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Socially-shared Metacognitive Regulation Episodes Between Undergraduate Engineering Students During a Collaborative Genre Analysis Task in an English for Academic Purposes Course

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Abstract

Recent findings suggest that genre-based tasks such as move analysis when underpinned by the theory of metacognition can familiarize undergraduate students with newly encountered academic genres such as the research article. However, there still is a limited understanding about how and when novices engage in socially shared metacognitive regulation processes (SSMR) during online collaborative genre analysis tasks. The purpose of this study was to identify when and how a small group of undergraduate engineering students engaged in SSMR processes during a collaborative online move analysis wiki task. Results suggest SSMR was frequently triggered when participants faced a task-related problem and manifested as an expression of doubt and conflicting ideas or when participants attempted to reach a consensus on seemingly difficult genre analysis aspects.

Keywords: metacognition, genre analysis, research article, collaborative wiki, English for Academic Purposes, engineering

1. Introduction

This paper describes a qualitative investigation of how and when social forms of metacognition emerge during a wiki-based collaborative genre analysis task within an experimental English for Academic Purposes (EAP) course that aimed to teach 2nd year Electrical and Computer Engineering (ECE) undergraduate students at the Technical University of Crete, Greece how to search and read research articles online (Seiradakis & Spantidakis, 2018). Related literature suggests EAP courses integrating genre-based tasks from the ESP school such as Swalesian move analysis (1990), can to a certain extent facilitate EFL novices' reading and/or writing of newly encountered academic genres, yet their effectiveness largely depends on whether they are underpinned by the theory of metacognition (Negretti & Kuteeva, 2011; Negretti & McGrath, 2018; Yeh, 2014). Nevertheless, existing metacognitive genre-based research is scarce and has solely focused on the development of individual metacognitive genre awareness, that is, it views metacognition as an internal cognitive process, ignoring the emergence of metacognition at the social plane. To bridge this gap, we use one group's interactions as a case study and offer a qualitative analysis of SSMR episodes as manifested in students' wiki comments based on a specially designed coding framework that focused on two key regulation processes: joint-planning and joint-monitoring. We complement the wiki comments data, with a retrospective recall interview that aimed to confirm the identified episodes.

More specifically, we ask:

When and how SSMR episodes emerge during a collaborative wiki research article introduction move analysis task?

1.1 Metacognitive Scaffolding of Genre Knowledge

Within the EAP field, ESP school genre-based approaches are thought to be effective in helping EFL students acquire the necessary genre knowledge for reading and/or writing research articles. Genre knowledge development according to Tardy's model (2009) is a multifaceted construct which encompasses formal,

rhetorical, process, and content facets. Formal and rhetorical knowledge facets include the linguistic and structural features of a genre, namely the "discourse or lexico-grammatical conventions of the genre, the contents or structural moves that are common to the genre" (p. 21) as well as the learners' awareness of the language writers use in order to achieve their purposes. Process knowledge encompasses awareness of the composing process of a genre but also "an understanding of the distribution of the genre to its audience and the reading practices of the receivers of the genre" (p. 21). Lastly, the content facet refers to discipline-specific knowledge related to a specific genre.

Swalesian move analysis tasks (1990) have been extensively used for drawing EAP students' attention to formal and rhetorical facets of the research article genre. This type of analysis refers to identifying rhetorical moves i.e. a unit that relates both to the writer's purpose and to the content that s/he wishes to communicate (Dudley & John, 1998: 89) as well as move sequences, cycles and key linguistic features. More specifically, students are expected to name a move, outline its content, define its purpose and analyze language features and discipline specific practices in the particular field (Peacock, 2011; Cheng, 2008).

The overarching goal of move analysis, is to raise students' "rhetorical consciousness" (Swales, 1990, p. 213) or according to Johns (2015) their "rhetorical flexibility" which will help them to adapt their socio-cognitive genre schemas to changing contexts (p. 116). In other words, the goal of genre-based instruction, is that students will be able to consciously activate and most importantly adjust their acquired textual and rhetorical knowledge for their own reading or writing purposes. Developing such a "consciousness" or "flexibility" however, essentially implies metacognitive ability which should also be purposefully scaffolded by providing students with repeated opportunities to practice genre analysis, get feedback, reflect on their performance and practice again (Devitt, 2015). In fact, genre-analysis tasks appear to be more effective when underpinned by traditional metacognitive scaffolds such as reflective journals, reflective matrixes and reflective accounts, concept mapping (Negretti & Kuteeva, 2011; Negretti & McGrath, 2018) or other typical metacognitive heuristics and prompts such as summarization and recall largely because these tasks push learners to explicate and verbalize what they think they know or do not know about a certain genre concept (Johns, 2015).

1.2 Socially-Shared Metacognitive Regulation

Like genre, metacognition is a complex construct, which is frequently defined as our ability to think about knowledge. The majority of metacognition models roughly agree on the distinction between two constructs: metacognitive knowledge and metacognitive regulation. The former refers to the stable and often conscious knowledge individuals have about themselves as learners, about the specific task at hand and about the learning process. The latter which is the focus of the present study, covers the procedural aspect of metacognition, that is, the actual planning, monitoring and evaluation skills learners use in order to increase their learning or their performance during task execution (Spantidakis, 2010).

Although metacognition is commonly viewed as an, intrapersonal cognitive activity there is a growing consensus among researchers in the field that such a view is inadequate, since an individual's ability to explicate their thinking to themselves, implies that they are also able to verbalize their thinking processes to others (Efklides, 2008; Järvelä & Hadwin, 2013). Collaborative tasks have been found particularly effective in fostering social forms of metacognitive regulation, namely "co-regulation" and "socially shared regulation". Both concepts refer to momentary interpersonal interactions between group members but emerge in a different form. Metacognitive *co-regulation* refers to momentary instances during collaboration when for example, one or more group members co-regulate the learning process of another student (Hadwin et al., 2017). Shared regulation on the other hand, refers to instances when at least two of the group members support or influence one another's regulation of cognitive processes in order to achieve a common goal associated with the task at hand. The term "socially-shared" according to Iiskala et al. "seeks to capture collective, mutually shared metacognitive regulation that unfolds when a group engages in co-constructing of knowledge and understanding of the task and its content" (2015: 80). Two of the key SSMR processes are joint-planning (e.g. what has to be done, time allocation etc.) and joint- monitoring of the task process and content comprehension (e.g. questioning the direction of the cognitive process) (Hadwin et al., 2017; Iiskala et al., 2015; Järvelä & Hadwin, 2013). Findings from previous SSMR studies suggest that these two processes influence each other and sometimes overlap, for example when students assess the group's common understanding of the task requirements and simultaneously try to agree on a common planning strategy (Rogat & Linnenbrink-Garcia, 2011).

Other empirical studies within the SSMR field further found that similarly to individual metacognitive regulation, SSMR episodes emerge more frequently and for a longer period of time when undertaking a difficult task in comparison to easy or moderately difficult ones, but this frequency dramatically drops when tasks are too

complex (Hadwin et al., 2017; Iiskala et al., 2015; Ucan & Webb, 2015). More specifically, SSMR tends to emerge when group members express doubt, confusion or conflicting ideas or when they try to reach a consensus about the solution of a related problem (Hadwin et al., 2017; Iiskala, 2015; Ucan & Webb, 2015). Compared to the face to face shared regulation processes, the emergence of SSRM during collaborative tasks in online environments is more complex and harder to capture both for teachers and researchers. For learners however, online environments can function as an additional metacognitive and mirroring tool which can make their thinking processes to other group members "visible" easily and effectively (Iiskala et al., 2015; Järvelä & Hadwin, 2013).

2. Method

2.1 Research Context and Participants

As mentioned earlier, the course that served as the setting of this study was an experimental EAP course that aimed to teach ECE undergraduates how to search, read and ultimately use research articles for their studies. The course lasted for one academic semester and adopted an ESP genre analysis approach combined with metacognitive training. The first part of the course aimed to familiarize students with the research article genre through genre analysis tasks whereas the second part of the course focused on genre-specific searching and reading strategies. The three participants, Andreas, Markos and Stelios were all 2nd year ECE students at the Technical University of Crete. Their age ranged from 19 to 20 years old. All three of them were C2 language certificate holders which they obtained during high-school.

2.2 Research Design

This study adopted a case study methodology (Croswell, 2015) using one case, that is the interactions of one group of students working on a single collaborative move analysis wiki task as an illustration of the phenomenon under study, that is SSMR episodes during genre knowledge co-construction. We aimed to explore learners' interactions and shed light to the complexities of the phenomenon under exploration rather than make generalizations. In order to identify SSMR episodes, we examined the wiki comments that had been exchanged among group members whilst working on the task combined with the participants' wiki logs and modifications. We then conducted a single group semi-structured retrospective recall interview in order confirm the focus of the episodes and the emergence forms of SSMR.

2.3 The Task

The task, involved a research article move analysis report, integrated in a Moodle-based wiki. The rhetorical coding scheme students had to use was based on a simplified version (Seiradakis & Spantidakis, 2018) of Swale's CARS model (create a research space) that identifies research article writers' most frequent introduction rhetorical moves (Swales, 1990). More specifically, the move coding scheme was based on findings from previous corpus-based descriptive move analysis studies which have shown that despite the extensive within-genre variations, research article introductions in the ECE discipline which are the focus of the present study, broadly include six major moves, namely the Introduction Background Move (IMB) the Introduction GAP Move (IGM), the Introduction Purpose Move (IMP), the Introduction Methodology Move (IMM), the Introduction Major Results Move (IMRM), the Introduction Evaluation of Results Move (IER) and the Introduction Outline of Paper Move (IOM) (Chang & Kuo, 2011).

The introduction students had to analyze was from an authentic research article of a high-ranking IEEE journal related to educational technology. The article was part of a small research article corpus that formed the basis of the whole course. All the articles fulfilled the criteria set by previous researchers who have also used research articles with undergraduate students (Muench, 2000). Most importantly, the specific introduction contains features commonly found in ECE research articles (Anthony, 1999; Chang & Kuo, 2011; Hyppönen, 2010; Kanoksilapatham, 2012; 2015; Maswana et al., 2015; Posteguillo, 1999).

2.4 Coding Scheme and Data Analysis

In order to analyze the group's SSMR interaction, we needed to determine SSMR episodes. Similarly to previous studies that have explored SSMR episodes in online environments (Iiskala et al., 2015), our analysis unit was a thread, that is a sequence of interconnected notes, in this case Moodle-based wiki comments, that shared the same move analysis task focus. Each episode started with the first metacognitive activity of a participant and ended after the last turn that dealt with the same focus of regulation. We implemented a multistep analysis approach as described by Ucan and Webb (2015). Accordingly, we initially transcribed and examined all the comments and through an iterative process we subsequently coded them using an adjusted literature-based scheme (Rogat & Linnenbrink-Garcia, 2011; Winters & Azevedo, 2005). The coding scheme (Table 1) was

attuned to the needs of the present study as to the best of our knowledge there are no studies exploring SSMR in collaborative genre analysis tasks. We then identified the focus of the interconnected notes/comments in order to determine which ones resembled instances of SSMR as opposed to co-regulation. After determining the episodes' focus as mentioned earlier, we conducted a stimulated recall group interview which lasted around 50 minutes based on a semi-structured protocol (Appendix A). This helped us to confirm or reject our analysis and also provided us with rich data with participants' reflections on their thoughts about the underlying reasons the episodes emerged. Finally, we implemented inductive coding and assigned codes to themes related to the triggers and manifestations of the identified SSGR episodes.

Table 1. Coding scheme

SSMR Episode Focus	Code Examples
Joint-planning	Interpreting Genre Task Directions (IGTD)
	Planning Genre Task (PGT)
	Monitoring Planning Strategy (MPS)
Joint-Monitoring	Assessing Genre Understanding (AGU)
	Questioning for Assessing Genre Understanding (QfGU)
	Assessing Genre Task Progress (AGTP)

3. Findings

The SSMR episodes are categorized under the two key metacognitive skills of joint-planning and joint-monitoring (Table 2). The prevalent theme identified regarding the episodes' triggers included the group's attempt to overcome a perceived task difficulty. Themes related to the emergence of SSMR, included participants' expression of doubt, conflicting ideas and attempting to reach a consensus in order to solve the encountered problem.

Table 2. Episodes' triggers & themes

Episode Focus	Number of Episodes	Triggers & Emergence Themes
Genre Task Joint-Planning	1	Expressing conflicting ideas on the effectiveness of the group's initial planning strategy.
Genre Task Joint-Monitoring	1	Expressing conflicting ideas about a general formal or rhetorical RA introduction sub-genre knowledge aspect (content).
Genre Task Joint-Monitoring	1	Expressing Conflicting ideas on initial GAP cycles.
	1	Trying to reach a consensus on the final GAP Move.
	1	Trying to reach a consensus on the Purpose Move

3.1 Joint-Planning Episodes

The single shared planning episode was triggered when one participant expressed doubts about the effectiveness of the group's initial planning strategy that entailed assigning one or two moves to each student. This comment in turn triggered a shared monitoring process as all three of them realized their strategy was ineffective and decided to adjust it by enacting genre-specific reading strategies. More specifically, they agreed on reading the Abstract, skim the whole RA and attempt to identify the Purpose Move first, as the GAP and Background Moves initially seemed chaotic.

In the extract below (Table 3), we see how two members of the group try to check their understanding for why they were continuing to produce contradicting answers and attempt to decide on specific strategies to resolve these issues.

Table 3. Extract from a joint-monitoring episode

Participant	Thread
Andreas	1) Maybe we should all read the whole thing and the Abstract and everything first because they are all mixed up we can't really divide them. (MPS)
Markos	2) I did read the first part of the Introduction quickly to figure out where the GAP move starts but I can't figure where it finishes this is why I keep changing it, because I have the worst Move, it's all mixed up. (MPS)
Andreas	3) What if you find the purpose move first then the final GAP move should be right above, no? (PGT)
Markos	4) Ok and what about the other GAPs? We need to read the whole thing. (MPS)
Stelios	5) The whole thing? It's almost three pages. (MPS)
Andreas	6) It's faster than constantly changing everything. (PGT)

Findings from the recall interview confirmed the focus and the emergence of this episode and offered more information on how the group's common previous metacognitive experiences in collaborative assignments at ECE TUC influenced their initial planning strategy. Andreas' comment below is an indication of how the group's common judgment of task difficulty was incorrect which in turn had a negative effect on the quality of their joint-planning strategy:

"In the beginning, we thought it would be easy and we would do what we usually do when we write Labs and other assignments…we usually split it, I take the Introduction, you take the results, but it didn't work…"

[Andreas]

Interestingly, Andreas' comment on the underlying reason the group originally decided to split the moves triggered monitoring processes of the group's collaborative writing practices for other academic genres such as the lab report:

"… I'm not even sure whether this strategy actually works when we write Lab Reports…in many cases when I read them afterwards, there is no flow between the Introduction and the Method and the Discussion,".

[Stelios]

"…yes but when we write the reports for ECE we basically care about the experiment and the results, but here the actual experiment was to locate the moves, and what we did here was basically saying you take this part of the experiment, but you cannot understand half of the experiment."

[Markos]

Overall, the group's shared monitoring of planning processes seems to have triggered a better mutual understanding of move analysis task requirements as Andreas' comment below illustrates:

"…we wasted time in the beginning, then we figured that because the Introduction was long and difficult, to identify a move we needed the bigger picture…so then we decided we should all read the other sections first and then zoom in the moves...".

[Andreas]

3.2 Joint-Monitoring Episodes

The majority of the identified SSRM episodes had a monitoring focus and entailed individual and joint monitoring of genre content understanding. More specifically, the two monitoring episodes focused on the GAP move, its manifestations and cycles in the specific introduction.

Episode 3 (Table 4) exemplifies the group's shared metacognitive monitoring processes which emerged as the participants attempted to reach a consensus on the final GAP move. At the beginning of the episode, Markos expresses uncertainty about the group's joint-answer (Note 1). As a response, participants check and assess their mutual genre understanding (turns 2 to 8). Finally, at the end of the episode, all the group members have agreed on a joint answer. This thread suggests traces of shared metacognitive monitoring, since the interaction is geared towards influencing the group's shared cognitive processing of identifying the GAP move and its cycles within the specific RA Introduction. It could be argued that it illustrates how participants' metacognitive monitoring promoted a shared, understanding of the GAP move which would not be possible without their reciprocal

interaction.

Table 4. Extract from a joint-monitoring episode

Participant	Thread
Markos	1. Are we sure this is a GAP? It isn't even in the Introduction. All together, we have put like three GAPs here. (AGU)
Andreas	2. Can GAPs exist only in the Introduction? (QfGU)
Stelios	3. Not sure…But we have already put two GAPs in the Introduction. How many GAPs can we have??? (QfGU)
Andreas	4. Maybe, here they have put the "cycles" the video said. We have two GAPs in the Intro and one final one here. (AGU)
Stelios	5. What's the "final GAP?"? The last one? So we have the previous two normal GAPs and one here? (QfGU)
Markos	6. So the final GAP isn't at the end of the Intro, where it says "However, none of the previous works…"? (QfGU)
Andreas	7. I think the final GAP thing is here, right at the end of the Related Work," the realistic settings", this is the final GAP. (AGU)
Markos	8. So, what's happening here? Are we keeping this? There's no key word there like "However"/Limited etc. (AGU)
Andreas	9. No…there isn't…but here they review all similar studies and then they say this is the first study that was actually conducted in schools. (AGU)
Stelios	10. What am I supposed to do? the final GAP isn't in the last paragraph of the Intro? The "However…?" It is that they have never tested the robot in real schools? (QfGU)
Andreas	11. Leave it as it is. That's what I think…in another case why have they put all these studies in the Related Work section and then repeat that all the others were in labs rather than actual school? (QfGU)
Markos	12. Ok, makes sense...maybe they want teachers to read it as well. (AGU)
Stelios	13. Probably because this is the IEEE educational technology journal… ok so we are leaving this as we have it then…Check the other moves now. (MAP)

Note: AGU = assessing genre understanding, QfGU = questioning to assess the level of genre understanding, MAP = Monitoring Actual Progress

Interview data provided more information about how these episodes enacted participants' monitoring processes of their initial incorrect judgments regarding task requirements and difficulties. Andreas' comment below illustrates how during this episode the group became aware of the complexities of the move analysis as a task which in turn led to an increased awareness of within genre variations in relation to the GAP move:

"…the difficulties we had the GAP move here, was partly I think, because it can be from a phrase to like three paragraphs long… we expected to find just a sentence or a phrase, so in the beginning we were a bit trapped."

[Andreas]

In a similar vein, Markos talks about how the group purposefully activated not only formal and rhetorical but also content genre knowledge facets in order to achieve their goal, i.e. to reach an agreement on the name, the boundaries and the purpose of the particular move:

"…their GAP move was complicated and had many cycles and they were not obvious, they were mixed with content and references…so we kept wondering is it what we think it is or are we just imagining GAP moves here?"

[Markos]

For Stelios, explicating his genre knowledge to his other classmates was initially intriguing, which explains why in his comments he appears more reserved in naming a move or contribute in the group's planning and

monitoring processes. In his comment below we see how his self-knowledge as an English language learner, initially inhibited him from using the wiki comments in order to interact with his team members:

"I am not very good in English, so I was a bit scared, I wasn't sure If what I saw as a certain move, actually was a certain move, but then I realized that Markos and Andreas were also confused so I started writing more comments".

[Stelios]

In essence, participants' comments above indicate how the interaction with the other group members functioned for them as a shared and as self-monitoring move knowledge springboard. Most importantly, during these interactions they attempted to solve the problems they encountered by integrating different genre knowledge facets, realizing that move analysis is difficult because genre itself is a complex, multifaced, context-dependent concept.

4. Discussion

Overall, our results are in line with previous findings, suggesting that small-group SSMR processes can to a certain extent be fostered in online collaborative environments (Huerme et al., 2009; Iiskala et al., 2015; Järvelä & Hadwin, 2013). Similarly to face-to-face SSMR, we found that online SSMR is also triggered when the group members become aware of a task problem or difficulty, and as a result they are trying to regulate their mutual learning process by expressing doubts or conflicting ideas or by trying to reach a consensus on a solution in order to complete the task (Ucan & Webb, 2015; Iiskala et al., 2004; 2015; Rogat & Linnenbrink-Garcia, 2011). This could also explain why the GAP move and its cycles, triggered more joint-monitoring processes. In other words, the reason this move triggered more episodes may simply be that it was more cognitively challenging for participants to identify and analyze. Accordingly, the current work proposes that it is important for EAP practitioners, especially those who wish to design collaborative research article genre analysis tasks for novices to contemplate the difficulty level of the task and the specific article combined with the group's collaborative ZPD (Goos et al., 2002).

Our findings suggest that participants engaged more in joint-monitoring processes than planning processes as we were able to identify only one joint-planning episode. This finding could be related to the fact that planning processes are inherently more generic compared to monitoring in that they largely entail deciding on a certain course of action. Monitoring on the other hand is more demanding and entails content knowledge and more cognitive work. Even though the present study exhibits several limitations and we do not wish to make connections about the students' actual genre knowledge development, our findings are encouraging in that the collaborative wiki task forced students to at least verbalize what they think they know or don't know about genre-a key step in enacting metacognition. We see the cognitive crush they experienced during the task, as an opportunity for exploration and clarification (Karmaski & Mevarech, 2003) of blurry genre concepts which in the long run and after repeated practice may facilitate the construction of a better mental model of the task at hand (Iiskala et al., 2004), in this case genre analysis.

References

Anthony, L. (1999). Writing research article introductions in software engineering: How accurate is a standard model? *IEEE transactions on Professional Communication, 42*(1), 38-46. https://doi.org/10.1109/47.749366

Chang, C. F., & Kuo, C. H. (2011). A corpus-based approach to online materials development for writing research articles. *English for Specific Purposes, 30*(3), 222-234. https://doi.org/10.1016/j.esp.2011.04.001

Cheng, A. (2008). Analyzing genre exemplars in preparation for writing: The case of an L2 graduate student in the ESP genre-based instructional framework of academic literacy. *Applied Linguistics, 29*(1), 50-71. https://doi.org/10.1093/applin/amm021

Cho, M. H., & Kim, B. J. (2013). Students' self-regulation for interaction with others in online learning environments. *The Internet and Higher Education, 17*, 69-75. https://doi.org/10.1016/j.iheduc.2012.11.001

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Devitt, A. J. (2015). Genre performances: John Swales' Genre Analysis and rhetorical-linguistic genre studies. *Journal of English for Academic Purposes, 19*, 44-51. https://doi.org/10.1016/j.jeap.2015.05.008

Dudley-Evans, T., & St John, M. J. (1998). *Developments in English for specific purposes: A multi-disciplinary approach*. Cambridge university press.

Efklides, A. (2008). Metacognition: Defining its facets and levels of functioning in relation to self-regulation and coregulation. *European Psychologist, 13,* 277-287. https://doi.org/10.1027/1016-9040.13.4.277

Goos, M., Galbraith, P., & Renshaw, P. (2002). Socially mediated metacognition: Creating collaborative zones of proximal development in small group problem solving. *Educational studies in Mathematics, 49*(2), 193-223. https://doi.org/10.1023/A:1016209010120

Hadwin, A. F, Järvelä, S., & Miller, M. (2017). Self-regulation, co-regulation, and shared regulation in collaborative learning environments. *Handbook of self-regulation of learning and performance* (pp. 65-86). New York, NY Routledge.

Hurme, T. R., Merenluoto, K., & Järvelä, S. (2009). Socially shared metacognition of pre-service primary teachers in a computer-supported mathematics course and their feelings of task difficulty: A case study. *Educational Research and Evaluation, 15*(5), 503-524. https://doi.org/10.1080/13803610903444659

Hyppönen, K., & Paganuzzi, V. M. (2010). Computer science research articles: The locations of different section types, and a proposal for standardization in the structure. *Scientometrics, 84*(1), 199-220. https://doi.org/10.1007/s11192-009-0089-8

Han, P., Zhu, Z., & Wei, Q. (2010, December). An Analysis of Disciplinary Variation in the Structure of Research Article Introductions. *Computational Intelligence and Software Engineering (CiSE), 2010 International Conference on* (pp. 1-4). IEEE. https://doi.org/10.1109/CISE.2010.5677239

Iiskala, T., Vauras, M., Lehtinen, E., & Salonen, P. (2011). Socially shared metacognition of dyads of pupils in collaborative mathematical problem-solving processes. *Learning and Instruction, 21*, 379-393. https://doi.org/10.1016/j.learninstruc.2010.05.002

Iiskala, T., Vauras, M., & Lehtinen, E. (2004). Socially-shared metacognition in peer learning? *Hellenic Journal of Psychology, 1*(2), 147-178.

Iiskala, T., Volet, S., Lehtinen, E., & Vauras, M. (2015). Socially Shared Metacognitive Regulation in Asynchronous CSCL in Science: Functions, Evolution and Participation. *Frontline Learning Research, 3*(1), 78-111. https://doi.org/10.14786/flr.v3i1.159

Järvelä, S., & Hadwin, A. (2013). New frontiers: Regulating learning in CSCL. *Educational Psychologist, 48*(1), 25-39. https://doi.org/10.1080/00461520.2012.748006

Johns, A. M. (2015). Moving on from Genre Analysis: An update and tasks for the transitional student. *Journal of English for Academic Purposes, 19*, 113-124. https://doi.org/10.1016/j.jeap.2015.04.005

Kanoksilapatham, B. (2012). Research article structure of research article introductions in three engineering subdisciplines. *IEEE Transactions on professional communication, 55*(4), 294-309. https://doi.org/10.1109/TPC.2012.2223252

Kanoksilapatham, B. (2015). Distinguishing textual features characterizing structural variation in research articles across three engineering sub-discipline corpora. *English for Specific Purposes, 37*, 74-86. https://doi.org/10.1016/j.esp.2014.06.008

Lajoie, S. P., & Lu, J. (2012). Supporting collaboration with technology: Does shared cognition lead to coregulation in medicine? *Metacognition and Learning, 7*, 45-62. https://doi.org/10.1007/s11409-011-9077-5

Maswana, S., Kanamaru, T., & Tajino, A. (2015). Move analysis of research articles across five engineering fields: What they share and what they do not. *Ampersand, 2*, 1-11. https://doi.org/10.1016/j.amper.2014.12.002

Muench, S. B. (2000). Choosing Primary Literature in Biology to Achieve Specific Educational Goals. *Journal of College Science Teaching, 29*(4), 255-60.

Näykki, P., Järvenoja, H., Järvelä, S., & Kirschner, P. (2017). Monitoring makes a difference: quality and temporal variation in teacher education students' collaborative learning. *Scandinavian Journal of Educational Research, 61*(1), 31-46. https://doi.org/10.1080/00313831.2015.1066440

Negretti, R., & Kuteeva, M. (2011). Fostering metacognitive genre awareness in L2 academic reading and writing: A case study of pre-service English teachers. *Journal of Second Language Writing, 20*(2), 95-110. https://doi.org/10.1016/j.jslw.2011.02.002

Negretti, R., & McGrath, L. (2018). Scaffolding genre knowledge and metacognition: Insights from an L2

doctoral research writing course. *Journal of Second Language Writing, 40*, 12-31. https://doi.org/10.1016/j.jslw.2017.12.002

Peacock, M. (2011). The structure of the methods section in research articles across eight disciplines. *The Asian ESP Journal, 7*(2), 99-124.

Posteguillo, S. (1999). The schematic structure of computer science research articles. *English for Specific Purposes, 18*(2), 139-160. https://doi.org/10.1016/S0889-4906(98)00001-5

Rogat, T. K., & Linnenbrink-Garcia, L. (2011). Socially shared regulation in collaborative groups: An analysis of the interplay between quality of social regulation and group processes. *Cognition and Instruction, 29*(4), 375-415. https://doi.org/10.1080/07370008.2011.607930

Seiradakis, E. & Spantidakis, I. (2018). Online Course Design and Materials Development for Teaching Reading of Research Articles to EFL Undergraduate Students at a Greek Technical University. *Journal of Teaching English for Specific and Academic Purposes, 6*(2), 285-296. https://doi.org/10.22190/JTESAP1802285S

Seiradakis, E., & Spantidakis, I. (2018). Training undergraduate engineering students to read research articles: A qualitative think-aloud study. *IEEE Global Engineering Education (EDUCON),* 1208-1213. https://doi.org/10.1109/EDUCON.2018.8363367

Spantidakis, I. (2010). *Socio- Cognitive Multimedia Environments for Learning and the Production of Writing*. Athens: Gutenberg.

Swales, J. (1990). *Genre analysis: English in academic and research settings*. Cambridge University Press.

Tardy, C. M. (2009). *Building genre knowledge*. West Lafayette, IN: Parlor Press.

Ucan, S., & Webb, M. (2015). Social Regulation of Learning During Collaborative Inquiry Learning in Science: How does it emerge and what are its functions? *International Journal of Science Education, 37*(15), 2503-2532. https://doi.org/10.1080/09500693.2015.1083634

Yeh, H. C. (2015). Facilitating metacognitive processes of academic genre-based writing using an online writing system. *Computer Assisted Language Learning, 28*(6), 479-498. https://doi.org/10.1080/09588221.2014.881384

Appendix A

Retrospective Interview Questions

[With the wiki comments and the move analysis task in front of them] Could all three of you go through your wiki comments and tell me if my coding corresponds to what you were talking and thinking about at that moment?

(Possible further prompts)

Can you remember about what you were talking about here?

Can you remember what you were thinking during this interaction?

Can you remember why you made this comment here?

Is there any other comment that you would like to make?