Procesos de regulación social y desarrollo del conocimiento en espacios de colaboración en línea

Knowledge development in online collaboration environments and social regulation processes

Juan Carlos Castellanos Ramírez
Facultad de Ciencias Humanas, Universidad Autónoma de Baja California, México
juan.castellanos@uabc.edu.mx

Shamaly Alhelí Niño Carrasco
Facultad de Ciencias Humanas, Universidad Autónoma de Baja California, México
shamaly.nino@uabc.edu.mx

doi: https://doi.org/10.36825/RITI.07.14.015

Recibido: Agosto 04, 2019
Aceptado: Octubre 30, 2019

Resumen: El propósito de esta investigación fue explorar dos tipos de discurso que los estudiantes emplean en la realización de tareas colaborativas en línea: el discurso cognitivo, centrado en la construcción del conocimiento, y el discurso regulador, orientado al control del proceso colaborativo. Para ello, se realizó un estudio de casos múltiples en el que participaron seis grupos de estudiantes universitarios que durante cuatro semanas realizaron tareas colaborativas a través de foros de comunicación asíncrona. Los resultados del estudio muestran que el discurso regulador de los estudiantes centrado en la explicitación de expectativas positivas sobre la tarea académica, el monitoreo en torno a los contenidos de la tarea y el soporte socioemocional entre los participantes favorecen la presencia de un diálogo argumentativo, profundo y proactivo sobre los contenidos temáticos. Se concluye un efecto positivo del discurso regulador utilizado por los estudiantes sobre el conocimiento construido por los grupos.

Palabras clave: *Aprendizaje Colaborativo, Educación Superior, Construcción del Conocimiento, Regulación Social, Aprendizaje.*

Abstract: The purpose of this research was to explore two discourse types that students deploy developing online collaborative tasks: cognitive discourse, focuses on knowledge construction, and regulatory discourse, focuses on the control of the collaborative process. A multiple case study was conducted with six groups of undergraduate students, they developed collaborative tasks through asynchronous communication forums among four weeks. The results highlight that regulatory discourse on explicit positive expectations about the academic task, the monitoring of the task contents and the socio-emotional support among the participants promote the presence of an argumentative, deep and proactive dialogue of the thematic contents. A positive effect of the regulatory discourse deployed by students on the knowledge developed by them is concluded.

Keywords: *Collaborative Learning, Higher Education, Knowledge Construction, Social Regulation, Learning.*

1. Introduction

Over the last two decades, online education has established itself as an essential formative option within universities. The development of different online learning platforms (Learning Management Systems, LMS) has significantly influenced the reconfiguration of traditional educational systems, shifting from an approach centered on the professor as a principal educational agent, to a model centered on students as active participants of their formative processes [1, 2].

An essential characteristic of LMS platforms is asynchronous communication tools designed to aid collaboration of students through network-connected computer systems [3]. Some authors [4, 5], have stressed that asynchronous communication offers excellent advantages for student learning, for example, the fact that in these platforms, participation is based on written language, strengthens organizational, systemization, expression, and argumentative skills. The accumulation of contributions in asynchronous forums allows students to make metacognitive judgments about the ideas contributed previously [6, 7]. They open the possibility of multi-directional communication, as students can keep conversations about different topics with several classmates at the same time and allow students more flexibility to work according to their schedules.

Asynchronous collaboration requires double the effort from students. On the one hand, participants must get involved in a cognitive discourse about the contents of the task, and on the other hand, they must regulate the context in which the cognitive activity of the group is produced [8, 9, 10, 11]. In this sense, the purpose of this project was to explore collaborative processes developed by university students through asynchronous communication networks, distinguishing between discursive strategies aimed at shared knowledge construction, and discursive strategies that focus on regulating the collaborative process.

1.1. Knowledge construction and learning regulation in collaborative tasks

The shared knowledge construction refers specifically to the cognitive process of discussion and review of ideas that leads to the advancement of group knowledge [12]. In empirical terms, the studies about the shared knowledge construction focus on learning and the results associated with domain knowledge, in order to assess the understanding and evolution of the ideas built by the students.

With respect to the notion of social regulation of learning, it refers to the control of the students over their collaborative processes and the way in which they manage three essential dimensions of their activity: cognitive dimension, social dimension and emotional dimension [5]. It is talked about social regulation of cognitive dimension when the students decide their own resources and/or strategies to perform the task, set goals, manage the time to approach the task, monitor the progress of the task, among other things. Instead, social regulation of social dimension means that students set out a plan to participate, establish rules of conduct, distribute roles and monitor the behavior of the participants. Otherwise, social regulation of emotional dimension becomes evident when students promote group cohesion and build a solid emotional base that allows them to express themselves freely with their peers.

2. Methodology

We analyzed the collaborative processes of six groups of students of the bachelor's degree in Education Science the Autonomous University of Baja California (UABC) in México, through a multiple case study [13, 14].

2.1. Participants and situation

Thirty students (22 women and 8 men) of the Research Methodology course (hybrid modality) participated in this study. Students randomly formed teams of five participants to work collaboratively in the statement of a problem and its theoretical framework. They communicated using an asynchronous communication forum to develop the task for four weeks, and at the end of this period, they sent the professor a written report on their work.

2.2. Data collection and analysis

The analyzed data correspond to the contributions made by the groups of students in the asynchronous communication forums. In total, 638 contributions were gathered, and they were distributed as follows: Group 1 (G1) 114 contributions, Group 2 (G2) 112 contributions, Group 3 (G3) 97 contributions, Group 4 (G4) 86 contributions, Group 5 (G5) 108, and Group 6 (G6) 121.

According to the objectives of the study, the first level of analysis consisted of identifying Interaction Segments (IS). An IS is formed by a set of contributions made by several members of the group, where the starting point is identified by the message that triggers a series of contributions linked to a concrete central theme; and the end of the chain is identified by the contribution that closes the central theme in question, ending the reciprocity of the dialogue.

The second level of analysis consisted of codifying the IS through two different codebooks. The Table 1 shows the first codebook; it was used to codify the cognitive discourse (focused on the knowledge construction) of the participants.

Table 1. Codebook for cognitive discourse analysis.

Codes	Description
KC_1	They contribute their ideas
KC_2	They reformulate previously presented meanings
KC_3	They request clarification or details about contributed ideas
KC_4	They manifest an agreement with contributed ideas
KC_5	They manifest disagreement with contributed ideas
KC_6	They repeat the contributions of their classmates literally
KC_7	They expand previous ideas
KC_8	They incorporate sources of information
KC_9	They relate ideas or contributions from different classmates
KC_10	They synthesize information

The second codebook, as Table 2 shows, was used to codify the discourse centered on regulating the collaborative process.

Table 2. Codebook for regulatory discourse analysis.

Codes	Description
SR_1	They establish objectives and/or goals for the task
SR_2	They formulate procedures to approach the task
SR_3	They interpret the guidelines of the task in order to guide their actions
SR_4	They monitor the progress of the task

SR_5	They request the attention and/or participation of their classmates
SR_6	They establish roles and functions to approach the task
SR_7	They inhibit bad behaviors inside the group
SR_8	They confirm the direction of the task
SR_9	They share positive expectations about the task
SR_10	They provide social-emotional support

The analysis of the data and the codification process was carried out by two researchers. That is, through an interjudge process, in a first moment, the researchers analyzed the same data, each independently; then, in a second moment, they got toghether to contrast and discuss the results.

3. Results

Table 3 shows the frequency of IS identified in the groups. In total, 111 IS were identified in the set of analyzed groups. The most significant proportion was observed in groups G2 (21 IS) and G6 (20 IS), appearing more frequently during the first two weeks of participation in the forum. A smaller proportion of IS was identified in the rest of the groups (G1, G3, G4, and G5). Also, IS appeared more frequently during the third week of activity.

Table 3. Interaction Segments (IS) identified in the groups.

Groups	Week 1	Week 2	Week 3	Week 4	Total
	f	f	f	f	f
G1	5	5	4	3	17
G2	6	6	5	4	21
G3	5	6	4	3	18
G4	2	3	6	6	17
G5	2	2	7	7	18
G6	5	7	4	4	20
Total	25	29	31	27	111

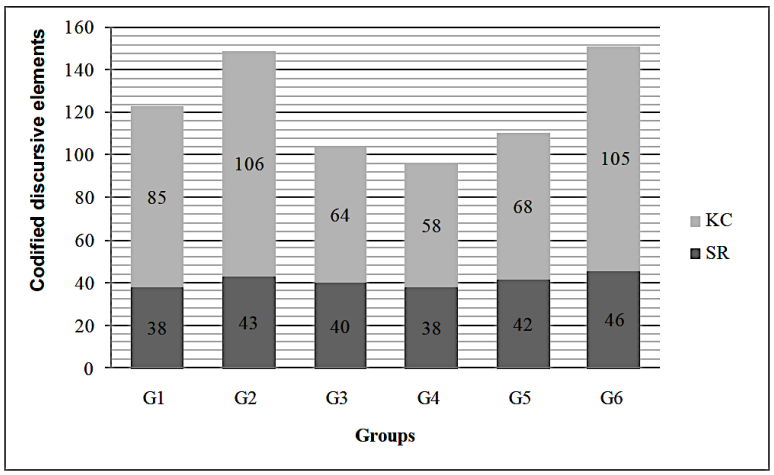

Figure 1. Frequencies of cognitive and regulatory discourse developed by groups.

In the set of IS that were identified, 733 meaning units were coded, of which 66% correspond to discursive strategies used for knowledge construction, and 34% correspond to task regulation strategies. According to Fig. 1, in groups G1, G2 and G6, there is a predominant frequency of discourse directed towards the discussion of meanings, in detriment of the use of regulatory strategies. On the other hand, in groups, G3, G4 and G5, regulatory discourse and cognitive discourse are present in a more balanced way.

Table 4 shows the results corresponding to the analysis of cognitive discursive strategies. The groups that demonstrated higher cognitive activity are G2 (106 coded elements) and G6 (105 coded elements). In these groups, the discourse of students was characterized mainly by the formulation of their ideas (KC_1), a relation of ideas (KC_9) and the students' skills to synthesize the contributed information (KC_10). In the case of G1, there was a considerable number of requests to clarify topics (KC_3 with 14 coded elements), the contribution of own ideas (KC_1 with 13 coded elements), reformulation of meanings (KC_2 with 12 coded elements), and the relation of ideas (KC_9 with 11 coded elements). G3, G4, and G5 show constant, literal repetition of ideas (KC_6), in detriment of the formulation of their ideas (KC_1).

Table 4. Frequency of the cognitive discourse strategies developed by the groups.

Codes	G1 f	G2 f	G3 f	G4 f	G5 f	G6 f	Total
KC_1	13	20	12	9	10	18	82
KC_2	12	9	6	5	6	14	52
KC_3	14	8	6	6	6	19	59
KC_4	7	9	11	10	7	7	51
KC_5	3	2	3	2	3	4	17
KC_6	4	10	14	12	18	6	64
KC_7	6	11	3	3	4	7	34
KC_8	6	7	6	7	6	5	37
KC_9	11	16	3	2	4	14	50
KC_10	9	14	2	2	4	11	42
Total	85	106	64	58	68	105	486

Table 5. Frequency of the regulatory discourse strategies developed by the groups.

Codes	G1 f	G2 f	G3 f	G4 f	G5 F	G6 f	Total
SR_1	7	8	3	3	7	7	35
SR_2	2	1	3	3	3	2	14
SR_3	5	3	4	5	5	2	24
SR_4	9	10	7	3	4	9	42
SR_5	0	1	6	7	5	3	22
SR_6	1	3	3	4	4	2	17
SR_7	0	0	1	2	3	1	7
SR_8	3	7	10	7	7	9	43
SR_9	5	7	0	2	3	6	23
SR_10	6	3	3	2	1	5	20
Total	38	43	40	38	42	46	247

Table 5 shows (by the group) the results obtained from the analysis of IS about the social regulation category. The groups that used a more significant amount of regulatory resources are G2 and G6, and they stand out mainly due to intensive monitoring of task progress (SR_4), goal and objective establishment (SR_1), confirmations of task direction (SR_8), and projection of positive expectations about the task (SR_9). Groups G3, G4 and G5 coincided on a constant confirmation of task direction (SR_8) and participation requests to their classmates (SR_5).

Tables 6, 7 and 8 shows the discursive mechanisms (of knowledge construction and social regulation) that are the most representative of the groups according to the different weeks of activity in the forums. Mechanisms that do not have a dominant role in the weekly activity of the students are not included in this table.

In G1 (Table 6), the cognitive discourse of the participants points towards effective and progressive construction of knowledge. In this group, students made a significant amount of contributions and manifested their ideas during the first week of activities. In the second week, they made a critical analysis of the contributed ideas by requesting clarifications and reformulating the meanings. During the third week, they established a shared framework for the contents through the expansion of ideas, the relation of meanings and incorporation of new sources of information. In the last week, they synthesized and made final agreements on the contents of the products they created. In terms of regulatory mechanisms, this group stands out for showing, during the first week of activities, a discourse aimed at establishing goals/objectives, formulating positive expectations, and interpreting task guidelines, while in the following weeks, there was constant monitoring of the progress of the task.

Table 6. Evolution of cognitive and regulatory discourse in the Group 1.

Weeks	Discourse Cognitive	Discourse Regulatory
1	• They contribute their ideas (KC_1)	• They establish objectives and/or goals for the task (SR_1) • They share positive expectations about the task (SR_9) • They interpret the guidelines of the task in order to guide their actions (SR_3)
2	• They request clarification or details about contributed ideas (KC_3) • They reformulate previously presented meanings (KC_2	• They monitor the progress of the task (SR_4) • They confirm the direction of the task (SR_8)
3	• They relate ideas or contributions from different classmates (KC_9) • They incorporate sources of information (KC_8) • They expand previous ideas (KC_7)	• They monitor the progress of the task (SR_4) • They provide social-emotional support (SR_10)
4	• They synthesize information (KC_10) • They manifest an agreement with contributed ideas (KC_4)	• They monitor the progress of the task (SR_4)

In G2 and G6 (Table 7), students immediately established a constructive dialogue, meaning that from the first two weeks of activities in the forum, students became involved in productive and constructive discourse, contributing with ideas of their own, expanding concepts, relating meanings and making agreements on the discussed topics.

The regulatory strategies they used with more frequency during the first week of activities corresponding to the formulation of positive expectations about the task, and confirmations about the direction of the task, while in subsequent weeks, as it happened with G1, they regularly monitored the progress of the task.

Table 7. Evolution of cognitive and regulatory discourse in G2 and G6.

Weeks	Discourse Cognitive	Discourse Regulatory
1	• They contribute their ideas (KC_1) • They expand previous ideas (KC_7)	• They share positive expectations about the task (SR_9) • They confirm the direction of the task (SR_8)
2	• They contribute their ideas (KC_1) • They relate ideas or contributions from different classmates (KC_9) • They incorporate sources of information (KC_8) • They manifest an agreement with contributed ideas (KC_4)	• They monitor the progress of the task (SR_4)
3	• They contribute their ideas (KC_1) • They relate ideas or contributions from different classmates (KC_9) • They synthesize information (KC_10) • They incorporate sources of information (KC_8)	• They monitor the progress of the task (SR_4) • They confirm the direction of the task (SR_8)
4	• They synthesize information (KC_10) • They manifest an agreement with contributed ideas (KC_4)	• They monitor the progress of the task (SR_4) • They confirm the direction of the task (SR_8) • They share positive expectations about the task (SR_9)

Finally, in groups, G3, G4, and G5 (Table 8), no complex cognitive activities were observed, since a large part of their collaboration centered on the accumulation and repetition of ideas with very little evidence of transformation/deepening of meanings. Regarding regulatory processes, we can highlight that task monitoring was not a recurrent strategy in these groups during the first three weeks. We should also mention that the interpretation of task guidelines and participation requests in late stages of the task reflect difficulties within the group that are linked to a lack of student involvement and ambiguities in the understanding of the initial request made by the professor about the creation of a final report. As for regulation, it was limited practically to confirmation of the task direction without involving systematic monitoring of progress, achievements or pending actions.

Table 8. Evolution of cognitive and regulatory discourse in G3, G4 and G6.

Week	KC	SR
1	• They contribute their ideas (KC_1)	• They confirm the direction of the task (SR_8)

	• They incorporate sources of information (KC_8)	
2	• They repeat the contributions of their classmates literally (KC_6) • They contribute their ideas (KC_1)	• They confirm the direction of the task (SR_8)
3	• They repeat the contributions of their classmates literally (KC_6)	• They confirm the direction of the task (SR_8) • They request the attention and/or participation of their classmates (SR_5) • They interpret the guidelines of the task in order to guide their actions (SR_3)
4	• They manifest an agreement with contributed ideas (KC_4)	• They monitor the progress of the task (SR_4)

4. Conclusions

As the first topic for discussion, we can see a significant relationship between the regulatory strategies used by students to control the task, and the quality of the cognitive
discourse held by the groups of students throughout the task. It was found that establishing goals, formulating positive expectations about the task, monitoring progress
and providing social-emotional support, are regulatory mechanisms that actively contribute to the development of in-depth knowledge construction processes, as it was observed in groups G1, G2, and G6. In this sense, we consider that the results of our research extend the findings of previous studies [15, 16] that found positive relationships between regulatory processes and the levels of performance reached by the groups when they finished the task.

Moreover, our work coincides with previous work [17, 18], in the sense that we found positive synergy between the social-emotional support given amongst participants, the regulation exercised on the task, and the quality of the cognitive discourse. We also consider that the formulation of positive expectations on the academic task is an essential regulatory strategy that has an impact on the achievement of deep shared-knowledge construction. Such findings coincide with the postulates of [19], who researched social presence in an online collaboration environment and showed that positive expectations –conceived as a feeling of internal competition in the group- significantly support the development of a cognitive presence in the group.

Concerning the analysis of the temporary evolution of the cognitive and regulatory discourse of the groups, we identified three different collaboration patterns. The first pattern (developed by G1), consists of the systematic and progressive construction of knowledge throughout the weeks, with the support of goal establishment, expectation, formulation and task guideline interpretation in the early stages of the activity, as well as constant monitoring of the collaborative process. The second pattern (developed by G2 and G6) consists of fast and deep knowledge construction that happens from the beginning of the activity. The positive expectations also characterize this manifested about the task and the constant monitoring of the collaborative process by the students. The third pattern (developed by G3, G4, and G5) consists of carrying out superficial/simple cognitive processes about the contents of the task with little evolution of knowledge and a lack of monitoring of the collaborative process.

About the previous point, we consider that even though there are previous studies in which the temporary evolution of the cognitive discourse of students is explored, such question had not been explored in the case of regulatory processes. There are two points of interest in this regard: first, that the formulation of expectations by students in the early stages of the assignment contributes to the proper functioning of groups and the subsequent

development of the task. Second, in agreement with [20] constant monitoring of the task and building ideas on the thematic contents are interactive mechanisms that influence each other.

We consider that one of the limitations of our work is the fact that we did not incorporate more specific categories in coding. For example, when we talk about task expectations, we do not make a distinction between self-expectations (personal), group expectations (shared) or the expectations deposited on another participant. Another limitation of our work consists of not having differentiated between types of regulation according to the agent at which the discourse is directed, for example, when they try to regulate the performance of a classmate (other regulation), the group (shared regulation) or personal performance (self-regulation).

5. References

[1] Conde, M. Á., García-Peñalvo, F. J., Rodríguez-Conde, M. J., Alier, M., Casany, M. J., Piguillem, J. (2014). An evolving Learning Management System for new educational environments using 2.0 tools. *Interactive Learning Environments*, 22 (2), 188-204. doi: http://dx.doi.org/10.1080/10494820.2012.74 5433

[2] Koivuniemi, M., Jarvenoja, H., Jarvela, S. (2018). Teacher education students' strategic activities in challenging collaborative learning situations. *Learning*, *Culture and Social Interaction,* 19 (4), 109-123. doi: https://doi.org/https://doi.org/10.1016/j.lcsi.2018.05.002

[3] Chan, G., Cab, M., Ayil, J. (2019). Curso virtual para la enseñanza de una asignatura de desarrollo personal. *Revista de Investigación en Tecnologías de la Información (RITI),* 7 (13), 61-69. Retrieved from: http://www.riti.es/ojs2018/inicio/index.php/riti/article/view/162/html

[4] Castro, N., Suárez, X., Soto, V. (2016). Using virtual forums to develop motivated learning strategies in university students. *Innovación educativa*, 16 (70), 23-41.

[5] Castellanos, J., Onrubia, J. (2018). Group characteristics and profiles of shared regulation in collaborative environments involving asynchronous communication. *Infancia y Aprendizaje,* 41 (2), 369-414. doi: https://doi.org/10.1080/02103702.2018.1434037

[6] Coll, C., Engel, A. (2014). Making meaning through joint activity in Computer-Supported Collaborative Learning (CSCL) settings: The interplay between content-related and activity- related talk. *Annals of Psychology*, 30 (3), 818-831. doi: https://doi.org/10.6018/analesps.30.3.201181

[7] Biasutti, M., Frate, S. (2018). Group metacognition in online collaborative learning: Validity and reliability of the group metacognition scale (GMS). *Educational Technology Research and Development,* 66 (6), 1321-1338.

[8] Grand, J. A., Braun, M. T., Kuljanin, G., Kozlowski, S. W. J., Chao, G. T. (2016). The dynamics of team cognition: A process-oriented theory of knowledge emergence in teams. *Journal of Applied Psychology,* 101 (10), 1353-1385. doi: https://doi.org/10.1037/apl0000136

[9] Mayordomo, R., Onrubia, J. (2015). Work coordination and collaborative knowledge construction in a small group collaborative virtual task. *The Internet and Higher Education,* 25 (2), 96-104. doi: https://doi.org/10.1016/j.iheduc.2015.02.003

[10] Shi, Z., Yu, S., Zhu, X., Li, M. (2016). *Perspectives on rethinking and reforming education*. Singapore: Springer.

[11] Koivuniemi, M., Panadero, E., Malmberg, J., Jarvela, S. (2017). Higher education students' learning challenges and regulatory skills in different learning situations. *Infancia y Aprendizaje,* 40 (1), 19-55.

[12] Zhang, J., Hong, H., Scardamalia, M., Teo, C., Morley, A. (2011). Sustaining knowledge building as a principle-based innovation at an elementary school. *Journal of the Learning Sciences,* 20 (2), 262-307. doi: https://doi.org/10.1080/10508406.2011.528317

[13] Flick, U. (2002). Qualitative research-state of the art. *Social science information,* 4 (1), 5-24. doi: https://doi.org/10.1080/02103702.2016.1272874

[14] Yin, R. (2006). Case study methods. In Green, J., Camilli, G. and Elmore, P. (Eds). *Handbook of Complementary Methods in Education Research* (pp. 111-122). Mahwah, NJ: L. Erlbaum.

[15] 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: http://dx.doi.org/10.1007/s11409-011-9068-6

[16] Lee, A., O'Donnell, A., Rogat, T. (2015). Exploration of the cognitive regulatory sub-processes employed by groups characterized by socially shared and other-regulation in a CSCL context. *Computers in Human Behavior*, 52 (11), 617-627. doi: https://doi.org/10.1016/j.chb.2014.11.072

[17] Kwon., Liu, Y., Johnson, L. (2014). Group regulation and social-emotional interactions observed in computer supported collaborative learning: comparison between good vs. poor collaborators. *Computers & Education,* 78 (9), 185-200. doi: ttps://doi.org/10.1016/j.compedu.2014.06.004

[18] Malmberg, J., Järvelä, S., Järvenoja, H., Panadero, E. (2015). Promoting socially shared regulation of learning in CSCL: progress of socially shared regulation among high- and low-performing groups. *Computers in Human Behavior*, 52 (11), 562-572. doi: https://doi.org/10.1016/j.chb.2015.03.082

[19] Colomina, R., Remesal, A. (2015). Social presence and virtual collaborative learning processes in higher education. *Infancia y Aprendizaje,* 38 (3), 647-680. doi: https://doi.org/10.1080/02103702.2015.1054664

[20] 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: https://doi.org/10.1016/j.chb.2012.02.016