Social Regulation of Learning

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This primer addresses the following questions:

- What is social regulation of learning?
- How does social regulation of learning help students during collaborative learning?
- What does social regulation of learning look like in a classroom?

This document culminates with some strategies, tips, and resources to help you apply the ideas to making your classroom collaborations more successful.

Key Takeaways

- Social regulation of learning is an essential component required for successful collaborative learning. Social regulation can be explicitly taught and improved with time, effort, and effective feedback, leading to increased self-efficacy, motivation, and success for all learners in collaborative settings.
- Teachers are essential in successful collaborative learning as they help students learn how to work together, teach regulation skills, and monitor groups. It is also essential for the teacher to gradually release control to students to give opportunities to practice so they can fully develop their own regulation skills.
- As students develop the ability to regulate their own learning, and then to regulate with others, they gain tools that can help them become more active learners, more able to jointly build understanding and co-construct knowledge, and more readily overcome challenges in school and beyond.
- Social regulation of learning is not discussed with practitioners as often as other elements of collaboration and the implications for practice are not as clear for this essential component. This primer aims to call attention for a needed discussion between research and practice.

Background

To incorporate collaborative learning in their classrooms, teachers often begin by placing students in groups. However, simply placing students in groups is not typically sufficient for successful collaboration because students do not automatically know how to navigate the natural social, cognitive, and emotional challenges that arise when working with others to learn (Dragnić-Cindrić & et al., 2023; Järvelä et al., 2016; Kaendler et al., 2015; Lobczowski et al., 2020).

Researchers have identified social regulation of learning as an essential component to social regulation of learning to help students navigate these challenges and collaborate effectively (Panadero & Järvelä, 2015). Specifically, socially shared regulation of learning expands our understanding of the cognitive processes in collaborative learning by considering the important role of motivation and emotions. Socially shared regulation of learning helps learners navigate the social, cognitive, and emotional challenges of working together.
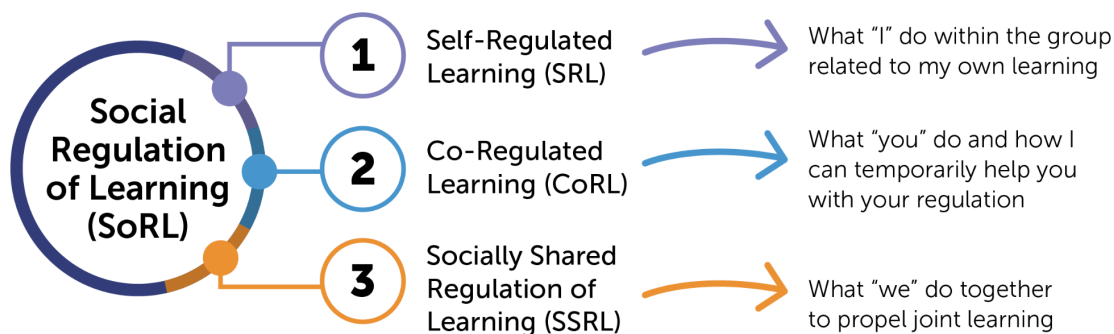
Social Regulation of Learning

Social regulation of learning is the broader category of regulation in social contexts; in collaborative contexts it occurs when group members plan, implement, and, if necessary, adjust their collective actions and behaviors to accomplish shared learning goals (Hadwin et al., 2018). For example, effective collaborators use social regulation of learning strategies when they clarify the task, plan for how to accomplish it, manage self and group frustration, build on each other's ideas, and keep each other on task.

Learners demonstrate social regulation of learning when they strategically find ways to overcome challenges and achieve their goals through behaviors such as setting goals, planning, implementing strategies, monitoring progress, reflecting, revising strategies, maintaining motivation, and many other regulative strategies. Social regulation of learning includes both individual and group-level regulative skills. Students benefit from social regulation of learning not only when collaborating with classmates but also when learning alone, both inside and outside the classroom (Dragnić-Cindrić & Greene, 2021).

Social regulation of learning is accomplished through three interacting component sets of skills: self-regulation, co-regulation, and socially shared regulation of learning (see Figure 1). We will consider the components further.

Figure 1: The currently understood structure of Social Regulation of Learning showing the three components of regulation

Note. Image created for this project, text adapted from Dragnić-Cindrić & Greene, 2021 and is licensed under CC BY 4.0.

Self-Regulated Learning

Self-regulated learning can simply be described as **what the individual learner does within a group** that regulates their own learning. It is done by an individual for individual benefits. As Cleary (2018) describes, self-regulated learners "want to perform well on some activity" and "purposefully and strategically figure out ways to achieve their goals…despite experiencing challenges, barriers, or struggles" (pp. 9-10). Self-regulated learners regulate many aspects of their learning, including their cognition, metacognition,[1] emotions, behavior, and environment (Greene, 2018).

While self-regulated learning is typically discussed when students are working in independent contexts, it is also relevant for groups. For example, if a student identifies what they don't understand, thinks about how they should share that with the group, and incorporates the group's feedback into their own thinking by evaluating, accepting, or even discarding the group's feedback to strengthen their own knowledge, a student is engaged in self-regulated learning. Self-regulated learning is an important component of successful academic and life outcomes (Dent & Koenka, 2016).

Co-Regulated Learning

Co-regulation of learning occurs when **one group member temporarily supports one or more others** in the group, with the goal of eventually transitioning the regulation of learning back to the regulated group member(s) (Järvelä & Hadwin, 2013). For example, if a student is repeatedly distracted by looking at another group, a teammate might prompt them a few times to pay attention to their own group.

Socially Shared Regulation of Learning

Socially shared regulation of learning is a type of regulation that is distinct from self- and co-regulation (Järvelä & Hadwin, 2013; Panadero & Järvelä, 2015). It is characterized by the equal and balanced participation of **all group members in the group's regulation of learning**. Cognitively, learners mutually scaffold each other's understanding and knowledge construction as they identify problems, discuss ideas, and determine group actions together. Socially, learners manage group dynamics together as they motivate and support one another, and navigate conflicts (Li et al., 2024).

When socially shared regulation of learning is occurring, it may be hard to tell as the ebb and flow of regulation and information sharing are highly fluid, seamless, dynamic, and sophisticated. As such, it's difficult to pinpoint the exact moment that socially shared regulation of learning is achieved or maintained, despite its positive impact on student learning. It might be easier to see if a problem occurs. To give an example of what it might look like, imagine a group of students working together and finding a

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[1] **Cognition** is concerned with thinking and learning that occurs in one individual's head; memory, perception, how an individual solves problems is considered in research on cognition.
Metacognition is an individual, internal cognitive process that allows awareness, monitoring, and regulation of other internal cognitive processes.

problem in their work. If they are able to share the regulation, they will plan and devise a workable solution as a group without teacher help or intervention. All participants will stay engaged, they may do emotional processing as they work through the problem, but generally, they stay calm, plan, and learn through the process.

What Does the Research Say?

As seen in Figure 1 and described above, social regulation of learning, the more broad term, has three main components: self-regulated learning, co-regulated learning, and socially shared regulation of learning. Socially shared regulation of learning is the newest area of research among the three components of social regulation of learning in collaborative learning (Panadero & Järvelä, 2015). The following section describes the research on the interplay of the three components and how each influences the other.

This section aims to clarify these relationships and discuss what each component brings to collaborative learning in accessible terms. However, the field is relatively new and still evolving with researchers working to establish consistent terminology and frameworks. The overlapping nature of these components—and the various ways they occur in different learning contexts—can make them challenging to distinguish and the descriptions below may seem to overlap. Additionally, these three regulatory processes often occur simultaneously and influence each other in dynamic ways. By presenting these interrelated concepts together, we hope to provide a holistic understanding of how regulation functions in social learning environments that can be useful in practice to help students succeed in school and beyond.

All types of regulation can be taught. With time, effort, and effective feedback, students can internalize social regulation of learning and deploy it when needed. If learners do not have the regulation skills required for collaboration, those skills can be explicitly taught (Järvelä & Hadwin, 2013). Regulation skills include goal-setting, pre-planning, implementing strategies, monitoring progress, reflecting, revising strategies, and maintaining motivation. Though there is variability in the regulation of learning skills, all learners can improve their abilities and skills when they become more aware of what they are and how to do it better. When learners realize that they can select strategies that will likely increase their success on tasks, their self-efficacy and motivation increase, as does their success (Greene, 2018).

Self-regulation is central to socially shared regulation of learning. Researchers have worked to understand how socially shared regulation of learning develops within a collaborative session and across sessions (Ucan & Webb, 2015). They have determined that self-regulation skills are required prior to developing socially shared regulation of learning (Järvenoja, et al., 2020; Järvelä & Hadwin, 2013). Students bring their self-regulated learning skills to groups, and these skills support their collaboration when groups begin working together (Järvelä et al., 2016). As groups work together over time, group members become more skilled at jointly regulating the group's learning and use socially shared regulation of learning more often.

Socially shared regulation of learning includes cognition, motivation, and emotions. Socially shared regulation of learning goes "beyond the cognitive aspects of the collaboration by acknowledging the important role of motivation and emotions in learning" (Malmberg et al., 2015). An overview of the research on socially shared regulation of learning highlights the importance of both a group member's ability for self-regulated learning and the group's socio-emotional climate (Bakhtiar et al., 2017; Järvelä et al., 2016).

Regulation becomes visible when challenges occur. Social regulation in a group is ever-present and allows members to learn together. When a group is working well together, regulation is so integrated into the flow of the work that it is hard to identify as something separate. However, when a challenge or tension occurs—like differences in understanding, discovering a mistake, or lack of topical understanding—the need for regulation becomes acute. These challenges can be emotional, cognitive, internal, or external. For example, a group could need to regulate for internal reasons, such as when members are frustrated with each other or don't understand the work, or for external reasons, such as the pressure to work quickly to meet a deadline. Regardless of the type of challenges or when they arise, all types of regulation are required to achieve social regulation of learning.

Positive classroom climates promote shared regulation. Understanding the classroom climate of a group is important to achieving social regulation of learning. A classroom climate is thought to be the pattern of shared emotions and behaviors that are fairly stable in an established group (Bakhtiar et al., 2017). Groups that have a positive climate seem to do shared regulation more often than groups with a negative climate (Rogat & Linnenbrink-Garcia, 2011). Therefore, creating a positive classroom climate should be considered an essential task for a teacher (see "Creating Classroom Culture" in the [Collaborative Learning Toolkit](#)).

Teachers are main influencers of successful collaborative learning. The role of the teacher is key to success in collaborative learning activities (Kaendler et al., 2015) and the development of social regulation of learning in the classroom (see [Teacher's Roles in Supporting Collaborative Learning](#)).

In a recent study conducted in high school physics classrooms, Dragnić-Cindrić and colleagues (2023) showed an inverse relationship between the level of teachers' control over small collaborative groups' dialogues and those groups' socially shared regulation of learning. In other words, students in groups where the teacher controlled the conversation engaged in less conversation with each other and used less socially shared regulation of learning. The more the teacher controls, the less time the students can spend learning how to co-construct, co-regulate, and negotiate their behavior, thinking, motivation, and emotions.

One way to reduce teacher control is for a teacher to not intervene in groups. Not intervening gives students more time to work in groups without the teacher present, shifting more towards student-led instruction and learning (Kramarski & Heaysman, 2021). Teachers experienced with collaborative learning suggest pausing 30 seconds and observing what happens when you find yourself wanting to

intervene (see [Teacher's Roles in Supporting Collaborative Learning](#) and the [Collaborative Learning Toolkit](#) for further examples.) It may be difficult for a teacher to step back for many reasons, but it is necessary to allow time for the development of socially shared regulation of learning (Dragnić-Cindrić et al., 2023).

Practitioner Perspectives

Strengthening student agency in learning. Socially shared regulation of learning provides students with emotional and cognitive advantages that strengthen their agency in their own learning (Malmberg et al., 2015). Because humans are inherently social creatures, we crave positive and meaningful interactions from one another. By contributing to the shared regulation of the group's learning experiences, each student can see themselves as a positive contributor to the collective learning experience rather than a passive consumer of existing knowledge, which develops a positive learner identity (Chowdhury, 2021).

Strengthening learners' metacognitive skills development.
Socially shared regulation of learning helps learners develop and strengthen their metacognitive skills. Co-constructing knowledge enables students to build on each other's metacognition (Järvelä & Hadwin, 2015) because the interactions encourage students to consider one another's thinking, check their own thinking, and verbalize their understanding of one another's thinking. Together they can generate contributions that they could not have done alone.

Ucan and Webb (2015) found that shared regulation of metacognition helped students build a shared understanding of the task, justify their perspectives, and continue building knowledge together. When students share regulation, they listen to each other, work together longer, and are more open to divergent ideas.

Building interpersonal skills. Students often face cognitive, motivational, and emotional challenges when collaborating. Socially shared regulation of learning can help students overcome these challenges by asking them to consider the "we" level rather than the "me" level of the group (Malmberg et al., 2015). Part of socially shared regulation of learning requires listening to other group members, gaining awareness of others, setting goals, negotiating and compromising, and adjusting to solve problems (Järvelä et al., 2014). Given that socially shared regulation of learning focuses on interactions and how to make things work more smoothly in a group, it is not surprising that it builds students' interpersonal skills (Malmberg et al., 2015).

Building perseverance. Socially shared regulation of learning can help a group persevere to achieve a certain level of competency and confidence (Isohätälä et al., 2017). In addition, when students are working to build valuable and important knowledge together (Scardamalia & Bereiter, 2010), they need each other's ability to self-regulate and jointly regulate. In situations where students struggle together, social regulation of learning helps contribute to the development of learner resilience. In addition, researchers found that the more groups engaged in social regulation of learning, the higher quality the product was from their collaboration (Järvelä et al., 2013).

Challenges for teachers

Despite the numerous benefits of social regulation of learning, several factors can make it difficult to achieve in the classroom. In this primer, we focus specifically on the factors that teachers need to consider when incorporating social regulation of learning into classroom practices. For guidance on additional challenges teachers face when implementing collaborative learning as a core instructional strategy, refer to our [Teacher's Roles in Supporting Collaborative Learning primer and the Collaborative Learning Toolkit](#); both documents discuss the culture needed to support collaborative learning.

The impact of regulation on student learning can be hard to measure. Many teachers often view collaborative learning practices as an add-on strategy rather than an essential part of their routine instructional practices. They tend to use collaborative learning practices intermittently, only when teaching specific units of study that seem to "fit." As a result, teachers often do not have the opportunities to develop successful collaborative learning facilitation skills, and therefore may perceive collaboration to be less effective than more traditional forms of instruction. In addition, a teacher new to collaborative learning activities may not be able to recognize whether students have regulation skills. Without good and easy ways to measure regulation, it is difficult to tell if collaborative learning activities are effective.

Students may respond negatively to collaborative learning. Even when a teacher is focused on developing regulation skills as a part of their core instructional strategy, students' attitudes towards these skills can significantly impact student learning. Because many students have internalized learning as an individual endeavor that leads to individual achievement measured and represented as a score or a letter grade, students who are asked to engage in collaborative learning can experience a level of anxiety and frustration. Achieving an optimal state of social regulation of learning is both fluid and situational throughout the learning process and difficult to quantify; as a result, students who are used to learning in a structured, sequential curriculum can experience social regulation of learning as a one-off exchange among peers, rather than a sophisticated learning experience that leads to deeper learning. Furthermore, they may consider group work not as an opportunity to regulate each other's learning, but as a performative task that precedes individual learning. Because many teachers neglect to explain the virtue of developing social regulation of learning skills or provide explicit feedback on the development of such skills, students often question the usefulness of developing these skills.

Challenges at the institutional level

Leaders may not understand how regulated learning impacts collaborative learning. School leaders who supervise teachers may not be well-versed in collaborative learning or familiar with concepts such as socially shared regulation of learning, co-regulated learning, or self-regulated learning. They may not have had opportunities to receive appropriate training in coaching their teachers. With lack of exposure, explicit training, or a combination of both, school leaders may not be able to help teachers maximize the benefits of collaborative learning in their classrooms. School leaders may incorrectly interpret the noise and movement of a highly collaborative learning environment as "out of control" and thus hinder the successful implementation of collaborative learning.

Leaders may prioritize content coverage over learning experiences. School leaders may feel pressured to prioritize the coverage of content or curriculum over the development of social regulation of learning skills based on the school calendar, state testing schedules, or third-party testing schedules (for example, the Advanced Placement test by the College Board). They may also face opposition from the school community because learning experiences that develop students' social regulation of learning, co-regulated learning, or self-regulated learning skills are radically different from many adults' previous schooling experiences.

Leaders lack sufficient training, practitioner-facing resources, and measurement tools. Even when a school leader understands the benefits of collaborative learning and the importance of social regulation, they may struggle to locate the appropriate resources that can help teachers develop the skills they need. Teachers unaware of their own self-regulated learning or co-regulated learning may require additional training and coaching in order to recognize their own social regulation of learning skills and then teach their students to develop them (Dignath & Sprenger, 2020; Hampton & Dragnić-Cindrić, 2023a). In addition, there are few evaluation methods to measure the effectiveness of social regulation of learning in practice. Assessing socially shared regulation of learning and other collaborative skills is paramount because, for better or worse, what is assessed is what becomes valued by both learners and society. The lack of knowledge, training resources, and impact measures make it challenging for school leaders to communicate the benefits of collaborative learning to their constituents, including the teachers who need to implement the strategy in their classrooms.

Social Regulation of Learning in Practice

Indicators of Socially Shared Regulation of Learning

Because observing what is happening inside a learner's mind is not possible, we need practical and observable indicators that suggest successful socially shared regulation of learning is occurring. Indicators are grouped below based on what students do, what a teacher does, and what the general classroom atmosphere should be. This section is designed to support both the teacher who would like to leverage this strategy effectively and any individual supporting the teacher (including the Instructional Coach, the Supervisor, and the Evaluator). It is important to note that many of these indicators are likely to be present simultaneously and intermittently.

The table below shows observable behaviors that indicate socially shared regulation of learning is present. Teachers can use these indicators when helping their students develop this skill. We offer a side-by-side comparison so that any observer can quickly discern what a student could experience in a classroom environment with low-quality versus high-quality socially shared regulation of learning.

Indicators of Low-Quality Socially Shared Regulation of Learning during Group Learning	Indicators of High-Quality Socially Shared Regulation of Learning during Group Learning
Sustained and frequent off-task behavior	Temporary and intermittent non-task behavior, especially social behavior that improves group climate
Unequal contributions of group members or a "divide and conquer" strategy to complete a task	Balanced contributions from all group members as they complete all parts of a task together
Frequent hostility, criticism, and frustration among group members	Group members support and respect one another and each member feels a sense of belonging
The group frequently requires teacher intervention to overcome comprehension challenges or negative group dynamics	The group frequently works together to overcome comprehension challenges or negative group dynamics

What a classroom fostering socially shared regulation of learning looks like:
- Students work in groups and there are rich conversations that could be perceived as just noise.
- The physical space is structured to support group work. It is a resource-rich environment (i.e., print materials including textbooks or books, internet access, and other informational resources). Students refer to the resources voluntarily and continuously.
- There is movement in the classroom among both the teacher and students; however, the movement does not impede anyone's learning.

What students skilled in socially shared regulation of learning do:
- On an individual level, students demonstrate their ability to set clear individual and group goals, make plans to achieve such goals, and make adjustments to their course of action based on their evaluation and reflection (Järvelä et al., 2018).
- Students ask clarifying questions, explain or justify their options, provide reasoning for their opinions, and elaborate expansive rationale for their opinions when questioned by their partner or group members (Hurme, Palonen, & Järvelä, 2006). Students are likely to use content and domain specific terms (academic language) and phrases that signal reasoning or sequencing, such as "I think X because of Y," "I agree/disagree with what you said because of X," or "What if we did X? How would we get the same/different results from before?"
- Students engage in self-regulated learning and co-regulated learning, such as:
  - Clarifying not only their tasks but also each other's tasks
  - Suggesting different tasks, strategies, or approaches towards deep learning of all members
  - Checking for their own and their group members' understanding,
  - Encouraging themselves and one another to persevere and to participate in the learning tasks fully
  - Reiterating ideas to show their attentive listening skills

- ○ Managing conflicts or disagreements among themselves without inviting teacher intervention
- ○ Engaging and discussing divergent ideas from their group members rather than dismissing
- ○ Referencing additional materials with little or no prompting from the teacher (Lobczowski et al., 2020)

What teachers encouraging socially shared regulation of learning do:
In a highly effective collaborative learning environment where social regulation of learning is present, teacher intervention is minimal yet impactful, timely yet infrequent, and peripheral yet targeted. It may appear as if the teacher is not doing much other than listening intently and asking questions, but the teacher has done a great deal to create conditions so that students have the opportunity to learn with and from each other (see Teacher's Roles in Supporting Collaborative Learning).

In a highly collaborative learning environment where socially shared regulation of learning is present among students, the teacher will:

- Circulate the room to observe and only intervene when it's absolutely needed
- Use prompting questions rather than instructive statements; continue to ask questions if students have misconceptions
- Provide small amounts of direct instruction only when no one in the group can answer the question or if the misconception continues as they elaborate and go deeper in their thinking with continued teacher questioning
- Provide feedback only when that prompts students to alter strategies and engage all members fully, rather than provide answers to the students (see Appendix for information on giving feedback that leads to further learning).
  - ○ A teacher may need to remind students that in the group, they need to work together and that each brings an important skill to the work (Webb, 2009) (see the Teacher's Roles in Supporting Collaborative Learning).

Teachers who have received training on Cognitive Apprenticeship and Reciprocal Teaching (Collins, Brown, & Holum, 1991; Kirschner & Hendrick, 2020) to learn how to model, scaffold, observe, coach, articulate, and reflect in order to make learning more visible for their students are better equipped to implement socially shared regulation of learning.

Additional Considerations

Practitioners who wish to implement collaborative learning in their classrooms should consider the following:

Teachers must provide structure and support to promote socially shared regulation of learning in a classroom rather than expecting it to occur naturally. Teachers can support socially shared regulation of

learning first by showing students how to identify challenges where socially shared regulation of learning may be helpful, and then by employing specific strategies and modeling solutions. For example, teachers can use sentence starters, classroom norm posters, guided questions, and prompts to help students address challenges. Some teachers may need to explicitly teach conflict resolution techniques for groups.

Teachers should be mindful of the importance of the gradual release of responsibilities that leads to mastery. If a teacher does not offer a release, students will not have the opportunity to develop socially shared regulation of learning as the teacher is controlling the regulation. The development of socially shared regulation of learning is most successful when classroom teachers adjust the pace and intensity of the necessary interventions. This process should be treated as nonlinear and highly dynamic, since students may need more intervention when they encounter a brand new topic and less intervention as they develop more familiarity with one another over time. One goal of collaborative learning is for students to guide and own their learning without teacher intervention.

To successfully help students become skilled in collaboration and set up more effective collaborative learning in their classrooms, teachers require more professional learning around socially shared regulation of learning. Teachers need to understand its impact on student learning in a collaborative learning environment, and the strategies to develop socially shared regulation of learning in their classrooms. As discussed in the challenges section, teachers face several obstacles when they work on developing their students' socially shared regulation of learning. Teachers need practical instructional materials and examples to experience success (Hill and Papay, 2022).

Summary

Social regulation of learning involves individuals working together to plan, monitor, and improve their learning processes in collaborative learning. It is critical for effective collaborative learning and includes three components: self-regulated learning, co-regulated learning, and socially shared regulation of learning. In this primer, we consider the development of social regulation of learning, the three different types of regulation involved in learning and collaborative learning, and how they interact to create successful learning experiences for all learners in a classroom. We note the conversation on this topic between research and practice is just beginning and there is still much to do to make these concepts usable in practice.

Getting Started

Practitioners should consider reviewing effective teacher moves related to socially shared regulation of learning in the Collaborative Learning Toolkit as well as the primer focused on the Teacher's Roles in Supporting Collaborative Learning. Both include resources that can be used in collaborative learning. By focusing on developing social regulation of learning among their students, teachers can yield the maximum benefits for their students when they participate in a collaborative learning experience.

Practitioners who have more expertise should consider developing lesson plans that leverage both content focused and non-content focused benefits of developing social regulation of learning among their students.

Other Primers in This Series:

- Assessment
- Classroom Discourse
- Collaborative Argumentation
- Teacher's Roles in Supporting Collaborative Learning

Related Resources

- Collaborative Learning Toolkit
- Regulation of Learning: What is it, and why is it Important?
- Social Regulation of Learning and Insights for Educators
- Foundations of Collaboration

Videos:

- Classroom Videos of Collaborative Learning

References

Bakhtiar, A., Webster, E. A., & Hadwin, A. F. (2017). Regulation and socio-emotional interactions in a positive and a negative group climate. *Metacognition and Learning 13(1), 57–90.*

Barron, B. (2003). When smart groups fail. *The Journal of the Learning Sciences*, *12*, 307-359.

Chowdhury, Takad. (2021). Fostering Learner Autonomy through Cooperative and Collaborative Learning. *Shanlax International Journal of Education*. *10*, 89-95. 10.34293/education.v10i1.4347.

Cleary, T. J. (2018). The self-regulated learning guide: Teaching students to think in the language of strategies. Routledge. https://doi.org/10.4324/9781315693378.

Collins, A., Brown, J. S., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator*, *15*(3), 6-11.

Dent, A.L., & Koenka, A.C. (2016). The Relation Between Self-Regulated Learning and Academic Achievement Across Childhood and Adolescence: A Meta-Analysis. *Educational Psychology Review*, *28*, 425–474. https://doi.org/10.1007/s10648-015-9320-8

Dignath, C. & Büttner, G. (2008). Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level. *Metacognition and Learning*, *3*, 231–264. https://doi.org/10.1007/s11409-008-9029-x.

Dignath, C., & Sprenger, L. (2020). Can you only diagnose what you know? The relation between teachers' self-regulation of learning concepts and their assessment of students' self-regulation. *Frontiers in Education 5*, p. 585683.

Dragnić-Cindrić, D., & Greene, J. A. (2021). Social regulation of learning as a base for successful collaboration. (Rapid Community Report Series). *Digital Promise*, *International Society of the Learning Sciences, and the Center for Integrative Research in Computing and Learning Sciences*. https://repository.isls.org//handle/1/6854

Dragnić-Cindrić, D., Lobczowski, N. G., Greene, J. A., & Murphy, P. K. (2023). Exploring the teacher's role in discourse and social regulation of learning: Insights from collaborative sessions in high-school physics classrooms. *Cognition and Instruction*, 1–32. https://doi.org/10.1080/07370008.2023.2266847

Greene, J. A. (2018). *Self-regulation in education*. Routledge. https://doi.org/10.4324/9781315537450

Hadwin, A. F., Järvelä, S., & Miller, M. (2018). Self-regulation, co-regulation, and shared regulation in collaborative learning environments. In D. H. Schunk & J. A. Greene (Eds.), *Handbook of self-regulation of learning and performance* (pp. 83–105). Routledge. https://doi.org/10.4324/9781315697048-6

Hampton S., & Dragnić-Cindrić, D. (2023a). Regulation of learning: What is it, and why is it important? *Center for Integrative Research in Computing and Learning Sciences.* https://circls.org/educatorcircls/regulation-of-learning-what-is-it-and-why-is-it-important

Hampton S., & Dragnić-Cindrić, D. (2023b). Social Regulation of Learning and Insights for Educators. *Center for Integrative Research in Computing and Learning Sciences.* https://circls.org/educatorcircls/social-regulation-of-learning-and-insights-for-educators

Hill, H. C., & Papay, J. P. (2022). Building better PL: How to strengthen teacher learning. *Research Partnership for Professional Learning*, 1-19.

Isohätälä, J., Järvenoja, H., & Järvelä, S. (2017). Socially shared regulation of learning and participation in social interaction in collaborative learning. *International Journal of Educational Research*, *81*, 11-24.

Järvelä, S., & Hadwin, A. F. (2013). New frontiers: Regulating learning in CSCL. *Educational psychologist*, *48*(1), 25-39.

Järvelä, S., Järvenoja, H., Malmberg, J., & Hadwin, A. (2013). Exploring collaboration. *Journal of Cognitive Education and Psychology*, *12*(3), 267–286.

Järvelä, S., Kirschner, P. A., Hadwin, A. F., Järvenoja, H., Malmberg, J., Miller, M., & Laru, J. (2016). Socially shared regulation of learning in CSCL: Understanding and prompting individual- and group-level shared regulatory activities. *International Journal of Computer-Supported Collaborative Learning*, *11*(3), 263–280. https://doi.org/10.1007/s11412-016-9238-2

Järvelä, S., Kirschner, P. A., Panadero, E., Malmberg, J., Phielix, C., Jaspers, J., ... & Järvenoja, H. (2014). Enhancing socially shared regulation in collaborative learning groups: Designing for CSCL regulation tools. *Educational Technology Research and Development*, *63*, 125-142.

Järvenoja, H., Järvelä, S., & Malmberg, J. (2020). Supporting groups' emotion and motivation regulation during collaborative learning. *Learning and Instruction*, *70*, 101090.

Kaendler, C., Wiedmann, M., Rummel, N., & Spada, H. (2015). Teacher competencies for the implementation of collaborative learning in the classroom: A framework and research review. *Educational Psychology Review*, *27*, 505-536.

Kirschner, Femke & Paas, Fred & Kirschner, Paul. (2009). A Cognitive Load Approach to Collaborative Learning: United Brains for Complex Tasks. *Educational Psychology Review 21*, 31-42.

Kramarski, B., & Heaysman, O. (2021). A conceptual framework and a professional development model for supporting teachers' "triple self-regulated learning–SRT processes" and promoting students' academic outcomes. *Educational Psychologist*, *56*(4), 298–311. https://doi.org/10.1080/00461520.2021.1985502

Langer-Osuna, J. M., Gargroetzi, E., Munson, J., & Chavez, R. (2020). Exploring the role of off-task activity on students' collaborative dynamics. *Journal of Educational Psychology*, *112*(3), 514–532. https://doi.org/10.1037/edu0000464

Lobczowski, N. G., Allen, E. M., Firetto, C. M., Greene, J. A., & Murphy, P. K. (2020). An exploration of social regulation of learning during scientific argumentation discourse. *Contemporary Educational Psychology*, *63*, 101925. https://doi.org/10.1016/j.cedpsych.2020.101925

Kirschner, P. A., & Hendrick, C. (2020). " Cognitive Apprenticeship" Revisited. *American Educator*, *44*(3), 37.

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 and Human Behavior*, 52, 562-572.

Miller, M., & Hadwin, A. (2015). Scripting and awareness tools for regulating collaborative learning: Changing the landscape of support in CSCL. *Computers in Human Behavior*, *52*, 573-588.

North Carolina Department of Public Instruction. (n.d.). *Portrait of a graduate.* https://www.dpi.nc.gov/districts-schools/operation-polaris/portrait-graduate#Tab-DurableSkills-4800

Panadero, E., & Järvelä, S. (2015). Socially shared regulation of learning: A review. *European psychologist*, *20*(3), 190-203.

Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologis*t, *36*(2), 89–101.

Scardamalia, M., & Bereiter, C. (2010). A brief history of knowledge building. *Canadian Journal of Learning and Technology/La revue canadienne de l'apprentissage et de la technologie*, *36*(1).

Webb, N. M. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology*, *79*(1), 1-2

Appendix: Feedback for Helping Students Learn

Feedback is essential to tell learners a) what they are doing, b) how they are doing, and c) what is next (Hattie & Timperley, 2007). From their review of research on formative assessment and feedback (meta-analysis) Hattie and Timperley identify four levels of feedback:

1. About the task: Whether something is correct or not, or if more information is needed;
2. About the processes that are involved in the task: For example, how to detect errors as you do the task;
3. About self-regulation: For example,how to plan, monitor, and reflect towards the learning goal;
4. About the self as a person: For example, "you are a brilliant student."

Of the four levels, feedback about "self as a person" is the least effective for helping further learning, as it contains no information related to the task. The first three levels of feedback listed are important to give for different reasons.

Feedback **about the task**, such as telling the student the answer is correct or incorrect, is especially important. Task feedback should be kept simple. If it is complex, it may not be understood. If a student needs more information, then the teacher should give further instruction, not feedback. Feedback can only build on knowledge that a student has; if they don't have basic knowledge, then instruction is necessary.

Feedback **about processing** or how to understand and manage tasks can give students insights that are generalizable. For example, showing a specific strategy to detect a mistake and provide self-feedback. This type of feedback can help lead to more confidence in the learner.

Feedback about **self-regulation,** such as how to plan, monitor, and reflect towards a learning goal, can help the learner create their own internal feedback routines, which make them a more effective and self-regulated learner (Hattie & Timperley, 2007). In groups, self-regulation is important.

If possible, combine the three levels of feedback about the task, processing, and self-regulation for increased positive impact on learning.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, 77(1), 81-112

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