Electronic Journal of Research in Educational Psychology
ejrep
EDUCATION & PSYCHOLOGY I+D+i
Ilustre Colegio Oficial de Psicología de Andalucía Oriental

Promoting individual and group regulated learning in colaborative settings: an experience in Higher Education

Javier Onrubia[1], **María José Rochera** [1], **& Anna Engel** [1]

[1] Dpt. de Psicología Evolutiva y de la Educación
Universitat de Barcelona, Barcelona

Spain

Correspondence: Javier Onrubia. P. Vall d'Hebron, 171 08035 Barcelona. España.
E-mail: javier.onrubia@ub.edu

Abstract

We present a teaching innovation intervention aimed at promoting individual and group learning regulation in undergraduate students working in a computer supported collaborative learning environment. Participants were 127 students and three teachers of a compulsory course on Educational Psychology at the University of Barcelona (Spain). As a central point of the intervention, a digital tool --the "student's log"-- was designed for students to include a series of evidences of their individual and group work processes, and of their learning progress, which the teachers systematically revised and marked with comments. The intervention was evaluated using student questionnaires and teachers' self-reports, and also considered students' final grades. The results of the intervention were positive both from the point of view of students' learning and working processes and from the point of view of students' and teachers' satisfaction.

Keywords: self-regulated learning, higher education, educational innovation, collaborative environment

Received: 06/04/14 *Initial acceptance: 08/02/14* *Final acceptance: 03/14/15*

Promover la regulación individual y grupal del aprendizaje en entornos colaborativos: una experiencia en Educación Superior

Resumen

En este trabajo presentamos una experiencia de innovación docente dirigida a promover la regulación individual y grupal del aprendizaje en estudiantes universitarios que trabajan en un entorno colaborativo mediado por ordenador. Participaron en la experiencia 127 estudiantes y tres profesores de una asignatura troncal de Psicología de la Educación de la Universitat de Barcelona (España). La experiencia se basó en el uso de una herramienta digital —el "cuaderno de bitácora"— en que los estudiantes debían incluir una serie de evidencias de su proceso de trabajo personal y grupal, y del progreso de su aprendizaje, que eran revisadas y comentadas sistemáticamente por los profesores. Se valoró la experiencia a partir de cuestionarios a los estudiantes y autoinformes de los profesores, así como de las calificaciones de los estudiantes. Los resultados de la experiencia fueron positivos tanto desde el punto de vista de la mejora en la organización y funcionamiento individual y grupal de los estudiantes como de la satisfacción de los estudiantes y el profesorado.

Palabras Clave: aprendizaje autorregulado, enseñanza superior, entorno colaborativo, innovación pedagógica.

Recibido: 04/06/14 *Aceptación inicial: 02/08/14* *Aceptación final: 14/03/15*

Introduction

In recent decades, Educational Psychology research has shown the potential of student collaboration for improving processes of knowledge construction and of attributing meaning to content and activities in teaching and learning (Dillenbourg, Baker, Blaye & O'Malley, 1996; Johnson & Johnson, 1974; Slavin, 1996). Similarly, it has also shown that this potential may be increased when collaboration is mediated through digital technology (Dillenbourg, Järvelä & Fischer, 2009; Stahl, Koschmann & Suthers, 2006; Resta & Laferrière, 2007). Interest in analyzing this potential has led to the development of a new sphere of study called *Computer-Supported Collaborative Learning*, CSCL.

Collaborating in order to learn allows students to participate in forms of conversation that develop ever increasing levels of inter-subjectivity, and with this, to progressively expand and enrich the systems of meanings that they construct together over a foundation of teaching and learning tasks and content (Bereiter, 1994; Mercer, 2001; Scardamalia & Bereiter, 2003; Suthers, 2006). Likewise, this allows students to negotiate and reach agreements on how the shared activity itself is to be organized and carried out, through use of planning, coordinating and mutually monitoring the common work, as well as their own contributions and roles in the interaction (Engel & Onrubia, 2010; Manlove, Lazonder & de Jong, 2009; Meier, Spada & Rummel, 2007).

However, to specifically identify these potentialities is not easy. Research has also repeatedly confirmed that, particularly in the case of CSCL environments (Dillenbourg, Järvelä & Fischer, 2009; Stahl, Koschmann & Suthers, 2006; Resta & Laferrière, 2007), it is not enough to assign students to work in a group, nor to offer them powerful "collaborative technologies" (Lipponen & Lallimo, 2004), and expect that the mechanisms and interactive steps that account for the effectiveness of collaborative learning will simply appear. Whether or not they appear, and hence, whether the collaboration between students has a greater or lesser contribution for learning, depend to a large degree on the nature of the students' involvement and participation in the group work.

For this reason, research in this sphere has progressively evolved toward trying to identify ways of providing instructional support for student collaboration processes. On one

 Electronic Journal of Research in Educational Psychology, *13*(1), 189-210. ISSN: 1696-2095. 2015, no. 35
http://dx.doi.org/10.14204/ejrep.35.14058

hand, researchers have looked at the teacher's possible role as guide and support for students' collaborative construction of knowledge (Dillenbourg & Hong, 2008; Garrison & Anderson, 2003; Kirschner, Sweller & Clark, 2006). On the other hand, they consider the role of the digital technologies themselves in supporting and facilitating aspects of collaborative processes (Lipponen & Lallimo, 2004; Martínez, Dimitriadis & de la Fuente, 2003; Pifarré & Cobos, 2010).

In both cases, emphasis is given to how to design environments or situations that promote certain interactive processes between students as well as how to help develop both individual and group work processes that the groups can effectively follow throughout the teaching and learning process. Tabak (2004) uses the term *synergistic scaffolding* to refer to the need to create synergies between aids and supports that are offered from different sources (teacher, online tools, pair work, learning materials, etc.) and then directed to the entire class group, to the small group, or to the individual student. In a similar sense, Fischer and Dillenbourg (2006) speak of *orchestration* in order to highlight how the teacher should design, in advance, multiple "harmonizing voices" (activities, supports and scaffolding) which later must be *tuned* and adapted at all times to the particular collaborative processes being pursued by the different student groups (for a broader discussion, see Dillenbourg *et al.*, in press).

Among the different aspects involved in collaborative work, the aspect of students' individual and group regulation of their work and learning has been receiving greater attention in recent years. This refers to how group members control their own processes of collaboration and learning. Understood in this light, such regulation involves metacognitive activities of planning, monitoring and evaluating the group work and group learning; it is both individual and social, including self-regulation processes in each student, the regulation of others' work and learning, and joint or shared regulation between group members (Jarvela & Hadwin, 2013; Volet, Summers & Thurman, 2009). Several recent studies underscore the complexity of these regulation processes and the need to teach them (Boeckaerts, 2002; de la Fuente & Justicia, 2007; de la Fuente, Justicia, Sander & Cardelle-Elawar, 2014; Pintrich, 2000), their importance to the success of work and collaborative learning, and the difficulties that students usually find in successfully regulating themselves in small-group collaborative work situations (Álvarez-Valdivia & López-Benavides, 2010; Janssen, Erkens, Kirschner & Kanselaar, 2012; Saab, Joolingen & Hout-Wolters, 2012; Schoor & Bannert, 2012).

Objective

In this framework, our study presents a teaching innovation experience that sought to promote individual and group regulated learning in university students who work in a computer-mediated collaborative environment. The experience is based on the use of an online tool, the "student's log", designed to help improve processes of planning, monitoring and revising the students' work and their learning as individuals and as a group.

Methodology

Participants

The experience was carried out in a required course in Educational Psychology that forms part of the Psychology degree at the University of Barcelona (Spain). Two class groups participated, included 127 enrolled students and three professors (one teacher in one group, and two in the other group). The subject was organized along three topic areas, each lasting about four weeks. The work in each topic area was structured into two tasks that students were to carry out in small groups of 4-6 students: a case study from school psychology, and a conceptual map with the basic concepts needed to address the case. The groups approached these tasks autonomously, although with continuous monitoring and support from the teacher. Collaboration between group members took place both face-to-face and online. The online work was done through the University of Barcelona's Virtual Campus, based on the Moodle platform. For this assignment, each small group had at their disposal a forum, a chat and a wiki; access to each of these was limited to group members and to the teacher.

The autonomous nature of each group's approach, along with the open, complex nature of the tasks themselves, required the groups to continuously coordinate and regulate both the collaboration between the different group members as well as each one's contribution to the group work process. In this context, the experience focused on preparing a set of helps designed to support the group regulation process and to promote student competency development in planning, monitoring and evaluating collaborative work. These helps were structured around an instrument that we called the "student's log".

Electronic Journal of Research in Educational Psychology, *13*(1), 189-210. ISSN: 1696-2095. 2015, no. 35
http://dx.doi.org/10.14204/ejrep.35.14058

Intervention procedure and instruments

The "student's log" was a space in the virtual classroom where small group members were to include certain online evidence of their personal and group work process, and of their learning progress. The term "student's log" was intended to highlight its function as a systematic register of the process carried out and the progress attained, at the same time emphasizing its personal nature, both in terms of the individual and the group. The "student's log" incorporated characteristics of both of an electronic portfolio and a learning diary, without being identical to either. In the first case, different types of evidence were to be presented, reflecting both the process and the results of the work itself and of learning; in the second case, it was a partially public document, relatively systematic in the frequency of its entries. From the technological viewpoint, after analyzing the possibilities and limitations of the Moodle tools available in the Virtual Campus, the student's log was implemented over a private small group forum, in which the members of each group could make entries and attach documents.

The attachments requested for each of the topic areas were designed to favor students' awareness of the different dimensions involved in processes of regulating collaboration, as well as to promote individual and group progress in mastering these processes. The following specifics were considered:

- The individual or group nature of the evidence provided.
- The moment within the work process of each activity when the evidence should be provided: at the beginning of the process (evidence of individual and group task planning); during the process (evidence related to work progress and successive versions of the final product to be turned in); or at the end of the process (evidence related to assessment of the final product).
- The type of evidence, distinguishing between product evidence (partial products or draft versions of the final product) and process evidence (descriptions, reflections, comments or evaluations of the individual or group work process itself).
- The degree of reflection on the evidence, distinguishing between direct product or process evidence and "meta-evidence", that is, comments or assessments on one's own evidence or the evidence of classmates, its quality and contribution to the individual or group work process.

In the *first topic area* of the course, each group was requested to include at least five pieces of evidence in their student's log: two pertaining to the individual and three pertaining

to the group, in both cases relating to the map activities and to the case study. Table 1 illustrates the evidence requested for this topic area, as expressed to the students.

Table 1. **Evidence required for the student's log for the first topic area of this course**

STUDENTS' LOG - TOPIC AREA 1

The student's log has been designed in order for the groups to make entries in the form of significant evidence of how the individual and the group study the content and complete the activities in Topic Area 1.

This evidence must be supplied by all group members. Specifically, while this Topic Area is under way, five types of evidence must be provided, two of which relate to the individual and three to the group. This evidence must have the following characteristics:

- Each student individually contributes two pieces of evidence: one related to developing the conceptual map and the other related to the case study. At least one of these two items must be an individual product that precedes group discussion of the activity (online document, published as an attachment to a prefatory message).
- The group will contribute three pieces of evidence that must refer to the two activities assigned in the Topic Area, the conceptual map and the case. At least two of these must be draft versions of the ultimate product that is turned in (online draft, published as an attachment to a prefatory message). Group evidence must reflect agreement and work done by all members of the group.

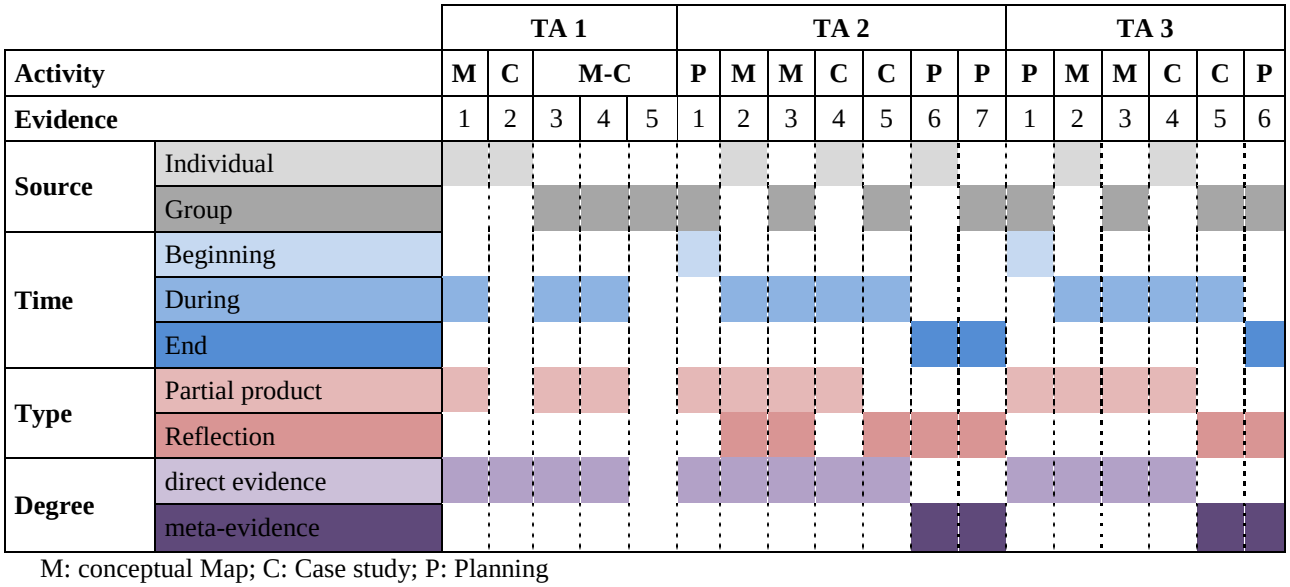
Each piece of evidence, whether from the individual or the group, must be published as a message in the student's log, sometimes including an attached file with the requested draft product. Attachments formatted as images (gif, jpg, tif, etc.) are not recommended. It is more practical to insert the image in a text document and attach the resulting file (doc, pdf, rtf, etc.). It is also recommended that the Subject line of the message plainly state the content (for example, "group evidence: conceptual map").

In terms of the dimensions noted above, these instructions placed the emphasis on differentiating individual evidence from group evidence, but they do not address the remaining dimensions, since they do not explicitly require evidence prepared at the beginning or at the end of the work process, process-related evidence or "meta-evidence". In the next two Topic Areas of the course, the requirements gradually increased in complexity, with explicit requests for different evidence related to these dimensions. In the *Second Topic Area*, seven pieces of evidence were required, three individual pieces and four group pieces, and included requirements for evidence before and after completing the activities (for example, initial group planning of the work process to be followed by the group), process-related evidence (for example, a commentary on the group work process for one of the activities) and "meta-evidence" (for example, an assessment/reflection, at the end of the process, on the usefulness

of the plans that were made), including retroactive and proactive aspects. In the *Third Topic Area*, the requirements for different types of evidence were practically identical. The increased complexity resulted from requiring one of the group pieces to discuss and evaluate how the individual contributions of the group members had influenced the group product.

The increasingly complex evidence required between the first topic area and the next two topic areas was supported by introducing a face-to-face activity at the end of the first topic area, when the small groups evaluated their group work dynamic during this first period. Toward this end, students individually answered a short questionnaire that helped them become aware of and rate different aspects of that process; then they used their answers to discuss in the small group how they might improve. The agreements they reached then guided their group work plans for the second topic area. This planning effort was also supported by a specific guideline. The same activity was repeated at the end of the second topic area.

The global evolution of the evidence required over the three topic areas is visually represented in Figure 1.



M: conceptual Map; C: Case study; P: Planning

Figure 1. **Sequence of evidence required in each topic area in the course**

Both the individual and group evidence that the small groups submitted during each topic area was subjected to teacher review, evaluation and commentary during and at the end of that particular topic area. The assessments and comments were included in a written report

that was presented to each group at the end of the topic area, addressing the entirety of the work done, and these reports were discussed in face-to-face tutorial sessions held for that purpose. Both the reports and the tutorial sessions aimed to encourage students' awareness of their collaborative work processes and of each member's contribution to the work, based on an analysis of the evidence provided by the groups (number of items, type and quality of the evidence, time at which it was entered in the student's log, consistency between individual and group evidence, etc.). They also promoted awareness of the relationship between these processes, the products produced and the grade they were given; they stimulated reflection on these processes; and offered guidance for increasingly autonomous, reflective individual and group regulation of the group's work and learning.

Data collection procedure

The experience was assessed by collecting information from the participating students and teachers. In the students' case, the information was collected through an individual questionnaire that students filled out at the end of the course. This questionnaire was built on the *Cuestionario de valoración & satisfacción de la asignatura* [Subject assessment and satisfaction questionnaire], customarily used in prior experiences. The questionnaire was structured into three groups of questions: student satisfaction with the student's log and other support activities for group work regulation processes; their assessment of how well the organization of both group and individual work had worked, in each of the topic areas; and their global assessment of the subject overall. A total of 22 closed, Likert-type items were included, with five possible response options, and seven complementary open response questions, where up to three possible responses were allowed in each case. As additional information, students' final grades for the class were also collected.

As for the teachers, they also prepared a self-report assessment of the experience when the subject had ended. As with the questionnaires, the self-report was modeled on other self-reports used in prior innovation experiences where the authors participated, and was adapted to this particular intervention. The self-report was made up of 13 questions: nine Likert-type items, where teachers were asked to rate different aspects of the experience, and four open questions, where they were asked to identify the strong and weak points of the experience, its main contributions, possible elements for improvement, and some final general comments.

 Electronic Journal of Research in Educational Psychology, *13*(1), 189-210. ISSN: 1696-2095. 2015, no. 35
http://dx.doi.org/10.14204/ejrep.35.14058

Data analyses

Descriptive statistics were used to analyze the Likert type items on the student questionnaires and the teacher self-reports. For the open questions, inductive content analysis was first applied to the responses, and response frequencies and percentages were calculated for the different categories obtained.

Results

Students' ratings and satisfaction with the student's log were clearly positive (Figure 2). In overall percentages, 79% of the students considered it "quite" or "very" useful for improving organization and planning of their individual work, 78% for improving organization and planning of their group work, and also 78% for improving the quality of products produced for this subject. Additionally, 83% of students affirmed that having to systematically and continuously turn in individual and group evidence had helped them "quite a bit" or "very much" in regulating and managing their learning process. This positive assessment was also found for the rest of the activities and instruments designed to support group work regulation processes in this subject (Figure 3). Despite the overall positive rating for the course, the students considered that, on the whole, they were required to put in very high levels of time and effort. For example, when asked how many subjects with this same overall workload and time dedication they would be able to take simultaneously in the same semester, they indicated on average between 2 and 3 subjects -- far below the five or six subjects per semester that they are typically assigned in the curriculum sequence of their degree program.

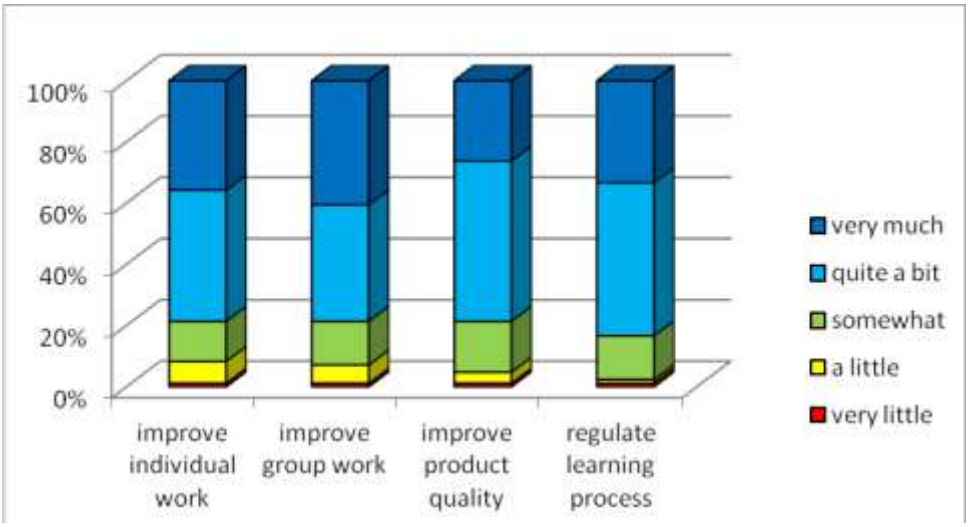


Figure 2. **Students' assessment of the usefulness of the student's log**

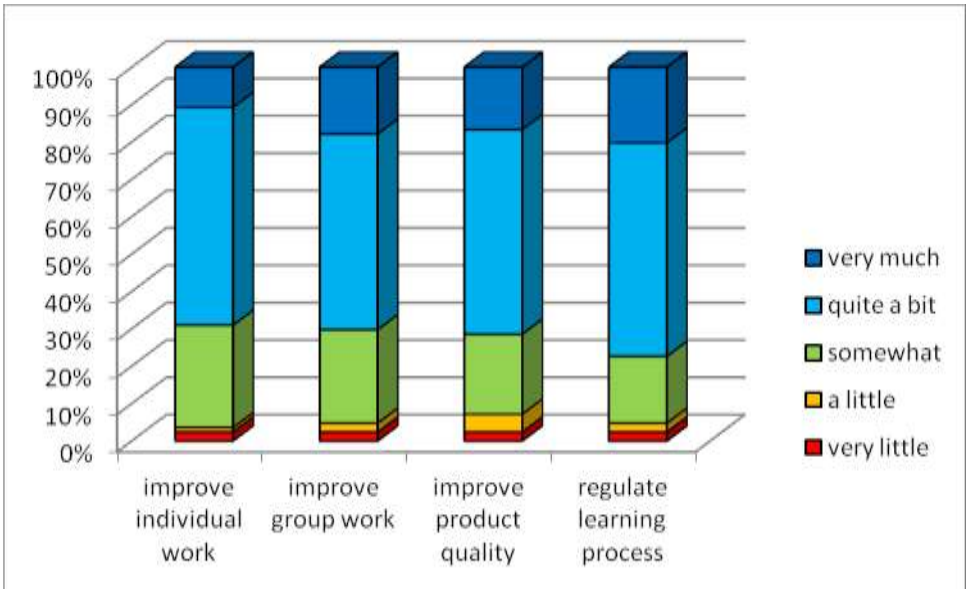


Figure 3. **Students' assessment of the usefulness of complementary support activities for regulating group work**

In addition to showing their overall satisfaction with the student's log and the support activities for group regulation processes, students' questionnaire responses indicated that their group work processes had improved over the term (Figures 4, 5 and 6). Specifically, with regard to organization and planning of individual work, only 47% of students rated it "good" or "very good" in the first topic area of the subject, while this percentage increased to 87% in topic area 2, and up to 90% in topic area 3. As for organization and planning of small group work, 40% of students considered it "good" or "very good" in the first topic area, 78% in topic area 2, and 83% in topic area 3. As for articulation of the individual and group activities, the proportions were 51% in topic area 1, 84% in area 2, and 81% in area 3. The reader will recall that topic areas 2 and 3 introduced the requirement to produce evidence of planning and evaluation of group work processes, evidence related to building awareness of individual and group work process, and "meta-evidence", and include these in the student's log. It was also in areas 2 and 3 when support activities and instruments were introduced for revising and planning the group's organization and functioning. The results thus indicate a clear positive effect of the student's log and other activities for supporting the students' group work regulation.

Electronic Journal of Research in Educational Psychology, *13*(1), 189-210. ISSN: 1696-2095. 2015, no. 35
http://dx.doi.org/10.14204/ejrep.35.14058

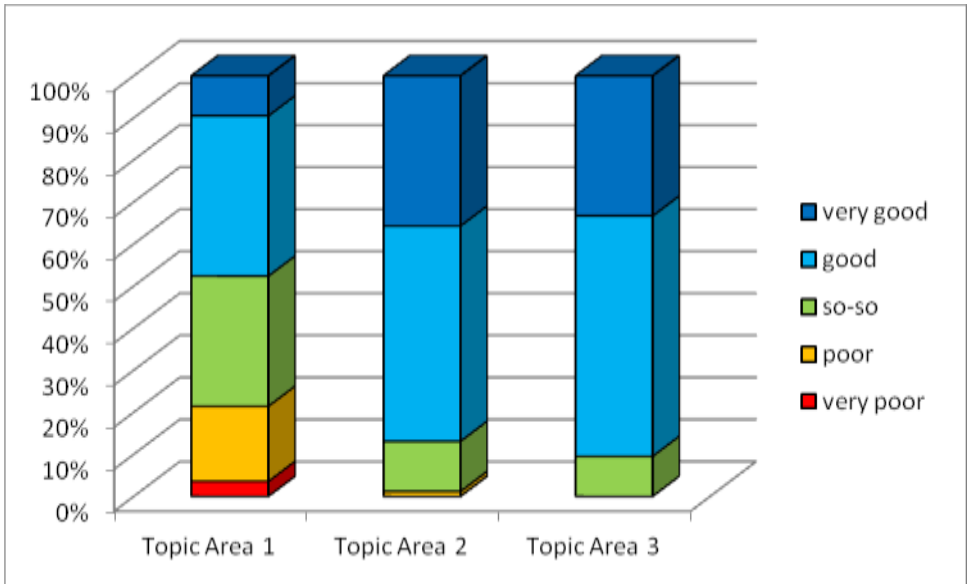


Figure 4. **Students' assessment of the organization and planning of their individual work in the three topic areas of the course**

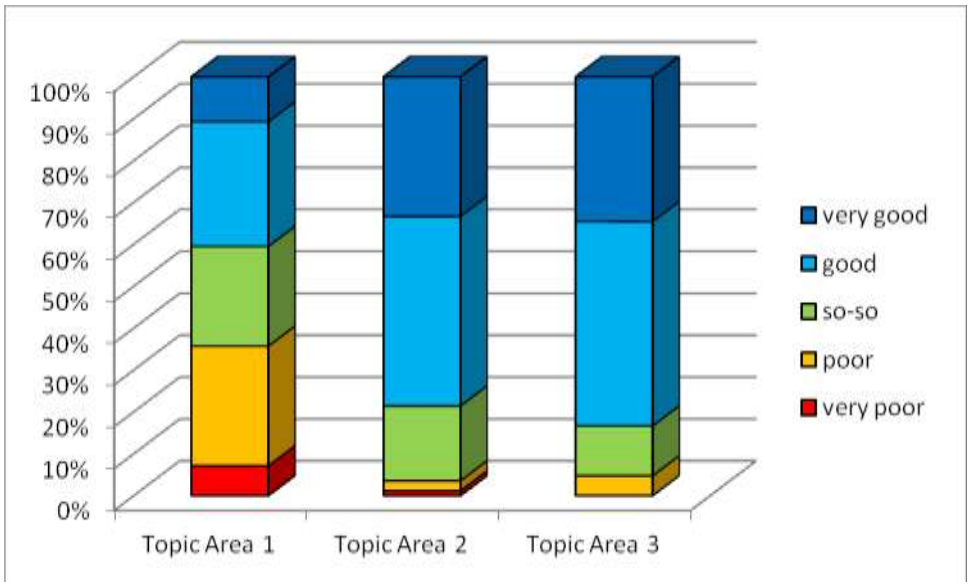


Figure 5. **Students' assessment of the organization and planning of their group work in the three topic areas of the course**

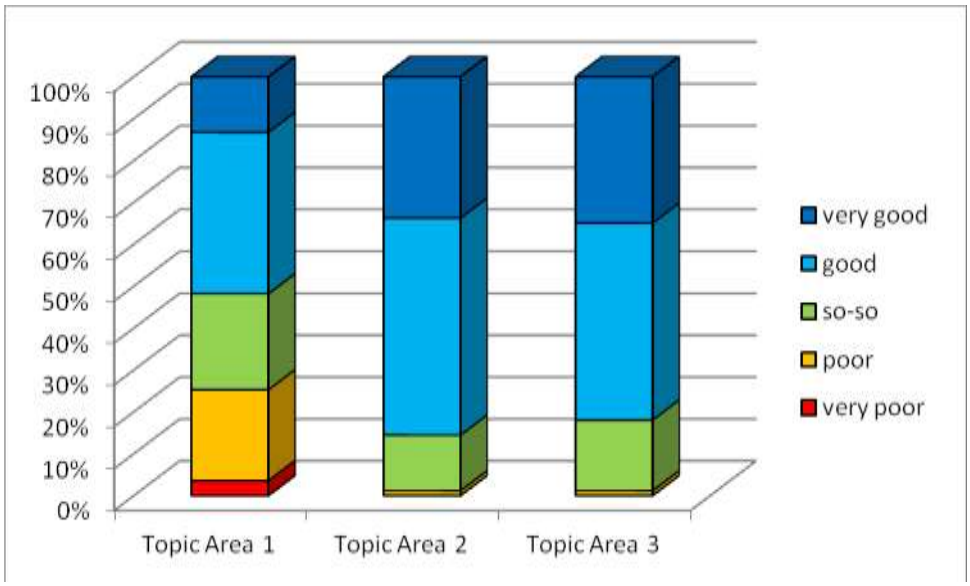


Figure 6. **Students' assessment of the articulation of their individual and group work in the three topic areas of the course**

The above results are furthermore framed within a positive global evaluation of the course, and with final academic grades that we can also label as positive. No less than 85% of the students stated that the subject had helped them attain meaningful learning "more" or "much more" than courses using a more traditional methodology, and 87% of students considered the experience "very satisfactory" or "quite satisfactory" (Figures 7 and 8). Similarly, 80% responded affirmatively to the question of whether they would enroll in another subject that followed a similar approach.

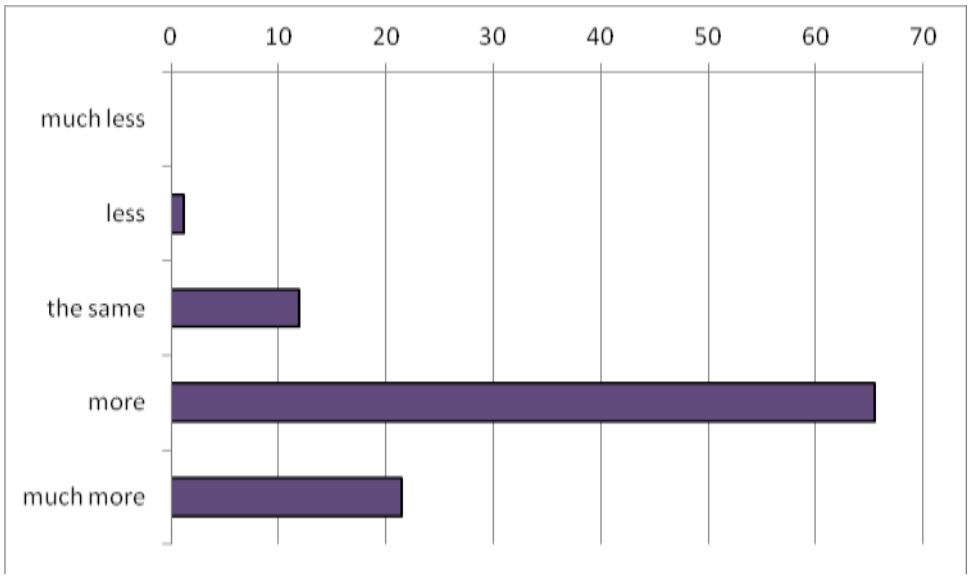


Figure 7. **Students' assessment of the degree to which the subject helped them attain meaningful learning, as compared to subjects using a traditional approach**

Electronic Journal of Research in Educational Psychology, *13*(1), 189-210. ISSN: 1696-2095. 2015, no. 35
http://dx.doi.org/10.14204/ejrep.35.14058

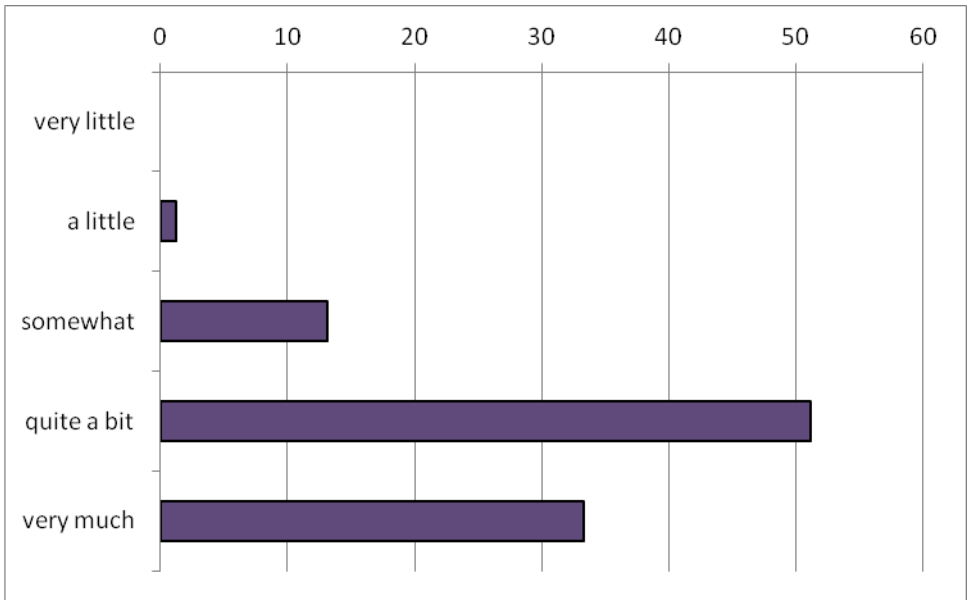


Figure 8. **Students' overall satisfaction with the experience**

In responses to the open questions, students point to the following methodological aspects as those that most helped them to learn: the learning tools made available to them, including the student's log (80% of students refer to one or more of these tools); task organization and distribution and the submission of evidence (50% of students refer to this aspect); collaborative work in groups (mentioned by 45% of students); and continuous feedback from the teacher (mentioned by 32% of students). At the same time, they point to the heavy workload and demands of the course as the main aspect to be improved (62% of students refer to this when answering this question). With regard to academic outcomes (Table 2), we note the high percentage of students who passed the subject[1] (85%), as well as the percentage of students who received an A or B (over 70%).

Table 2. **Students' final grades for the subject**

Grades	**Students**	
	f	**%**
A	50	39.4
B	41	32.3
C	17	13.4
Fail	4	3.1
Withdraw	15	11.8
TOTAL	127	100.0

The teachers in turn gave positive ratings for achievement of project objectives. The teachers concurred that students most benefited from this innovation in: increased awareness of their work processes; acquisition of certain skills for planning, monitoring and assessing their learning process; and greater involvement in the activities. At the same time, the teachers also concur in identifying certain weak points and difficulties with the experience. They pointed to the complexity of the evidence that was required, and the workload that this involved for the students; in some cases this provokes a mechanical approach to such requirements, which fails to take advantage of their potential benefits. Moreover, this was given as the most important reason when students expressed dissatisfaction with the experience. The teachers also emphasized their own workload in monitoring and tutoring students, as the experience demanded.

Discussion and Conclusions

Recall that the objective of this innovation experience was to design and develop a set of helps, organized around a "student's log", that would support students' individual and group regulation process. In this regard, the results confirm that students find difficulty in adequate, spontaneous regulation of their own collaborative processes, without specific aids. This is demonstrated by the fact that less than half of the students gave positive ratings to their individual and small-group work processes during the first topic area of the course. Our study thus confirms results obtained in several previous studies in the area of CSCL, which report the complexity and difficulty that students encounter when coordinating and regulating their group work (Engel & Onrubia, 2010; Manlove, Lazonder & de Jong, 2009; Mauri, Colomina, Clarà & Ginesta, 2011; Meier, Spada & Rummel, 2007; Schoor & Bannert, 2012). This is also consistent with the multidimensional nature of regulation processes that we find described in recent studies in this sphere. These processes include both cognitive aspects and social/affective, or motivational, aspects. Processes of self-regulation, other-regulation and shared regulation are combined in complex fashion (Chan, 2012; Järvelä & Hadwin, 2013; Saab, 2012; Schoor & Bannert, 2012).

[1] *Translator's note*: One source states that, on average, university students in Spain pass 64% of the subjects in which they are enrolled. http://www.abc.es/20120420/sociedad/abci-precio-creditos-universidad-201204192110.html

In the face of these difficulties, this intervention obtains positive results in terms of student and teacher satisfaction, as well as students' perceived improvement in their processes of individual and group organization and functioning. The improvement that students showed in their individual and group regulation processes in the second topic area, being further consolidated in the third area, seems to be especially significant. These results confirm the need to support and guide students' action in order to help them develop optimal interaction when collaboratively constructing knowledge in CSCL environments. These recommendations call for the teacher to fulfill a two-fold function. On one hand, the teacher acts as designer of instructional approaches that explicitly outline and structure the students' collaborative processes, for example, elaborating CSCL scripts (Carmien, Kollar, Fischer & Fischer, 2007; Dillenbourg & Hong, 2008; Kirschner, Sweller & Clark, 2006). On the other hand, the teacher must carefully monitor the collaborative processes undertaken by the groups. This monitoring is oriented toward regulating and scaffolding the interaction between students, in order to lead them toward effective learning and collaboration, offering them assistance with learning the content and with managing their collaboration. In addition, the teacher must adapt his/her premade design to new information that is being obtained (Fischer & Dillenbourg, 2006; Mauri, Colomina, Clarà & Ginesta, 2011; Onrubia & Engel, 2012).

In the framework of these positive results, the main limitation of the intervention, as seen in our results, is the large volume of work involved in the student's log, both for the students and for the teachers. This is noted in the students' open answers on their assessment questionnaire, and in the teachers' self-reports. In this respect, and leaving aside other considerations, we recognize that our attempt to teach the competencies of regulating individual and group learning at the same time as the subject-specific tasks may sometimes have led to cognitive overload (Kirschner, 2002). This cognitive overload is reflected in that, in some cases, certain students prepared their evidence in a superficial way, without getting involved in building awareness or reflecting on the collaboration in the way we had intended. This, together with the teachers' estimation that monitoring and tutoring the groups involved a sizable effort, points to the need to introduce certain modifications in the experience in order to lessen the complexity and volume of evidence required.

The results also allow us to offer orientations for future perspectives and priority avenues for improving the intervention put forward here. The first of these has to do with fine tuning the workload and demands on the students throughout the process, without letting this

reduce the effectiveness of the intervention. To improve the experience in this aspect seems critical for ensuring that the benefits of the innovation may be extended and maintained in a sustainable fashion. Two additional lines for future work refer to giving balanced attention to both cognitive and motivational-affective components involved in regulation of collaborative work, as well as making the helps more flexible so that they are more adaptable to groups and students with experience and skills in team work. All of this aims to offer increasingly well-tuned support for improving students' competencies in regulating their work and learning in CSCL environments.

Electronic Journal of Research in Educational Psychology, *13*(1), 189-210. ISSN: 1696-2095. 2015, no. 35
http://dx.doi.org/10.14204/ejrep.35.14058

References

Álvarez-Valdivia, I. & López-Benavides, D. (2010). Regulación del comportamiento durante la construcción conjunta de conocimientos en tareas cooperativas en entornos de aprendizaje virtuales asincrónicos & escritos. [Behavior regulation during joint construction of knowledge in cooperative tasks in asynchronous, written, virtual learning environments.] *Cultura & Educación, 22*(4), 419-438. doi: 10.1174/113564010793351830

Bereiter, C. (1994). Implications of postmodernism for science, or, science as progressive discourse. *Educational Psychologist,* 29 (1), 3-12. doi: http://dx.doi.org/10.1207/s15326985ep2901_1

Boeckaerts, M. (2002). Bringing about change in the classroom: Strengths and weaknesses of the self regulated learning approach. *Learning and Instruction, 12*, 589-604. http://dx.doi.org/10.1016/S0959-4752(02)00010-5

Carmien, S., Kollar, I., Fischer, G., & Fischer, F. (2007). The interplay of internal and external scripts. In F. Fischer, I Kollar, H. Mandl & J. M. Haake, *Scripting computer-supported collaborative learning* (pp. 303-326). New York: Springer.

Chan, C.K.K. (2012) Co-regulation of learning in computer-supported collaborative learning environments: A discussion. *Metacognition and Learning, 7* (1), 63-73. doi: http://dx.doi.org/10.1007/s11409-012-9086-z

De la Fuente, J. & Justicia, F. (2007). The DEDEPRO model of regulatory teaching and self-regulated learning: recent advances. *Electronic Journal of Research in Educational Psychology, 5*(3), 535-564.

De la Fuente, J., Justicia, F., Sander, P., & Cardelle-Elawar, M. (2014). Personal Self-Regulation and Regulatory Teaching to predict Performance and Academic Confidence: new evidence for the DEDEPRO Model. *Electronic Journal of Research in Educational Psychology, 12*(3), 597-620. http://dx.doi.org/10.14204/ejrep.34.14031

Dillenbourg, P., Baker, M., Blaye, A. & O'Malley, C. (1996). The evolution of research on collaborative learning. In E. Spada & P. Reiman (Eds), *Learning in Humans and Machine: Towards an interdisciplinary learning science* (pp. 189-211). Oxford: Elsevier.

Dillenbourg, P. & Hong, F. (2008). The mechanics of CSCL macro scripts. *International Journal of Computer-Supported Collaborative Learning*, *3*(1), 5-23. doi:

http://dx.doi.org/10.1007/s11412-007-9033-1

Dillenbourg, P., Järvelä, S. & Fischer, F. (2009). The Evolution of Research on Computer-Supported Collaborative Learning. From Design to Orchestration. In N. Balacheff, S. Ludvigsen, T. De Jong, A. Lazonder & S. Barnes (Eds.), *Technology-Enhanced Learning. Principles and Products* (pp. 3-19). Dordrecht: Springer Netherlands.

Dillenbourg, P., Nussbaum, M., Dimitriadis, Y. & Roschelle, J. (in press). Design for Classroom Orchestration. *Computers & Education*. doi: http://dx.doi.org/10.1016/j.compedu.2012.10.026

Engel, A. & Onrubia, J. (2010). Patrones de organización grupal y fases de construcción del conocimiento en entornos virtuales de aprendizaje colaborativo. [Patterns of group organization and stages of knowledge construction in online collaborative learning environments.] *Infancia y Aprendizaje, 33*(4), 515-528. doi: http://dx.doi.org/10.1174/021037010793139608

Fischer, F. & Dillenbourg, P. (2006, April). *Challenges of orchestrating computer-supported collaborative learning.* Paper presented at the 87th Annual Meeting of the American Educational Research Association (AERA), San Francisco, USA.

Garrison, D, R. & Anderson, T. (2003). *E-learning in the 21st century. A framework for research and practice*. London: Routledge Falmer.

Janssen, J., Erkens G., Kirschner P., & Kanselaar, G. (2012). Task-related and social regulation during online collaborative learning. *Metacognition and Learning*, *7*(1), 25-43. doi: 10.1007/s11409-010-9061-5

Järvelä, S. & Hadwin, A. H. (2013). New Frontiers: Regulating Learning in CSCL. *Educational Psychologist, 48*(1), 25-39. doi: 10.1080/00461520.2012.748006

Johnson, D. W. & Johnson, R. T. (1974). Instructional goal structure: Cooperative, competitive or individualistic. *Review of Education Research, 44*, 213-240.

Kirschner, P. A. (Ed.) (2002). Cognitive load theory [Special Issue]. *Learning and Instruction*, 12. doi: http://dx.doi.org/10.1016/S0959-4752(01)00014-7

Kirschner, P.A., Sweller, J. & Clark, R. E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist, 41*(2), 75–86. doi: http://dx.doi.org/10.1207/s15326985ep4102_1

Lipponen, L. & Lallimo, J. (2004). Assessing applications for collaboration: from collaboratively usable applications to collaborative technology. *British Journal of Educational Technology, 35*(4), 433–442. doi: http://dx.doi.org/10.1111/j.0007-1013.2004.00402.x

Manlove, S., Lazonder, A.W. & De Jong, T. (2009). Trends and issues of regulative support use during inquiry learning: Patterns from three studies. *Computers in Human Behavior*, 25 (4), 795-803. doi: http://dx.doi.org/10.1016/j.chb.2008.07.010

Martínez, A., Dimitriadis, Y. & De La Fuente, P. (2003). Interaction analysis for formative evaluation in CSCL. In M. Llamas, M. J. Fernández, & L. E. Anido (Ed.), *Computers and Education: Toward a lifelong learning society* (pp. 227-238). Dordrecht: Kluwer Academic.

Mauri, T., Colomina, R., Clarà, M. & Ginesta, A. (2011). Support for learning in collaborative writing tasks with Moodle. *Electronic Journal of Research in Educational Psychology, 9*(3), 1103-1128.

Meier, A., Spada, H. & Rummel, N. (2007). A rating scheme for assessing the quality of computer-supported collaboration processes. *International Journal of Computer-Supported Collaborative Learning*, 2 (1), 63-86. doi: http://dx.doi.org/10.1007/s11412-006-9005-x

Mercer, N. (2001). *Palabras y mentes. Cómo usamos el lenguaje para pensar juntos.* [Words and minds. How we use language for thinking together.] Barcelona: Paidós.

Onrubia, J. & Engel, A. (2012). The role of teacher assistance on the effects of a macro-script in collaborative writing tasks. *International Journal of Computer-Supported Collaborative Learning*, 7 (1), 161-186. doi: http://dx.doi.org/10.1007/s11412-011-9125-9

Pifarré, M. & Cobos, R. (2010). Promoting metacognitive skills through peer scaffolding in a CSCL environment. *International Journal of Computer-Supported Collaborative Learning, 5*(2), 237-253. doi: http://dx.doi.org/10.1007/s11412-010-9084-6

Pintrich, P. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. Pintrich & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 451-502). California: Academic Press. doi: 10.1016/B978-012109890-2/50043-3

Resta, P. & Laferrière, T. (2007). Technology in Support of Collaborative Learning. *Educational Psychology Review, 19*(1), 65–83. doi: http://dx.doi.org/10.1007/s10648-007-9042-7

Saab, N. (2012). Team regulation, regulation of social activities or co-regulation: Different labels for effective regulation of learning in CSCL. *Metacognition and Learning*, 7 (1), 1-6. doi: http://dx.doi.org/10.1007/s11409-012-9086-z

Saab, N., Joolingen, W. & Hout-Wolters, B. (2012). Support of the collaborative inquiry learning process: Influence of support on task and team regulation. *Metacognition and Learning, 7*(1), 7-23. DOI 10.1007/s11409-011-9068-6

Scardamalia, M. & Bereiter, C. (2003). Knowledge building. In J. W. Guthrie (Ed.), *Encyclopedia of education* (2nd ed., pp. 1370-1373). New York: Macmillan Reference, USA.

Schoor, C. & Bannert, M. (2012). Exploring regulatory processes during a computer-supported collaborative learning task using process mining. *Computers in Human Behavior*, 28 (4), 1321-1331. doi: http://dx.doi.org/10.1016/j.chb.2012.02.016

Slavin, R. E. (1996). Research for the future: Research on cooperative learning and achievement: What we know, what we need to know. *Contemporary Educational Psychology*, 21, 43–69. doi: http://dx.doi.org/10.1006/ceps.1996.0004

Stahl, G., Koschmann, T. & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning sciences*. Cambridge, UK: Cambridge University Press.

Suthers, D. (2006). Technology affordances for intersubjective meaning making: A research agenda for CSCL. *Computer-Supported Collaborative Learning*, *1*, 315-337. doi: http://dx.doi.org/10.1007/s11412-006-9660-y

Tabak, I. (2004). Synergy: a complement to emerging patterns of distributed scaffolding. *Journal of the Learning Sciences, 13* (3), 305–335. doi: http://dx.doi.org/10.1207/s15327809jls1303_3

Volet, S., Summers, M., & Thurman, J. (2009). High-level co-regulation in collaborative learning: How does it emerge and how is it sustained? *Learning and Instruction*, *19*(2), 128-143. http://dx.doi.org/10.1016/j.learninstruc.2008.03.001