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# Conceptualizing Socially Shared Regulation In Challenge-Based Learning

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# CONCEPTUALIZING SOCIALLY SHARED REGULATION IN CHALLENGE-BASED LEARNING

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## ABSTRACT

Students in Challenge-based learning (CBL) courses work in multidisciplinary groups to develop a solution to an open-ended and ill-defined challenge.Thus, in CBL, students need to regulate their learning individually and collectively to learn. Socially shared regulation of learning (SSRL) refers to the development of collective and co-constructed task perceptions or shared goals by multiple students working as a group. Existing knowledge about conceptualizing and researching SSRL in CBL is currently

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lacking. In this paper, we provide evidence from a qualitative study we conducted in a CBL course, using analysis of individual learning portfolios and in-depth interviews about students' perceptions of SRRL. We discuss, firstly, which individual characteristics students perceive as important for SSRL. Secondly, we discuss the identified processes of SSRL identified in our data. Finally, we discuss how groups with high and low SSRL differ. For example, groups with high SSRL spend more time in task planning and role division. They also discussed shared goals early in the process and frequently monitored and evaluated their collective work and progress.

On the other hand, groups with low SSRL need guidance individually and as a group to plan and evaluate their activities in different project stages. In addition, they had fewer conversations as a group about their shared goals, and they had more difficulties getting along at a social level. Finally, theoretical implications, practical recommendations, and future directions for research are discussed.

## 1 INTRODUCTION

Challenge-based learning embraces an active, student-centered approach that prepares students for the complexities of the real world (Gallagher and Savage 2020; Doulougeri et al., 2022a). By engaging in open-ended challenges, students are expected to learn independently and collaborate with their peers to develop their collective skills, such as teamwork and communication skills (Gallagher and Savage 2020, Doulougeri et al., 2022a).

When students work in collaborative groups, a relevant concept to consider is socially shared regulation of learning (SSRL), which refers to the collaborative effort where students support and regulate each other's learning processes (Hadwin and Oshige 2011; Panadero & Järvelä, 2015). SSRL encompasses the collaborative efforts of students within the same group, as they actively co-construct and adapt cognitive processes (e.g., developing conceptual understanding), meta-cognitive processes (e.g., fostering group efficacy), and emotional processes (e.g., developing trust for each other) through constant negotiation during the learning process (Hadwin et al., 2017).

SSRL plays a critical role in achieving success in learning, as suggested by previous research (e.g., DiDonato, 2013), and it can support students to take ownership of their learning, preparing them for success in both academic and professional contexts.

However, previous studies have already revealed that students might face difficulties regulating their learning at an individual level, and thus, regulation at a group level might present them with an additional level of complexity (Doulougeri et al., 2022b). In the CBL context, achieving SSRL can be challenging for students, especially encountering CBL for the first time.

Moreover, despite encouraging students in CBL to regulate their learning at a group level when tackling open-ended and real-life challenges, the individual regulatory processes employed by each student can influence the overall group regulation (Järvelä & Hadwin, 2013). Little attention has been given to the individual resources that each group member brings to the collaboration, such as prior knowledge, motivation, task-relevant information, and social skills. A review of SSRL by Panadero et al. (2015) emphasizes the importance of exploring the impact of individual self-regulation skills on SSRL to gain a deeper understanding of the concept.

To be able to foster and support students in successfully regulating their learning at an individual and group level, it is first important to study how students experience SSRL in CBL and what are unique resources each group member brings to the collaborative process. Current research does not explore how individual characteristics may either facilitate or disrupt the occurrence of SSRL. By addressing these issues, we aim to better understand how CBL can improve student learning outcomes and meet the needs of today's complex, dynamic educational landscape.

Thus, the present study investigates the relationship between individual characteristics and a group's SSRL within a CBL context.

## 2 METHODOLOGY

We conducted a qualitative, multimethod study within a CBL course for first-year engineering students focusing on ethics and data analytics. The course was

conducted in the academic year 2021-22. The present study is part of a larger study, and its methodology has been reported elsewhere (Doulougeri et al., 2022a, 2022b)

The study employed two distinct methods of data collection:

a) Analysis of weekly learning portfolios, and b) conducting in-depth individual interviews.

The three groups selected for the study, each consisting of 4 students, were chosen purposefully based on their potential to represent important theoretical constructs relevant to the research.

## 2.1 Data collection

### Weekly learning portfolia

Learning portfolia and reflections are useful tools for assessing socially shared regulation in higher education as they provide a space for students to gain a deeper understanding of their learning processes and how they can collaborate with others to regulate their learning. Moreover, learning portfolia and reflections can be used to highlight specific instances of socially shared regulation, such as developing learning strategies with peers or evaluating group performance. Examining these occurrences of shared regulation can provide valuable insights into how students work together to facilitate their own learning. For this study, we analyzed the learning portfolio of 12 students, which meant that we, in total, analyzed 120 weekly reflections.

### In-depth interviews

In-depth interviews were conducted at the end of the course and offered valuable insights into individuals' experiences, strategies, social dynamics, contextual factors, and barriers and facilitators in students' learning (Doulougeri et al., 2022a). For this study, we analysed 10 interviews of students.

## 2.2 Data analysis

To analyze the collected data, the researchers utilized ATLAS.ti software, which allowed for the creation of an initial set of codes designed to capture the themes related to students characteristics that influence SSRL and SSRL processes.

After reading every student's learning portfolio and the transcript of the individual interview, we categorized the student as individuals exhibiting: low, average, or high self-regulated learning.

Then, the analysis happened at a group level, where we looked for a second time the portfolio of each student within a group and the interviews about their perceptions of their group and also categorized the three groups into low, average, and high SRRL.

Table 1 summarises the distinct categories which we identified for individuals and groups.

*Table 1. The distinction of SRL and SSRL*

| | **Low** | **Average** | **High** |
|---|---|---|---|
| **Self-regulated Learning (individual level)** | Low SRL= difficulty to regulate own learning; | Average SRL= student needs some general guidance but shows proactivity and effort to regulate their own learning; | High SRL= students show evidence of regulating all cognitive, emotional, motivational, and meta-cognitive aspects of their learning in high level |
| **Socially shared regulated learning (group level)** | Low SSRL= difficulty in regulating learning as a group; need teacher guidance at the cognitive, meta-cognitive, and motivational levels | Average SSRL= Students need group support in some aspects of learning but show proactivity and effort to collaborate and regulate their own learning as a group; | High SSRL= students show evidence of regulating all cognitive, emotional, motivational, and meta-cognitive aspects of their learning at a high level as a group |

### 2.3 Data synthesis

Through an auditing procedure, the final set of codes was collaboratively constructed by all members of the research team. The overarching goal of this research is to enhance our understanding of the processes involved in SSRL by investigating how individual group members' SRL influences shared regulation within collaborative groups.

## 3 RESULTS

### 3.1 Individual characteristics influencing SSRL

The results of this qualitative study, which involved synthesizing information from individual interviews, portfolios, shed light on the individual characteristics of group members that positively influence groups' SSRL. Four themes emerged from the analysis.

**Theme 1: Intrinsic Motivation for CBL**

The first theme that emerged from the data was the presence of intrinsic motivation for Case-Based Learning (CBL) among group members. Participants who showed a genuine interest and enthusiasm for CBL demonstrated higher engagement and active participation within their groups. Their motivation stemmed from an intrinsic desire to learn, solve problems, and explore real-world applications of ethics and data analytics. This intrinsic motivation drove their active involvement in group activities and discussions, fostering an environment conducive to SSRL.

**Theme 2: Prior Experience with Active-Learning Pedagogies**

The second emerging theme highlighted the significance of students' prior experience with active-learning pedagogies. Group members who had previous

exposure to collaborative learning approaches, such as project-based learning, reported a greater familiarity and were more comfortable with the uncertainty open-ended projects like CBL entail. This prior experience enabled them to quickly adapt to the requirements of the group tasks and contribute meaningfully to the collaborative process.

**Theme 3: Preference for Multidisciplinary Collaboration**

The third theme surfaced was the preference for multidisciplinary collaboration among group members. Participants strongly inclined to work in diverse teams comprising individuals with different academic backgrounds and expertise demonstrated enhanced SSRL. These individuals recognized the value of multidisciplinary perspectives and actively sought opportunities to engage with peers from varied disciplines. The diverse knowledge and perspectives brought by different group members fostered more in-depth discussions, knowledge exchange, and problem-solving approaches, contributing to the group's overall success.

**Theme 4: Social Skills**

The fourth emerging theme emphasized the importance of social skills in influencing SSRL within groups. Group members who possessed strong social skills, including effective communication, active listening, and empathy, contributed positively to the group's SSRL. These individuals established and maintained constructive relationships with their peers, facilitating open and meaningful communication. Their social competence contributed to a supportive and collaborative group climate, encouraging active participation, knowledge sharing, and the development of a shared understanding.

### 3.2 Reported processes of socially shared regulation

The following aspects of group processes emerged from their reflections as relevant to how students experienced SSRL.

**Theme 5: Shared understanding and goal setting**

Students recognized the importance of establishing a shared understanding of project goals and objectives within their groups. They emphasized the significance of clarifying expectations, discussing individual perspectives, and reaching an agreement on goals and plans to ensure everyone was on the same page. A clear and shared understanding of the project facilitated effective collaboration and helped them work towards a common purpose.

**Theme 6: Task division**

Many students discussed the allocation of tasks within their groups. They acknowledged the necessity of dividing the project into smaller, manageable tasks and assigning responsibilities to individual members. By assigning tasks based on their strengths and expertise, students could maximize productivity and ensure the completion of all required components of the project. Effective task division helped maintain accountability and kept the group organized. On the other hand, other groups prioritized task division based on group members learning goals. For example, if a student already had programming experience, this task was allocated to another student so he/she could also develop the same skill. In the latter cases,

students tended to work more in pair where a more and a less experienced group member collaborated for a certain task.

**Theme 7: Time management**

Time management was another group process that students highlighted in their portfolio reflections. They emphasized the importance of setting timelines, establishing deadlines, and monitoring progress to ensure timely completion of the project. Though important, very often, groups struggled with time management.

**Theme 8: Monitoring and evaluation of working processes**

Collaboration was a central theme in students' reflections. They highlighted the significance of open communication, active listening, and constructive feedback within their groups. Students recognized that collaboration fostered a positive and supportive group dynamic, enabling them to leverage the diverse perspectives, skills, and knowledge of their team members.

### 3.3 Differences in the three groups

For this study, we studied in depth three exemplary groups of students with distinguished differences in the way they experienced CBL individually and as a group. Important variations in SSRL among the three distinct groups- low, average, and high were revealed from the analysis of students' reflections.

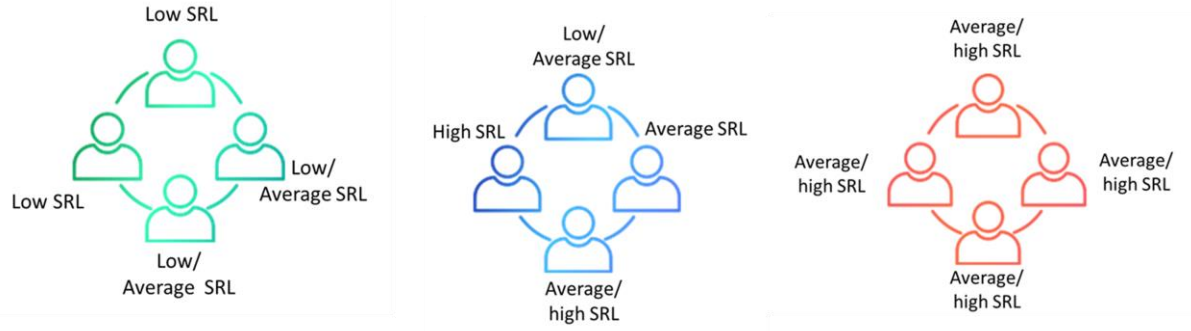


*Figure 1. Composition of 3 groups with various combinations of SRL and SSRL*

The low SSRL group faced difficulties in establishing a shared understanding of their task due to poor communication and social relations. They mainly worked individually and needed external guidance at every stage of the project, which led to frustration and dissatisfaction towards their team members. This affected their morale and productivity negatively.

On the other hand, the average SSRL group prioritized task division and time management, but spent less time in meetings and group discussions. The discussions were more focused on practical aspects than the content, hampering the overall learning process. They allocated tasks based on individual strengths and existing competencies, with a focus on optimizing the working process. Although they faced some frustration, the students proactively attempted to overcome problems and worked together.

Finally, the high SSRL group was dedicated to shared regulation of learning. They frequently brainstormed and set shared goals, monitored and planned as a group, and achieved a balance between individual and group work. They also

conducted peer review sessions to reflect on group processes and emphasized learning together. This group exhibited a high level of collaboration and a positive attitude towards the challenge and each other.

## 4 SUMMARY AND ACKNOWLEDGMENTS

This study aimed to investigate how the self-regulated learning characteristics of students within a group affect their perception of socially shared regulation of learning. Our findings indicate that socially shared regulation of learning is a crucial component of collaborative learning in engineering education.

Successful groups do not only focus on working together but essentially learning together, spending time brainstorming and reviewing each other's work. Establishing a positive group climate that encourages mutual learning and support is important. This can be achieved by prompting students to discuss their strengths and weaknesses and learning orientation, reflecting on their learning, and coaching/scaffolding the learning and working process.

According to the study findings, it is essential to provide students with low SSRL the necessary support and guidance to help them become self-regulated learners and to help them establish effective group processes.

The findings of this study have implications for pedagogical approaches in CBL-courses. The results suggest that high SSRL groups are more effective at regulating their learning and achieving their project goals than low and average SSRL groups. The study stresses the importance for a group to establish a shared task understanding early on in the project and the value of focusing on learning together as a group rather than simply working together.

For further research, studying socially shared regulation using multiple methods is recommended. In addition, future research should explore the role of group composition on shared regulation in CBL courses. When a group involves diverse groups members, this may result in different perspectives and knowledge. However, at the same time, students' differences in learning and working processes can affect shared regulation.

In conclusion, this study highlights the importance of promoting socially shared regulation in collaborative learning settings, particularly in CBL courses, to facilitate students learning and positive experience with CBL.

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