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Work-In-Progress: Tracking social regulation of learning in interdisciplinary group work

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Summary

Recent years have seen a growing interest in how student groups regulate their learning when taking part in collaborative and interdisciplinary project-courses that are increasingly becoming popular in Engineering Education programs. While there is a rich research landscape on self-regulated learning, more empirical studies are needed on social regulation of peer-learning in collaborative group work. This study addresses this gap by conducting a narrative comparative case study to document shared regulation in three student groups from three project-based courses. Qualitative data was collected through interviews with members from those interdisciplinary groups working on real world challenges. The interviews were analysed for regulation episodes and synthesised into narratives representing key aspects of the groups regulative behaviours. The results are expected to highlight numerous instances of social regulation of learning within the various groups' at different stages of the project. Preliminary results presented here demonstrate challenges faced by a group when attempting to socially regulate their learning, underlining the importance of scaffolding for collaborative learning. Findings from the full study will highlight the important role that social regulation processes play in group learning and add to the current understanding of the interplay between different modes of social regulation in groups.

Keywords: Socially Shared Regulation, Co-Regulation, Interdisciplinary, Groupwork, Project-based learning

Type of contribution: Research extended abstracts

1 Introduction

Current Higher Education (HE) initiatives increasingly emphasize the need to develop students' teamwork skills through interdisciplinary and intercultural group work. Collaborative learning activities in education can help to create learning experiences that are distinct from learning experiences in one-to-many lecture-based activities. Research has reported positive effects of collaborative learning (e.g., Johnson & Johnson, 2009), however it is important to consider the general structure within collaborative learning activities. In engineering education, larger, semester based, collaborative learning activities are increasingly designed as project work where students work in groups on specific, oftentimes, authentic problems over several weeks (Gavin, 2011). This approach emphasises peer-learning, in active and self-regulated forms (Gavin 2011). Peer-learning encompasses a wide variety of educational strategies and activities, focusing on learning through active help and support among learners with equal status (Griffiths et al., 1995). In this way, peer-learning moves the focus from independent learning towards interdependent learning, where students develop skills to plan, organise, work, and evaluate their learning together (Boud, 2001). However, for effective

collaborative learning to take place, groups must engage in both the co-construction of knowledge and social regulation of learning (Summers & Volet, 2010).

Regulation of learning refers to activities such as planning, goal setting, evaluation, and self-instruction and requires learners to view their learning as dynamic, a process that they can take control of, as opposed to learning being something that happens to them as a result of teaching practices or their environment (Zimmerman, 2015). In terms of collaborative learning, there is a common misconception that simply taking part in group work will lead to collaborative learning (Summers & Volet, 2010) and until recently both teaching practice and research have ignored the regulatory dimension of learning: how does effective social regulation in group work foster collaborative learning, and which factors influence it? This question is particularly pertinent for interdisciplinary project work, which is being increasingly implemented in Engineering Education curricula (Hadgraft & Kolmos, 2020). In this paper, we address this gap, by comparing the regulation of learning in three interdisciplinary group projects. Our research question is:

How do student groups taking part in interdisciplinary group projects regulate their learning?

Theoretically, we build upon the emerging literature on social regulation of learning (SoRL), which extends the rich tradition of theoretical and empirical work on self-regulated learning (SRL) (Hadwin et al., 2017). While SRL provides a lens onto how an *individual* regulates and processes their own learning (e.g. Zimmerman, 2015), it is increasingly recognized that SRL is not able to address questions about the social dimension of learning. Thus, in recent years, an increasing number of studies have examined SoRL. Studies on socially shared regulation of learning (SSRL) and/or co-regulation of learning (CoRL) have identified various regulatory areas, categories, coding schemes and frameworks (e.g., Miller & Hadwin, 2015) conceptualizing SoRL. Many focus on metacognition, but some include the regulation of motivation, behaviour, or emotion (e.g., Rogat & Linnenbrink-Garcia, 2011). For this paper, we will consider two modes of social regulation: CoRL, and SSRL. CoRL is the regulation of one person by another agent (Hadwin et al., 2017). For CoRL to be successful, group members need to be aware of each other's skills, knowledge and personal goals and provide support and guidance when needed (Miller & Hadwin, 2015). CoRL as a process can be initiated by one or more individuals by requesting regulation, prompting others to regulate, or technology prompting regulation (Hadwin et al., 2017). It should be noted that CoRL can help or hinder SRL and SSRL (Hadwin et al., 2017). SSRL is the joint regulation of a group's learning; it requires negotiation for consensus within a group about task goals, plans, and ongoing strategic adjustments (Hadwin et al., 2017). For SSRL to be successful the group needs to be metacognitively aware of its joint goals and how to work together towards achieving said goals (Miller & Hadwin, 2015). However, previous research has predominantly sought to identify regulated learning in mono-disciplinary groups and not interdisciplinary ones, as in this ongoing study. Similarly, previous research predominantly discussed instances of regulation in isolation and not as a series of developments within a project.

Empirically, we examine social regulation in three group projects, part of interdisciplinary courses within *Tracks*, a major educational initiative by Chalmers University of Technology in Gothenburg, Sweden. *Tracks* courses are open to all students across the university, are project-based and intended to be multi- or interdisciplinary in nature (Enelund & Briggs, 2020). Thus, students meet and learn collaboratively across programme boundaries and take on relevant challenges with a basis in real-world problems together. The courses in this study are all one semester in duration and at master's degree level. All three courses started with a more theoretical lecture part after which students were placed in groups of 2-4 for the project work.

2 Methodology

As the field of SoRL is still quite new, researchers are experimenting with different ways to observe and record instances of social regulation, often employing a variety of qualitative methods to ensure richness of data (Hadwin et al., 2017). To examine our research question, we conducted a comparative narrative case study of SoRL in three interdisciplinary group projects. Narrative case studies are qualitative case studies in which the researcher collects data (in this case interviews) from one or several individuals about a specific event or events (the interdisciplinary group project) in order to retell and analyse the story (Baron & McNeal, 2019).

We collected data through five qualitative, semi-structured student interviews (Cohen et al., 2011) at the end of courses that ran in the same semester. The interviewees were selected through convenience sampling and came from a variety of engineering disciplines and national backgrounds, informed consent was gathered. During the interview, participants described different phases of the project and how the group approached different forms of regulative activities such as planning, monitoring and evaluation, including motivational and socio-emotional aspects. The interviews were held over Zoom, recorded, and transcribed for analysis.

Initially, the first author analysed the interviews using Miller & Hadwin (2015)'s definitions for SRL, CoRL, and SSRL as an analytical framework, to identify and code regulation episodes. Then co-authors compared the identified episodes with the original interview data to ensure reliability. Next, these episodes were formed into clusters related to similar events across groups (e.g., planning the project). These were then summarized into narratives that describe how groups regulated learning throughout the semester (names are fictive). Narratives allow for data to be presented in a readable format highlighting aspects relevant to the research question (Cohen et al., 2011). Finally, the narratives were jointly interpreted to highlight the different forms of social regulation across the groups, including specific episodes worth highlighting. In this work-in-progress paper, we present as illustration two narrative episodes from a group of three students conducting an interdisciplinary project in a course on battery development for transport.

3 Preliminary results

Episode 1 – Hans, Saoirse and John plan the project

Hans, Saoirse and John began their project with a group meeting after approximately six weeks of lessons on the topic. Their discussion aimed at setting a possible goal and a plan for the project, but they faced some disagreements: Hans' ideas were felt as too ambitious by Saoirse and John, both in terms of the level of knowledge and skill in the group and in terms of time. Additionally, because neither had specific expertise on the topic, all three felt insecure about which potential challenges they could encounter in the project, meaning that they struggled in making an accurate and realistic plan. Eventually, after negotiations, they came to an agreement on a number of goals, one of which was related to a measurement strategy. However, when they presented their idea to their supervisor, it transpired that their plan was unnecessary, since a measurement tool had already been designed and only needed more work. The supervisor suggested that they use this existing design to create and test battery samples. This change in the group's goal led to further disagreements as they now had to adjust their plan, including for instance what types of tests they should conduct on the batteries.

“It was also clear that we didn't quite sort of understand each other I think in terms of like a, one person thinks it's, this [plan] is going to be taking way too much time already. The other person thinks it's like, this [plan] doesn't answer at all the question that we were supposed to answer and so on.” – Hans

Despite extensive discussions among them, the group couldn't come to an agreement and so individuals turned to the supervisor:

“At that point we were really pulling different directions and it sort of felt like everybody was just trying to get the support of the supervisor on like their idea.” – Hans

The group eventually came to an agreement, but the disagreements had a negative effect on Hans who experienced a drop in motivation when his suggestions on goals were rejected by Saoirse and John.

Interpretation

The episode illustrates how the group used SSRL to formulate goals and a plan to achieve them and despite conflicting views/opinions they eventually reached an agreement. CoRL from the supervisor saw the goal and plan rejected and replaced by a new goal. The group attempted to use SSRL and CoRL via discussions within the group and with the teacher to formulate a plan to achieve the new goal but were unable to reach consensus. Group members then tried to implement aggressive CoRL as they attempted to push their plan on the group by convincing the supervisor to support their plan. The achievement of a consensus on the plan and goals through discussion hints towards successful SSRL, though a negative effect on motivation was noted.

Episode 2 – Knowledge acquisition

The course topic was outside the three students' disciplinary background, so they found it challenging to plan their work on the project. In addition to the compulsory lectures, their supervisor gave them scientific papers on the topic to help them in the initial phases of the project. The group members read these papers individually, using their own reading strategies:

“We got like a set of five or six papers from our supervisor that she asked us to read, and I think most of us did, I'm not really sure everyone in our group read the papers”-Hans

Devising a plan and relevant strategies improved as the project progressed and the group learned more about the topic, and on final reflection they felt the initial uncertainty was ultimately not a problem. In addition to the lectures and the reading, the supervisors were available to provide immediate help if needed, which helped lessen the impact of any knowledge gaps.

Interpretation

This episode reveals how the group failed to engage in social regulation after the supervisor used CoRL to try and help the group overcome knowledge gaps. Instead, the group members used individual SRL rather than a form of social regulation. The quote demonstrates how little shared monitoring of the group's learning was applied at this early stage of the project, when the group had little knowledge of each other and the topic. The supervisors continued to co-regulate the group during the project when requested.

4 Concluding discussion

We aimed to examine how student groups regulate their learning in interdisciplinary group projects, using narrative case studies of empirical basis. Given the ongoing nature of the research the results and their implications are limited but nevertheless illustrate the potential social regulation as a framework to interpret learning dimensions of effective project work. For example, their ability to successfully socially regulate the planning stage of the project was limited by their joint lack of experience in the subject area, including different views on the task and its required effort, and the lack of initial support from the supervisor in terms setting up strategies for collaboration. As evidenced by work on “desirable difficulties” or “desirable challenges (O'Connell et al., 2021), this is not necessarily a barrier to learning as such, but it increases the risk of students employing strategies that limit or even counteract the expected benefits of collaborative learning. In the presented case, this was indicated on several occasions, e.g., attempts of aggressive co-regulation when goal needed to be readjusted, and individual learning (reading) rather than group learning, impacting the students' ability for further regulation (Rogat & Linnenbrink-Garcia, 2011). Interestingly, while other studies have reported similar episodes of aggressive co-regulation (e.g., Rogat & Linnenbrink-Garcia, 2011), our case is unique in that individuals tried to use the supervisor as external figure of authority to push for their ideas about goals and strategies. Further, we observed a lack of shared monitoring in the knowledge acquisition process during the initial stages of the project, with little effort invested to ensure that all members understand the topic: another indication of poor social regulation (Rogat & Linnenbrink-Garcia, 2011). Finally, it is also relevant to observe how the supervisor's attempt to support the group by replacing

the group's hard-won goal agreement caused regulation challenges in the group. Altogether, similarly to the studies on self-regulation (e.g., Cervin-Ellqvist et al., 2020), these findings underline the importance of scaffolding both the process of knowledge construction and of collaborative learning regulation, to enable student groups to apply effectively engage in interdisciplinary projects entailing problem-based learning. Eventually this group managed to overcome their initial struggles as they became more familiar with each other and the project, though this is not the case for all groups investigated in this project. As our research is progressing, we will present and further discuss episodes of regulation and their implications for research and practice.

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