotional feedback), Table 3 shows that positive emotions (such as happiness/satisfaction), mental states (such as motivation and concentration) and behaviors (such as be supportive and helpful) had significant positive effects on lightening students' workload.

In addition, Table 4 shows that Teacher Affective Feedback has also contributed in lightening students' workload. This includes all kinds of feedback that teacher used, though a special mention should be made to feedback TAF.4 (Encouraging and motivating students' individual work, sharing it with the team) which presented more outstanding results. This means that motivation can be considered an important means for reducing student workload. As regards Time Management, Table 2(c) shows that EG students were able to make a better management of their workload than CG students.

6. Conclusion and Future Work

This work aimed to shed some light on the relationship between emotion management and time and self-management in computer-based learning. To tackle this issue, we explored the way some of the competencies in time and self-management may be affected when students are explicitly aware of their emotions and receive explicit emotional feedback by the teacher. The competencies examined were: behavioral and cognitive engagement, self- regulation, and achievement orientation.

The hypothesis set by our study "Increasing the ability of learners to manage emotions better and more effectively will positively influence their ability to manage the time allocated to the learning practice more productively, and consequently their learning performance in terms of behavioral and cognitive engagement, self-regulation and achievement", indeed turns out to be fairly true. This is especially true for the case of behavioral engagement as well as achievement and partially true for cognitive engagement and self-regulation.

In particular, our study set two main research questions for testing emotion awareness and emotional feedback as two independent enquiries.

Our results showed that "emotion awareness" is fairly related to "time and self- management" in

the sense that when students are aware of their emotions may enhance their learning performance in terms of behavioral engagement and achievement and, partly, in terms of cognitive engagement and self-regulation.

Besides, "emotional feedback" is more closely related to "time and self-management", meaning that when a teacher provides explicit affective feedback to students, this may enhance their learning performance in terms of behavioral and cognitive engagement as well as achievement and, partly, in terms of self-regulation, placing more weight on motivation as a critical factor for enhancing self-regulation.

In addition, we performed a basic exploration of a third research question that concerned the relationship between "emotional and time management" and student workload. At first sight, it was shown that an explicit and effective emotion and time management can reduce students' workload.

This research also revealed new interesting aspects and important issues that certainly need further investigation. Some of these aspects and issues concern the first axis of our research, emotion awareness. An important open question is how emotion awareness can be reinforced in order to achieve an effective cognitive engagement and self-regulation. What other competencies in "time and self-management" can emotion awareness strengthen and thus improve students' performance further? As regards the second axis of our research, emotional feedback, how this can be combined with other factors that can improve self- regulation? Also, what other competencies in "time and self-management" can emotional feedback nourish and thus improve students' performance further? Finally, deeper research is needed to corroborate the positive relationship between "emotional and time management" and student workload, as well as to examine how this is also affecting teacher workload.

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