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The role of peer observation and peer feedback in the promotion of self-regulated learning: An integrative review

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Self-regulated learning (SRL) involves the cognitive, metacognitive, emotional, and behavioral dimensions of knowledge acquisition and predicts academic achievement. This process can be enhanced through collaboration, particularly peer observation and feedback. Despite extensive research on SRL, the impact of peer observation and feedback in secondary education has been underexplored. This review aims to map the existing literature and analyze factors affecting SRL development through peer observation and feedback in secondary education, employing a systematic search adhering to PRISMA guidelines. Eighteen studies from seven databases, published between 2012 and 2023, were selected, involving 1,132 students aged 13 to 18 across various fields (e.g., mathematics, sciences, languages, arts). Most studies focused on upper secondary school (66.7%). Results indicated that peer observation and feedback have a positive impact on SRL. Collaborative activities were common, with some using inquiry-based, constructivist, or reflective learning strategies. Most studies explicitly described peer feedback, while peer observation was often implicit. Effective SRL

promotion requires systematic, intentional collaboration led by motivated teachers. High subject-related confidence, academic engagement, and strong social and emotional skills, such as self-awareness and communication, further support SRL. This review highlights the importance of integrating structured peer observation and feedback into educational policies to optimize lifelong learning.

Keywords: collaboration, autonomy, peer observation, peer feedback, self-regulated learning.

Introduction

One of the key competencies for lifelong learning (Council of the European Union, 2018; European Commission et al., 2020; UNESCO, 2015) is the ability to know how to learn, since it is expected that the children and adolescents who are now at school will have jobs or demands that we do not know yet. So, if we cannot prepare them with specific skills for an ever-changing labor market and to exercise critical citizenship, then they must learn how they learn by themselves. Self-regulated learning (SRL) involves learners independently guiding themselves through the process of skill acquisition (Zimmerman, 2000). Self-regulation encompasses essential metacognitive, motivational, and behavioral components, including tasks like managing time, arranging, practicing, and encoding information, focusing on, and dedicating attention to instructions, creating a conducive workspace, and making effective use of social resources (Zimmerman, 1989). The development of SRL strategies can be facilitated by collaboration and in moments of help-seeking, in which peers observe and give feedback to each other (Karabenick & Gonida, 2017). Although collaborative learning and socially mediated self-regulation have garnered increasing attention, peer observation and peer feedback have not been thoroughly examined in terms of their role in the learning process and as part of the SRL development process. The present review addresses this research gap and examines the literature from the last 10 years about the factors that facilitate and/or impede the SRL process, considering peer observation and feedback in secondary

education.

Self-regulated learning

SRL is a goal-driven activity (Zimmerman, 2000) and one of the most relevant concepts in learning studies, representing not only cognitive and metacognitive aspects but also emotional, motivational, and proactive behaviors that learners employ during their learning processes (Panadero, 2017).

In Zimmerman's (2000) SRL cyclical model, three phases of the process are described: forethought (preparatory phase), performance, and self-reflection (appraisal phase). In the updated version of the cyclical model (Zimmerman & Moylan, 2009), one can find a list of 20 strategies, grouped according to the three main phases and subprocesses identified by the author. In the forethought phase, there are the strategies involved in task analysis - goal setting and strategic planning – and in self-motivation beliefs – self-efficacy, outcome expectations, task value, and goal orientation. In the performance phase, there are the strategies involved in self-regulation – task strategies, self-instruction, imagery, time management, environmental structuring, help-seeking, interest incentives, and self-consequences – and in self-observation – metacognitive monitoring and self-recording. In the self-reflection phase, there are the strategies involved in self-judgment – self-evaluation and causal attribution – and self-reaction – self-satisfaction and adaptive (i.e., when students react positively and constructively to their self-judgments and feel motivated to repeat the process) or defensive (i.e., when students respond negatively or unproductively to their self-judgments to protect themselves rather than improve learning) strategies.

It is widely agreed that SRL impacts academic performance, with data consistently showing its predictive value (de Boer et al., 2018; Donker et al., 2014; Panadero, 2017; Perry et al., 2019). Moreover, a meta-analysis of SRL interventions showed that SRL can be

learned independently of the students' SRL level or ages, with the strategies having more impact on performance being metacognitive knowledge and evaluation (Donker et al., 2014). Another study found that implementing SRL interventions across diverse contexts and subjects can result in more enduring achievement effects and superior outcomes compared to sole content-strategy instruction (Cousins et al., 2022). Additionally, de Boer et al. (2018) found that metacognition strategy instruction influenced student performance slightly more from post-test to follow-up, with low social and economic status students having a bigger performance increment. Regarding the relevance of SRL strategies in achievement, Richardson et al. (2012) performed a meta-analysis that included different SRL components and found that academic self-efficacy, grade goal, and effort regulation showed medium-sized correlations with academic performance. Additionally, through a systematic review, Broadbent and Poon (2015) found that time management, metacognition, effort regulation, and critical thinking were predictive of performance.

A growing body of research has been focusing on the social aspects of regulated learning, with studies showing that collaboration enhances the acquisition of cognitive and metacognitive strategies since peer and group work activities offer students the opportunity to share responsibilities, ideas, and thoughts (Theobald, 2021). The Socially Shared Regulated Learning model (e.g., Hadwin et al., 2011; Järvelä & Hadwin, 2013) (SSRL) emphasizes the social aspects that are part of the learning process during group work. In this model, the authors proposed two additional modes of regulation beyond SRL, which are co-regulation (CoRL) and shared regulation. Additionally, the authors explained that during collaboration, SRL also includes the individual adaptation to the interaction with the group members. CoRL refers to the interactions in which one learner either guides, is guided by, or supports another learner. It can also involve the teacher acting as the guide in the co-regulation process. The SSRL implies that multiple learners in interdependence regulate their collaboration and their

collective learning process through social interaction, i.e., adaptation and regulation of collective goals, plans, strategies, and evaluations (Ito & Umemoto, 2022).

Peer observation and peer feedback

Considering the development of SRL, Zimmerman (2000) proposed the multi-level model with four levels that considered 1) observation: skills acquired through observing an experienced model in action; 2) emulation: imitating the strategies observed with social assistance; 3) self-control: displaying the skills learned from the model under a structured conditioning; 4) self-regulation: ability to use the strategies and to adapt them according to the needs. According to Zimmerman (2000), SRL strategies are not limited to asocial forms of education but rather include social forms of learning, such as seeking guidance from others. In this proposal, the role model can be a peer (or a teacher), and this process can exist throughout the process of working and learning with peers. Peer observation might be more present in the earlier phases of SRL as a social influence, though even the most self-regulated learners continue to rely on models (Zimmerman, 2000).

Observational learning through modeling occurs when observers display new behaviors that they could not perform before being exposed to the models (Kitsantas et al., 2000; Schunk, 1987), for example, when learning new sports or solving math problems together. Observational learning through modeling comprises four processes: attention, retention, production, and motivation (Bandura, 1986). In peer observation, motivation might be crucial when forming groups, since modeling will occur if the observer has confidence in the usefulness of the skills of the observed. Moreover, Schunk and Zimmerman (2007) proposed that children acquire self-efficacy (e.g., in tasks) in their abilities more significantly when they observe and learn from their peers, meaning peer observation.

Peer observation occurs spontaneously and implicitly in a process of collaboration. Thus, one might find it implicitly or explicitly mentioned in the literature. For instance, peer observation is pervasively present in the literature regarding peer assessment, considering either observation of the process (e.g., peer observation in teaching) or observation of the products (e.g., observation of peers' work), as well as a consequential feedback moment. A crucial element of self-regulatory models is the presence of a cycle of recursive feedback, which provides learners with task performance information to facilitate informed adjustments (Zimmerman, 2008). Through this cyclical process, students can continually assess the efficiency of their learning strategies and make adaptable modifications that can contribute to achieving academic success (White & Bembenutty, 2013).

Peer feedback can be defined as a 'communication process through which learners enter into dialogues related to performance and standards' (Liu & Carless, 2006), involving at least one student being the feedback provider and another being the feedback receiver. As such, both receiver and provider benefit from this relationship since the receiver gains valuable information to adjust learning, and the provider engages in observational learning. In fact, Zong et al. (2021) showed that students who provided long comments benefited more than their peers who received long comments.

A meta-analysis about the effectiveness of SRL training programs on performance, SRL strategies, and motivation in university students highlighted how peer feedback is a relevant element in cooperative learning (Theobald, 2021). The author argues that group discussions and explicit peer feedback reinforce metacognitive monitoring and reflection on goals and plans, and reflecting on the appropriate use of specific strategies might encourage students to apply those strategies frequently (Theobald, 2021). Also, it might enhance the knowledge about how, when, and why to apply a certain strategy (Theobald, 2021).

The present study

Past reviews have studied SRL instruction and interventions. However, analysis of the role of peer observation and peer feedback has been overlooked, especially in secondary education students. Peer observation has been mainly studied as a learning tool for teachers and clinicians (Mouraz et al., 2023; Torres et al., 2017), whereas peer feedback has been mainly studied as a formative assessment strategy. Taking all together, students experience a high cognitive load when performing novel or complex tasks (Panadero, 2017; White & Bembenutty, 2013), and they tend to seek help when dealing with high cognitive load (Karabenick & Gonida, 2017). Moreover, SRL skills develop over time with practice, observation, and feedback (Zimmerman & Kitsantas, 2005), and SSRL implies a cyclical loop where individual adaptation and SRL occur (Järvelä & Hadwin, 2013). Thus, collaborative learning with the explicit instruction to employ observation and feedback should be used frequently. However, the factors that might empower or hinder the process are not clear and require further clarification. As far as we know, there is no review that discusses the role of peer observation and peer feedback in SRL promotion, nor an analysis of the moderators that might increase or decrease the applicability and effectiveness of peer observation and feedback in SRL at the secondary school level.

Considering the increasing awareness of the impact of social components of the SRL process, and thus on the role of peer observation and peer feedback, this study aims to provide the first integrative review of research to 1) map the types of pedagogical strategies and activities that included explicit peer observation and/or feedback found to promote SRL; 2) describe the contributions from peer observation and peer feedback to SRL; 3) identify and critically analyze the moderator factors that might facilitate or hinder SRL through peer observation and peer feedback in secondary school students. So, the paper aims to explore how peer observation and peer feedback have been related to SRL in educational research.

In line with the main research goals, the following three questions will be addressed:

- What kind of peer observation and feedback strategies/activities promote SRL?
- What contributions from peer observation and feedback to SRL have been identified?
- What factors might facilitate or hinder SRL through peer observation and peer feedback?

Methods

The updated Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines were used to guide the development of the review protocol and the reporting of the findings (Page et al., 2021). Also, the dataset used in this study has been made available to align with the goals of open science at https://osf.io/r6qdv/.

Search strategy

In the framework of a Portuguese national project (WAY: Who sAw You then and who sees you now!; https://lead.uab.pt/way-en/name), a systematic search was conducted on seven databases: RACCP (Portugal Open Access Science Repository), Scielo, Scopus, Web of Science, ERIC, PsycInfo, and PsycArticles (the last three through the EBSCOhost research platform) on 08-09/03/2023 and repeated on 31/03/2023. A building block strategy was created, where the query was divided into key concepts A, B, and C, with A being related to the target population or the context (student OR pupil OR learner OR class OR lesson), B considering self-regulation or self-regulated learning and C including all the keywords relevant to the project (i.e., active listening, agency, autonom*, critical thinking, collaborat*, digital, empath*, pedagogic voice, peer feedback, peer instruction, peer observation, metacognition, and voice). . The search algorithm comprised Boolean combinations and truncation operators (Siddaway et al., 2019). This initial search was intended to create a

meaningful reference list for the mentioned project. One of the authors (A.C.S.) selected and tagged each reference with all the appropriate project keywords. After that, and for the goal of this review, specific keywords were selected, and the references that were in the software were selected based on the previous process of selection and categorization.

A following search, specific to this review, identified 131 relevant references within the database of the project. Categorization was manually performed with the support of the Rayyan software. Selected references combined SRL with at least one of the following keyword-tags: collaborative, collaboration, co-regulation, co-regulated learning, peer feedback, and peer observation. The first four keywords were included since their process integrates peer observation or feedback, albeit implicitly.

Selection Criteria

Studies were eligible for inclusion if: i) published between 2012 and March 2023; ii) written in English, Spanish, Portuguese, or French; iii) published in peer-reviewed journals; iv) the whole or majority of the sample was composed of adolescent students, with ages ranging from 13 to 18 years old, attending secondary school.

Studies were excluded if: i) published in languages other than the defined ones or before 2012; ii) participants attended kindergarten, primary school, or university, or were adult learners, including teachers; iii) unrelated to SRL; iv) consisting of an editorial or a commentary; v) participants had clinical symptoms or a diagnosis within the DSM 5's Neurodevelopmental Disorders cluster (American Psychiatric Association, 2013), which could influence their learning process *per se*.

In the second stage of screening, references related to books, chapters, and reviews were also excluded.

Screening and data extraction

Initially, a total of 6,811 references identified through database searches were imported to Zotero. After deleting 2,550 duplicated references and three retracted articles, 4,258 references were imported into Rayyan QCRI, an app developed to facilitate the screening phase of systematic reviews through a semi-automated process (Ouzzani et al., 2016). The software presents a search box and a highlighting system supporting a faster screening process. Additionally, it is possible to add specific keywords and specify if they will be used for inclusion and exclusion, and the system highlights them in different colors. With the support of the software, the first author executed study selection and screening. After screening by title and abstract, 771 references were retained, and 3,487 were deleted. A secondary screening, considering more specifically the goals of the current review, selected 131 references by title, abstract, or keywords. Consequently, 74 full-text articles were assessed for eligibility after deleting 36 review or theoretical articles, 13 chapters, and seven books. Since one record was not found and the contact with the author failed, 73 records were screened by full text, of which 29 were excluded for reasons specified in Figure 1. The remaining 41 articles progressed to the data extraction stage, of which only 18 studies explicitly mentioned peer observation and/or peer feedback in the full text.

The authors designed, negotiated, and agreed on a shared MExcel® table for data extraction and mapping, considering the review's research goals and research questions. All authors participated in reading the studies and extracting data according to the agreed-upon method for summarizing them. To summarize the studies, the following data were extracted from the articles: i) publication information (year of publication, authors, title, journal); ii) country of the investigation; iii) keywords; iv) purpose of the study; v) fundamental theoretical concepts; vi) sample size; vii) age; viii) gender; ix) school level; x) methodological design; xi) type of data collection; xi) learning environment; xiii) field of

knowledge; xiv) pedagogical strategies; xv) implemented activities; xvi) explicit peer observation, xvii) explicit peer feedback; xviii) main results regarding peer observation and feedback associated with SRL. Data extraction was later verified by different authors rather than the ones who had extracted data from specific studies. Three authors (A.M., A.C.S., and A.C.T) divided themselves by each research question, with the aim of integrating the extracted information. After that, the authors reviewed and edited the information, and meetings were held whenever necessary to discuss the findings, interpretation, and synthesis.

Regarding the learning context, it must be noted that the emergence of digital learning applications/software has enhanced the possibilities for collaboration activities, promoting group work, in which students learn from their peers, observe each other's work, and provide feedback (Lim et al., 2019). Thus, in the present review, we have included studies in which collaborative work happened in different learning environments, such as face-to-face learning, blended learning, and online learning.

Results

Included Studies' Characteristics

A total of 18 studies were included in the systematic integrative review. Table 1 presents the overall characteristics of the included studies.

Regarding country of origin, most of the included studies were published in the United States of America (n = 3, 16.7%), followed by Greece with two studies and other countries with one study each. By continent, most of the studies were published in Europe (n = 6, 33.3%), followed by Asian countries (n = 5, 27.8%). Two studies did not clearly mention where the study was developed (Arguedas et al., 2016; Zheng et al., 2020). The total sample comprised 1132 students, with 13 to 178 participants, and participants aged 10 to 19 years old, with the majority focusing only on the upper secondary school level (n = 12, 66.7%).

One study did not mention its sample size, reporting that it included 31 teachers and their students (Lau, 2013). Note that the report of age is absent in 11 studies, though they were included due to reference to being conducted in a secondary school.

Most studies had interventions or dynamics designed in face-to-face learning mode (*n* = 9, 50.0%), followed by face-to-face learning using digital strategies (*n* = 4, 22.2%) and blended learning (*n* = 3, 16.7%). The more common subject field of knowledge was languages (*n* = 5, 27.8%), followed by sciences (*n* = 4, 22.2%) and informatics (*n* = 4, 22.2%). Concerning the methodological design, the majority employed a pre-experimental design[1] (*n* = 15, 83.3%), while three used an experimental design, one was quasi-experimental, and another was observational. Lastly, half of the studies' data collection methods were mixed, considering both qualitative and quantitative data (*n* = 9, 50.0%), followed by qualitative (*n* = 5, 27.8 %) and then quantitative (*n* = 4, 22.2%) studies.

The literature analysis and review reporting were organized to map the connections between SRL and the components of observation and feedback in learning activities that involve peer collaboration. As such, we started to analyze how SRL is framed within the studies and how observation and feedback were embedded in the collaboration reported in the studies. Table 2 shows the main findings and essential characteristics for each included study related to the focus on the relations between observation and feedback in peer collaboration, as well as SRL.

This initial analysis revealed that most studies framed SRL as a variable or analytical dimension (*n* = 9) on the one hand, or as a goal or effect (*n* = 6) of the scrutinized

1 A pre-experimental design is a study that considers a one-group pretest-post-test design, it can also have only a post-test design. It does not include a control group or the randomization of participants (Cohen et al., 2018).

intervention or phenomenon on the other hand. When explored as an analytical dimension, SRL was mainly related to procedural or affective competencies, such as reading (Ivey & Johnston, 2015), mathematical reasoning (Kartono & Shora, 2020), argumentation (Lobczowski et al., 2020), and emotion awareness (Arguedas et al., 2016). Specific instructional strategies that purposefully required peer interaction or peer collaboration were also analyzed with a measure of SRL. The analyzed instructional strategies were peer review (Kong & Teng, 2023), small-group scientific argumentation discourse (Lobczowski et al., 2020), flipped classroom (Zheng et al., 2020), and a blog-based activity (Michailidis et al., 2022). In a unique case in which the analytical object was not a specific instructional strategy or design, Tamura and Uesugi (2019) reported a case study of a long-lasting experience of the implementation of student-led lesson studies in a Japanese school. When explored as a goal or effect, SRL was found to be connected to SRL-based instruction, namely in Language learning (Lau, 2013) and Music learning (Mieder & Bugos, 2017). Moreover, SRL came up as an effect of strategies fostering collaboration in all the studies, namely through collaborative inquiry (Chen & Wu, 2012; Kuisma, 2018; Zion et al, 2015), collaborative reading (Kielstra et al., 2022; Mendieta et al., 2015), and collaborative dialogues (Newman, 2017), often associated with a computer-supported collaborative learning (CSCL) environment (Chen & Wu, 2012; Michailidis et al., 2018; Zion et al., 2015).

When it comes to how peer observation and peer feedback fit into collaboration, they are often connected to peer review or peer evaluation tasks of performance or learning outcomes (Kartono & Shora, 2020; Kong & Teng, 2020; Michailidis et al., 2018, 2022; Lau, 2013). At other times, it was explored in activities that involve peer support (Arguedas et al., 2016; Lau, 2013; Zheng et al., 2020; Lobczowski et al., 2020). However, most of the time they were associated with group discussions, argumentation, or collaborative talk (Ivey & Johnston, 2015; Kielstra et al., 2022; Kuisma, 2018; Lobczowski et al., 2020; Mendieta et al.,

2015; Mieder & Bugos, 2017; Newman, 2017; Tamura & Uesugi, 2020; Zheng et al, 2020; Zion et al., 2015).

Types of pedagogical strategies and activities that included explicit peer observation and/or feedback to promote SRL

An analysis of the pedagogical strategies employed in activities that utilized peer feedback and observation (see Table 3) revealed that strategies fostering collaboration were the most commonly used, being present in all the studies. In conjunction with the previous, some studies also used inquiry-based learning (Arguedas et al., 2016; Chen & Wu, 2012; Kartono & Shora, 2020; Shchetynina et al., 2022; Zion et al., 2015), constructivist learning (Ivey & Johnston, 2015; Kong & Teng, 2020; Lau, 2013; Tamura & Uesugi, 2020; Zheng et al., 2020), and reflective learning strategies (Lau, 2013; Mieder & Bugos, 2017; Tamura & Uesugi, 2020).

Regarding the activities performed by students that lead to SRL, they were divided by the learning environment, meaning if they were developed face-to-face, face-to-face with the use of digital tools, blended, or solely online. As previously highlighted, all activities involved some kind of collaboration between peers. For instance, in face-to-face activities, students were instructed to read and engage in group discussions (Ivey & Johnston, 2015; Lobczowski et al., 2020; Mendieta et al., 2015; Newman, 2017); write an essay and receive peer feedback based on previous revisions of the material (Kong & Teng, 2020); solve mathematic exercises and receive peer feedback (Kartono & Shora, 2020). In Newman's (2017) study, students were instructed to participate in a collaborative process of metatalk, in addition to the collaborative task (i.e., explicit discussion and analysis of the interpersonal processes of collaborative talk) and self-evaluation. Another study analyzed a music learning process in which students followed a curriculum that included peer collaboration, verbal mediation, group discussion, and goal setting (Mieder & Bugos, 2017). Another study

described a student-led process, not subject-specific, in which students observe other classes and engage afterward in self-reflection and discussions with peers and with the class-responsible teacher to develop class learning plans (Tamura & Uesugi, et al., 2020).

In four studies, activities were performed face-to-face with the support of digital software (Arguedas et al., 2016; Kielstra et al., 2022; Shchetynina et al., 2022; Zheng et al., 2020). In three studies, instruction was received face-to-face, but a part of the task performance was developed online outside the classroom (Kuisma, 2018; Michailidis et al., 2018, 2022). Software used was Trello (Shchetynina et al., 2022), Moodle (Arguedas et al., 2016; Kuisma, 2018), and blogs that enabled game creation (Michailidis et al., 2018, 2022), where students obtained peer feedback in textual form (i.e., by exchanging comments/ideas and useful links).

Among the activities developed online, one was dedicated to online discussions, for which students received detailed instructions to provide "individual and social metacognitive support" to each other (Zion et al., 2015). The other consisted of the use of learning software that 1) provided didactic material in the form of multimedia, 2) computer simulations related to the scientific topic, and 3) recommendations for improving students' comprehension of the topic, along with expert and peer feedback to enhance their learning experience (Chen & Wu, 2012).

Contributions from peer observation and peer feedback to self-regulated learning

From the studies that integrated observation and feedback into peer review or peer evaluation tasks, effects on SRL were reported by 10 of the included studies, namely on overall SRL (Michailidis et al., 2018, 2022), self-monitoring and self-confidence (Tamura & Uesugi, 2020), motivation (Mendieta et al., 2015; Shchetynina et al., 2022; Tamura & Uesugi, 2020), effective knowledge management (Arguedas et al., 2016), self-efficacy (Mieder & Bugos,

2017), goal setting (Shchetynina et al., 2022), self-evaluation (Newman, 2017), cognitive skills (Kartono & Shora, 2020), metacognitive performance (Zion et al., 2015) and academic self-regulation (Kartono & Shora, 2020). Also, three studies specifically mentioned SRL strategies, including time management (Arguedas et al., 2016), peer learning and help-seeking (Michailidis et al., 2022), effort regulation, and study environment management (Kuisma, 2018).

Using an interaction analysis toolkit, Michailidis et al. (2018, 2022) examined two different samples of secondary school students to support the development of their self-regulation skills in a blog-based Computer-Supported Collaborative Learning (CSCL) activity. In their studies, the pedagogical design of the CSCL activity and peer feedback were associated with review and rating activities in a blog of Scratch Games produced collaboratively by student teams. A significant increase in SRL skills was observed, with the students in the experimental group demonstrating improvements in time and study environment management, effort regulation, peer learning, and help-seeking. In contrast, the control group did not (Michailidis et al., 2022). Interaction analysis graphs were automatically generated during the activity, providing students with information on the number of comments received on the blog regarding proposed improvements. This visual tool had a significant motivational effect, leading students to refine their performances and utilize peer feedback, which in turn improved communication with peers (Michailidis et al., 2018). In a later study, Michailidis et al. (2022) detected significant effects on motivational orientations such as intrinsic goal orientation, task value, control of learning beliefs, and self-efficacy for learning and performance. Kartono and Shora (2020) explored the mediating role of SRL between peer feedback and reasoning abilities, detecting an increase in logical thinking ability after learning of process-oriented guided inquiry with peer feedback, adding to the existing research connecting self-regulation, cognitions, and metacognition.

Another group of studies connected observation and feedback with peer support, addressing supportive behavior concerning positive socioemotional interactions (Arguedas et al., 2016; Lobczowski et al., 2020; Zheng et al., 2020). Arguedas et al. (2016) highlighted the interplay between student motivation, engagement, and self-regulation when peer support was more substantial, with beneficial effects on performance. Intrinsic motivation and self-regulation favor the regulation of interactions in peer support. As such, the teacher is essential in providing guidance and affective feedback for students to be more motivated to regulate their communication with peers (Arguedas et al., 2016), in scaffolding students' SRL skills for them to be more effective in social forms of regulation (Zheng et al., 2020) or simply in offering students a model of social practice to live into (Ivey & Johnston, 2015). Some studies also related peer support with precise role setting and student leadership when collaborating (Lobczowski et al., 2020; Mendieta et al., 2015; Tamura & Uesugi, 2020). For instance, Lobczowski et al. (2020) noted that individuals with strong self-regulation abilities who can engage in facilitating socioemotional interactions could be effective leaders in SSRL. As such, when designing group discussion learning activities, teachers must account for individual students' profiles in terms of self-regulation skills and socioemotional interactions when assembling groups and for ways of supporting students in such leadership roles through their feedback. Mendieta et al. (2015) adapted Klingner and Vaughn's (1998) proposal for attributing students' roles in a collaborative strategic reading activity in English L2 classes. In this strategy, peer support appeared with the attribution of an "encourager" role to a specific student. In this respect still, we highlight the study by Tamura and Uesugi (2020) in which students assumed the role of observers and reviewers of classes, focusing on how peers engaged with learning activities. With a collective improvement perspective, the students increased their motivation and self-confidence in participating in lesson improvement. As the authors explain: "Students were motivated by observing other students'

practices in the same grade, rather than by being told what to do by teachers. Since they felt confident that they could do the same themselves, they were motivated by being the main players in lesson creation." (p. 149).

Moreover, individual features may also influence students' interactions and peer observation and feedback. For instance, while detailing a case-based model of operating mechanisms of different sources of self-efficacy for peer review, Kong and Feng (2020) pointed out how teachers should consider learners' previous experience and imagined experience as factors affecting the expected outcomes of the training and pay attention to the effect of peer comparisons during the task on learners' self-efficacy for future engagement with tasks involving peer feedback. On the contrary, some students may possess good self-regulation skills in several domains (e.g., time management, effort regulation) but prefer to learn alone and do not need to negotiate with peers or seek their help, as highlighted in Kuisma's (2017) narrative study. It appears that effective communication, social skills, and motivation play a crucial role in group interaction. Michailidis et al. (2022) also emphasized the importance of intrinsic goal orientation in motivating students to participate in collaborative activities, thereby enhancing student interactions. In this case, online peer reviews between students were mediated by interaction analysis visual graphs, which provided students with instant feedback on who was commenting on their writings and who was reading their comments.

Factors that facilitate or hinder self-regulated learning through peer observation and peer feedback

In what concerns moderating factors that might facilitate or hinder SRL through peer observation and peer feedback, an analysis of the literature reviewed leads us to organize them as they depend on pedagogical practices (chosen and implemented by teachers) or are related to the form of peer collaboration in which the peer observation and peer feedback

occur. Figure 2 intends to present the factors in a condensed way, which will be described below.

Regarding pedagogical practices related to teaching and teachers' role, identified factors that facilitate SRL are the degree of challenge and promotion of students' thinking skills; the existence of teachers' guidance (Kong & Feng, 2020; Kuisma, 2017; Tamura & Uesugi, 2020) and support (Lobczowski et al., 2020), the systematic character of peer observation experiences (Kong & Feng, 2020), and the existence of teachers' affective feedback (Arguedas et al., 2016; Kuisma, 2017). In general, the analysis of the included papers suggests that students demonstrate greater commitment and engagement toward learning when participating in a collaborative classroom, as Mendieta et al. (2015) clearly state. However, such interest has varying levels of commitment among group members, which can hinder the peer feedback process (Kong & Teng, 2020; Lobczowski et al., 2020). Facilitator factors related to collaborative work include communication and social skills (Kuisma, 2008; Newman, 2017), with their promotion playing a crucial role in the quality of group interaction (Kuisma, 2008). Also, socio-emotional peer support is closely related to this quality of group interaction. Lobczowski et al.'s (2020) study highlights how individuals with strong self-regulation abilities are able to engage in facilitating socioemotional interactions and can be effective leaders not only of social regulation of learning in a group discussion but also of their peers' self-regulation abilities development. Tamura and Uesugi (2020) highlighted how students assuming the role of observers and reviewers of classes, focusing on how peers engaged with learning activities, positively influenced their motivation and self-confidence to participate in lessons, thus emphasizing the importance of students' voices and autonomy in learning. Students' emotional awareness (Arguedas et al., 2016) and motivation to learn (Chen & Wu, 2012) were also reported to facilitate the regulation (self-, co-, and group) of learning.

Another dimension that facilitates SRL development is the production of feedback, as reported by four studies in which students were asked to provide feedback on their peers' work. The results support the connection between such demand and the improvement in SRL of students who were able to perform the task (Kong & Feng, 2020; Kartono & Shora, 2020; Gogoulou et al., 2012; Michailidis et al., 2022). These results were also supported by a quantitative study, which found that the control group posted fewer comments than the experimental group (Michailidis et al., 2018).

Amongst factors hindering SRL, one may point out the absence of the previously highlighted facilitator factors. In addition, regarding pedagogical practice, it seems that teachers need stakeholders' support (Lau, 2013) to implement purposeful and long-lasting SRL experiences to frame their teaching. Closely related to this lack of support, the task orientation and collaboration scripts made available by teachers to guide SRL experiences challenge the effectiveness of tasks (Kielstra et al., 2022). In fact, teachers must be fully convinced of the benefits of SRL improvement and the long-lasting process it involves in order to persevere and make the experience effective. Another important factor is time. Time also affects SRL in two ways. First, as reported by Kartono and Shora (2020), more time was needed for SRL experiences to achieve the expected benefits. Similar difficulties related to time were highlighted by others (Lau, 2013; Mendieta et al., 2015). Nevertheless, time is also an important factor in managing the events. Tasks that involve collaborating and negotiating with peers are time-consuming, stressing teachers who are already dealing with curriculum development challenges and some students who are reluctant to engage in activities that require their participation outside the classroom (Kuisma, 2017).

Concerning the factors that might hinder SRL at the collaborative work level, there are social comparisons and other barriers to collaborative work. As Kong and Teng (2020) and Mendieta et al. (2015) remark, certain students are often reluctant to work in

collaboration with their peers, both because they dislike comparison between their own performances as reviewers with those of their peers or when they recognize a lack of participation or disturbing behaviors in them. When associated with group discussions, argumentation, or collaborative talk, peer observation and feedback are influenced by the quality of group interactions and, consequently, by SRL. For instance, despite the limited sample size of students in their intervention, Kielstra et al. (2022) correlated the occurrence of shared and co-constructed interactions in group discussions with deep-level metacognitive interactions, suggesting that the quality of group interaction plays an important role in facilitating high-level metacognitive regulation. As an illustrative example, they detail an episode in which group members answer each other's questions (according to the script), having difficulty following up on peers' comments with further questions, clarifications, or additional suggestions.

Furthermore, when students express low subject-related knowledge, they tend to exhibit low self-efficacy in reviewing others' work, do not enjoy being peer reviewers, and are also less committed to learning tasks (Kong & Teng, 2020). Also, the perceived difficulty level of the content/subject makes SRL development harder (Lobczowski et al., 2020). Likewise, Lau (2013) found that teachers were more inclined to include elements of SRL in their lessons when they perceived their students to possess strong subject-related abilities and high levels of motivation. Additionally, the primary reasons cited for the limited autonomy and student-led evaluation were the teachers' perception of the students' struggles in making effective choices or conducting appropriate evaluations, their dependence on teachers, disciplinary issues, and time limitations.

Discussion

The purpose of this article was to review the empirical research that has been undertaken on

the promotion of SRL using peer observation and peer feedback in secondary school students, analyzing the pedagogical strategies and activities implemented, contributions, and the factors that may facilitate or hinder SRL when peer observation and peer feedback are used. This integrative review identified several characteristics from the literature analyzed.

First, there is a lack of studies that explicitly instruct students to do peer observation (n = 9) and peer feedback (n = 2) in the process of SRL in collaborative work, mentioning it implicitly (i.e., peer observation being a previous step of peer feedback, and both being part of discussions in collaborative learning). Indeed, during the screening stage, 23 other studies were found where peer observation and/or feedback might have been used, though it happened only implicitly due to collaborative peer work, and no explicit mention of the terms was found (in the included studies, either peer observation or peer feedback was coded as explicit). Second, most of the studies were published within the last six years, indicating that interest in the topic is growing. Face-to-face learning was the most prevalent learning context, with four studies using digital tools and two being developed in an online learning context (Chen & Wu, 2012; Zion et al., 2015).

We also detected a prevalent explicit use of peer observation and feedback for SRL in languages, sciences, and informatics, often associated with specific instructional strategies that are didactically defended in the respective fields of knowledge. Most of the time, the strategies focused on specific performance outcomes such as reading, writing, dialogue, or argumentation. These are valuable transversal skills. Unfortunately, we noted an absence of studies on visual arts, technology, and sports, as well as a few studies on social sciences. Furthermore, although the present study is an integrative review, a meta-analysis by Dignath and Büttner (2008) found that interventions in the mathematics field held larger effect sizes than in other fields.

The observation dynamics in which students engage were often unreported or unexplored (Ivey & Johnston, 2015; Kartono & Shora, 2020; Kielstra et al., 2022; Kuisma, 2018; Lobczowski et al., 2020) or implicit but unmentioned, with the analytical focus lying preferably on interactions in the teaching and learning environment. We attribute this absence to two main sets of reasons. First, a methodological set of reasons is connected to the fact that interactions are often external processes that produce concrete and measurable information, such as recorded conversations, paper or online registers, or even narratives that involve memories of specific events (for instance, through narrative interviews). Conversely, observations are often internal processes that, even when guided, produce internal information that is difficult to collect and highly subjective, as it is often reinterpreted. As a consequence, researchers tend to explore metacognitive processes triggered by reflection on observation (e.g., Zion et al., 2015) more than the procedural aspects of the observation dynamics. A second set of reasons has an epistemological background and is connected with the prominence of Vygotsky's Sociocultural theory (1978, 1987) in learning studies at the turn of the century. Though we follow the view of learning as a collectively shared event dependent on interactions between individuals and the several components of their learning environments, we believe it sometimes conditions an overview of the external processes of interactions with disregard for the internal processes of observing and reflection that are pivotal in SRL individual development (Zimmerman, 2000).

Authors found out that, by observing other classes, "the students developed self-management strategies that were self-monitoring, thus changing their learning processes by themselves" (Tamura & Uesugi, 2020, p. 6). The explanatory connection between peer observation and SRL relies on the fact that they observe, and then they must communicate and take action based on what they think is more appropriate. Such movement is included in

the competencies of SRL, specifically the awareness of necessary changes that can lead to more positive behavior (Arguedas et al., 2016).

When observation and feedback align with task performance during collaborative learning, the development of SRL strategies can be facilitated by moments of help-seeking (Karabenick & Gonida, 2017). However, we noted little of that alignment and poor attention to the power of guided observation in peer feedback and collaboration, which we believe should be explored in future studies on instructional strategies for SRL development.

One must note that some students, influenced by cognitive, motivational, and social factors, exhibit different help-seeking tendencies, and some may display poor help-seeking behaviors, such as unawareness of the need for help, help avoidance, and help abuse (Gonida et al., 2019; Karabenick & Gonida, 2017). In school settings, help-seeking is an important self-regulatory strategy (Karabenick & Dembo, 2011). Appropriate help-seeking can be a useful competence that can boost the learning process and foster more collective, supportive and collaborative forms of learning (as opposed to more individualistic and competitive forms of learning). Thus, students must gain knowledge of the importance of this behavior but also receive feedback to moderate it if they start to abuse it ot tend to avoid it.

Note that all included studies used collaborative learning strategies. Peer observation and feedback during task performance may be especially advantageous for the learning process, as students can receive immediate feedback on whether their task solution is correct or not, which often leads to adjustments in the task enactment strategy (Zheng et al., 2020). Also, during this stage, observers can help their peers to reflect on the learning regulatory strategies that might be helpful, such us helping their peers in goal setting or self-evaluation, but also reminding them of metacognitive, motivational, and behavioral components of SRL strategies, including time management, space arrangements, information decoding, needs and strengths, offering other pedagogical resources, and making effective use of social resources

(Zimmerman, 1989). Moreover, according to Malmberg et al. (2021), task performance occurs when students become more involved in observing others and providing feedback, which can be because, at that moment, students can mobilize the trial-and-error system to solve the problem/task/exercise together.

In cases where observation and feedback occur on digital platforms, observation was conducted on the product resulting from the task performance. In contrast, in face-to-face learning, observation was performed either on the process or the result. Considering the higher engagement of students during task performance, as referred, it is worth noting what was identified by Stark (2019), who observed that students in the online context used SRL strategies less frequently, namely strategies of organization, seeking help from peers, and metacognition, compared to their peers whose learning took place in the face-to-face context.

Concerning the issues related to pedagogical practices and specifically from the teaching point of view, it was found that SRL promotion is facilitated when teachers are fully convinced of its positive impact and innovative purpose and are available for the demanding process, namely the time it takes in the class schedule, as well as the need to implement SRL focused activities, including observation and feedback between peers in a systematic, intentional and frequent way (Kartono & Shora, 2020; Kielstra et al., 2022; Kuisma 2017; Lau, 2013; Mendieta et al., 2015). Considering SRL as a defined key competence for lifelong learning (European Commission et al., 2020; UNESCO, 2015), teachers must have the training and educational policies and school boards that support them in the implementation of collaborative learning activities that include peer observation and peer feedback.

Intrinsically related to SRL development through observation and feedback between peers, as already mentioned, is collaborative work, with some authors identifying relevant social and emotional skills that can act as facilitating or disturbing factors, such as self-regulation, self-efficacy, ability to listen to others, use appropriate language, be able to ask

questions and negotiate with their peers, be able to provide support, trust, accept other people's ideas, value difference and avoid criticism (Kong & Teng, 2020; Kuisma, 2018; Lobczowski et al., 2020; Newman 2017; Zheng et al., 2020). Kuisma (2018) also reflected on the importance of social and emotional learning, along with the implementation of collaborative pedagogical strategies and the promotion of SSRL and SRL. This finding aligns with systematic reviews that have shown the association between social and emotional competencies and students' emotional, behavioral, and cognitive engagement (Santos et al., 2023) and academic performance (Corcoran et al., 2018). Also, the socio-emotional relationships between students and their self-perception of their academic status can influence the quality of such interactions. As reported by Boer et al. (2018), collaborative ambiance among students should be supportive, both social and emotional, in order for it to be fruitful in terms of SRL and SSRL.

Additionally, Mieder and Bugos (2017) noted that SRL-based instruction involving student discussions may be compromised by the student's capacity to engage in verbal mediation and goal setting, for which they recommend more training on cooperative learning activities and related skills. In this matter, Newman (2017) offered a proposal of metatalk about collaborative talk within group discussions in English classes, which showed promising results in supporting students' skills of self-regulating their engagement in peer dialogues, for instance, in adjusting used words, engaging with alternative views, and dealing with dissonance in the talk.

Limitations to our integrative review should be noted when considering its findings. First, theses and dissertations were not included. Although some eventually became available as peer-reviewed articles, we expect that only a subset of empirical works published as dissertations or book chapters is not covered in this review. Second, despite comprehensive and systematic literature searches, grey literature other than dissertations was not included.

Studies including SRL and the use of peer observation and feedback without mentioning it in the title, abstract, or keywords cannot be identified through electronic searches, only expert referral; thus, this type of work is not part of this review.

Moreover, despite our efforts to search seven databases, only 18 studies were included, despite SRL being a widely studied topic. Furthermore, among these, the majority had small samples, and most lacked a robust design with a control sample or randomization (only one was quasi-experimental, and only three were experimental). Another relevant limitation concerns the use of peer observation in SRL processes. It was absent, unreported, or unexplored in the design of six out of the 18 studies included in this analysis. Indeed, during the search phase, 23 studies were excluded since peer observation and/or feedback could have been used, although this was only implicit due to collaborative peer work.

Additionally, some factors can limit the applicability of SRL promotion through peer observation and feedback, such as the time-consuming nature of these activities, teachers' limited autonomy, and students' difficulties in providing proper evaluations and constructive feedback.

Implications for Research and Practice

From this integrative review, we align some suggestions to future research, as follows: explore the benefits of peer observation and peer feedback for SRL of transversal skills, but in wider fields of knowledge, namely in visual arts, technology, sports, or social sciences, or even in cross-field knowledge. This research path should also strive to reach larger sample sizes and more robust designs, including control groups and randomization, as this review has shown that the sample sizes of existing studies tend to be small, with only four studies including more than 100 student participants. In this respect, the use of digital tools in the classroom, whether online or in blended learning, creates a learning environment where data on peer observation and peer feedback can be easily collected from larger samples.

Considering the analytical framework in which observation is the first level of self-regulation development (Zimmerman, 2000), we think that more research should focus on the internal metacognitive processes triggered by observation in learning environments and on developing and monitoring instructional strategies based on collaboration that enhance the potential of learning through peer observation and feedback. Exploring the internal dynamics of observation can shed light on how it can be best promoted in classrooms to be conducive to reflection that favors progression to the following levels of self-regulation development: emulation, self-management, and self-regulation.

Concerning pedagogical practices, one may suggest to practitioners that the connections between SRL and collaboration in the classroom should include a greater emphasis on peer observation and feedback in their designs. Successful pedagogical activities to promote SRL through peer observation and feedback can be group discussions, collaborative problem-solving, and peer reviews, through which students will develop critical skills such as self-monitoring, self-evaluation, and goal setting. Examples of such could include students being asked to read and discuss a text, solve math problems, or write essays and provide feedback on each other's work. Additionally, we suggest that the development of programs with this intention, which are thought to be used online, should consider feedback focused on the product rather than the process.

Finally, practitioners must bear in mind that the socioemotional relationships among students are relevant to both engaging students in the observation and feedback process, as well as in the help-seeking process; thus, intentional socioemotional learning should be associated with these interactions. Adding to this, the teacher's role is crucial - Educators must actively scaffold the learning process by providing guidance, modeling effective communication, and offering affective feedback. Considering teachers' limited autonomy and

time restrictions that can affect this process, educational administrations should bear in mind the impact of such work to provide the resources to promote it.

Concluding remarks

In conclusion, peer observation and feedback are highly effective strategies for promoting SRL. Collaboration in face-to-face environments was the most commonly used pedagogical strategy, which included peer observation and feedback to promote SRL. In most situations, peer observation focused on the product (not the process), and feedback occurred through peer discussions. When the activities (or part of them) occurred online, students obtained peer feedback in textual form through software.

Regarding the identified contributions of peer observation and feedback to SRL, it was noted that the regulation of interactions in peer support enhances students' logical thinking ability during the learning process-oriented guided inquiry with peer feedback, adding to the existing research that connects self-regulation, cognition, and metacognition. Also, with a collective improvement perspective, the students increased their motivation and self-confidence in participating in lesson improvement.

Teachers must account for individual students' profiles in terms of social and emotional skills, specifically, self-awareness, self-regulation, and communication and social skills. These skills must be considered when assembling groups, as well as when supporting students in providing feedback. Moreover, individual previous experience should be considered as it affects the expected outcomes of the training and the effect of peer comparisons. Additionally, on this matter, some students may prefer to learn independently and might not be interested in improving their learning through peer feedback, or need help from their peers.

Finally, the factors that facilitate SRL are the systematic, intentional, and frequent implementation of collaborative activities, in which motivated teachers give detailed

instructions or scripts that help students perform and guide their observations and related feedback, along with students' high levels of subject confidence and academic engagement and high levels of social and emotional competencies such as self-awareness, self-regulatory and co-regulatory skills and communication and reflective skills.

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References

Note: References marked with an asterisk indicate studies included in this systematic review.

*Arguedas, M., Daradoumis, T., & Xhafa, F. (2016). Analyzing how emotion awareness influences students' motivation, engagement, self-regulation and learning outcome. *Educational Technology and Society*, *19*(2), 87–103.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Prentice Hall.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, *27*, 1–13. https://doi.org/10.1016/j.iheduc.2015.04.007

*Chen, C. H., & Wu, I. C. (2012). The interplay between cognitive and motivational variables in a supportive online learning system for secondary physical education.

Computers and Education, *58*(1), 542–550. https://doi.org/10.1016/j.compedu.2011.09.012

Cohen, L., Manion, L., & Morisson, L. (2018). Research Methods in Education (8th ed.). Routledge

Corcoran, R. P., Cheung, A. C. K., Kim, E., & Xie, C. (2018). Effective universal school-based social and emotional learning programs for improving academic achievement: A systematic review and meta-analysis of 50 years of research. *Educational Research Review*, *25*, 56–72. https://doi.org/10.1016/j.edurev.2017.12.001

Council of the European Union. (2018). Council recommendation on key competences for lifelong learning. *Official Journal of the European Union*, *189*, 1–13. https://cutt.ly/MKKtVUN

Cousins, E., Bol, L., & Luo, T. (2022). Exploring long-term impacts of self-regulated learning interventions in K-12 contexts: A systematic review. *Current Issues in Education*, *23*(1). https://doi.org/10.14507/cie.vol23iss1.2013

de Boer, H., Donker, A. S., Kostons, D. D. N. M., & van der Werf, G. P. C. (2018). Long-term effects of metacognitive strategy instruction on student academic performance: A meta-analysis. *Educational Research Review*, *24*, 98–115. https://doi.org/10.1016/j.edurev.2018.03.002

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*(3), 231–264. https://doi.org/10.1007/s11409-008-9029-x

Donker, A. S., de Boer, H., Kostons, D., Dignath van Ewijk, C. C., & van der Werf, M. P. C. (2014). Effectiveness of learning strategy instruction on academic performance: A meta-analysis. *Educational Research Review*, *11*, 1–26. https://doi.org/10.1016/j.edurev.2013.11.002

European Commission, Joint Research Centre, Sala, A., Punie, Y., & Garkov, V. (2020). *LifeComp: The European Framework for personal, social and learning to learning to learn competence*. https://doi.org/10.2760/922681

Gonida, E. N., Karabenick, S. A., Stamovlasis, D., Metallidou, P., & Greece, the C. T. Y. (2019). Help seeking as a self-regulated learning strategy and achievement goals: The case of academically talented adolescents. *High Ability Studies*, *30*(1/2), 147–166. http://10.0.4.56/13598139.2018.1535244

Hadwin, A. F., Järvelä, S., & Miller, M. (2011). Self-regulated, co-regulated, and socially shared regulation of learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of Self-Regulation of Learning and Performance* (pp. 65–84). Routledge.

Ito, T., & Umemoto, T. (2022). Self-regulation, co-regulation, and socially shared regulation of motivation for collaborative activity: Comparison between university students and working adults. *Japanese Psychological Research*, *64*(4), 397–409. https://doi.org/10.1111/jpr.12337

*Ivey, G., & Johnston, P. H. (2015). Engaged reading as a collaborative transformative practice. *Journal of Literacy Research*, *47*(3), 297–327. https://doi.org/10.1177/1086296X15619731

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

Karabenick, S. A., & Dembo, M. H. (2011). Understanding and facilitating self-regulated help seeking. *New Directions for Teaching and Learning*, *126*, 33–43. https://doi.org/10.1002/tl.442

Karabenick, S. A., & Gonida, E. N. (2017). Academic help seeking as a self-regulated learning strategy: Current issues, future directions. In D. H. Schunk & J. A. Greene (Eds.), *Handbook of Self-Regulation of Learning and Performance* (2nd ed., pp. 421–433). Routledge. https://doi.org/10.4324/9781315697048-27

*Kartono, & Shora, R. Y. (2020). Effectiveness of process oriented guided inquiry learning with peer feedback on achieving students' mathematical reasoning capabilities. *International Journal of Instruction*, *13*(3), 555–570. https://doi.org/10.29333/iji.2020.13338a

*Kielstra, J., Molenaar, I., van Steensel, R., & Verhoeven, L. (2022). 'Supporting socially shared regulation during collaborative task-oriented reading.' In *International Journal of Computer-Supported Collaborative Learning* (Vol. 17, Issue 1). Springer US. https://doi.org/10.1007/s11412-022-09365-x

Kitsantas, A., Zimmerman, B. J., & Cleary, T. (2000). The role of observation and emulation in the development of athletic self-regulation. *Journal of Educational Psychology*, *92*(4), 811–817. https://doi.org/10.1037/0022-0663.92.4.811

*Kong, A., & Teng, M. F. (2023). The operating mechanisms of self-efficacy and peer feedback: An exploration of L2 young writers. *Applied Linguistics Review*, *14*(2), 297–328. https://doi.org/10.1515/applirev-2020-0019

*Kuisma, M. (2018). Narratives of inquiry learning in middle-school geographic inquiry class. *International Research in Geographical and Environmental Education*, *27*(1), 85–98. https://doi.org/10.1080/10382046.2017.1285137

*Lau, K. L. (2013). Chinese language teachers' perception and implementation of self-regulated learning-based instruction. *Teaching and Teacher Education*, *31*, 56–66. https://doi.org/10.1016/j.tate.2012.12.001

Liu, N.-F., & Carless, D. (2006). Peer feedback: the learning element of peer assessment. *Teaching in Higher Education*, *11*(3), 279–290. https://doi.org/10.1080/13562510600680582

*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

Malmberg, J., Fincham, O., Pijeira-Díaz, H. J., Järvelä, S., & Gašević, D. (2021). Revealing the hidden structure of physiological states during metacognitive monitoring in collaborative learning. *Journal of Computer Assisted Learning*, *37*(3), 861–874. https://doi.org/10.1111/jcal.12529

*Mendieta, J., Múnera, L., Olmos, T., Onatra, C., Pérez, P., & Rojas, E. (2015). Fostering reading comprehension and self-directed learning in a collaborative strategic reading (CSR) setting. *Íkala, Revista de Lenguaje y Cultura*, *20*(1). https://doi.org/10.17533/udea.ikala.v20n1a02

*Michailidis, N., Kapravelos, E., & Tsiatsos, T. (2018). Interaction analysis for supporting students' self-regulation during blog-based CSCL activities. *Educational Technology & Society*, *21*, 37–47. https://www.jstor.org/stable/26273866

*Michailidis, N., Kapravelos, E., & Tsiatsos, T. (2022). Examining the effect of interaction analysis on supporting students' motivation and learning strategies in online blog-based secondary education programming courses. *Interactive Learning Environments*, *30*(4), 665–676. https://doi.org/10.1080/10494820.2019.1678487

*Mieder, K., & Bugos, J. A. (2017). Enhancing self-regulated practice behavior in high school instrumentalists. *International Journal of Music Education*, *35*(4), 578–587. https://doi.org/10.1177/0255761417689921

Mouraz, A., Pinto, D., & Cristina Torres, A. (2023). Effects of a model for multidisciplinary peer observation of teaching in teacher professional development and in nurturing a reflective school. *Reflective Practice*, *24*(1), 45–58. https://doi.org/10.1080/14623943.2022.2130225

*Newman, R. (2017). Let's talk talk: Utilising metatalk for the development of productive collaborative dialogues. *Thinking Skills and Creativity*, *26*, 1–12. https://doi.org/10.1016/j.tsc.2017.04.006

Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—A web and mobile app for systematic reviews. *Systematic Reviews, 5*(1), 210. https://doi.org/10.1186/s13643-016-0384-4

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *PLoS Medicine*, *18*(3), 1–15. https://doi.org/10.1371/JOURNAL.PMED.1003583

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, *8*(APR), 1–28. https://doi.org/10.3389/fpsyg.2017.00422

Perry, J., Lundie, D., & Golder, G. (2019). Metacognition in schools: what does the literature suggest about the effectiveness of teaching metacognition in schools? *Educational Review*, *71*(4), 483–500. https://doi.org/10.1080/00131911.2018.1441127

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, *138*(2), 353–387. https://doi.org/10.1037/a0026838

Santos, A. C., Simões, C., Melo, M. H. S., Santos, M., Freitas, I., Branquinho, C., Cefai, C., & Arriaga, P. (2023). A systematic review of the association between social and emotional competencies and student engagement in youth. *Educational Research Review*, *39*, 100535. https://doi.org/10.1016/j.edurev.2023.100535

Schunk, Dale H. (1987). Peer models and children's behavioral change. *Review of Educational Research*, *57*, 149–174.

Schunk, Dale H., & Zimmerman, B. J. (2007). Influencing children's self-efficacy and self-regulation of reading and writing through modeling. *Reading & Writing Quarterly*, *23*(1), 7–25. https://doi.org/10.1080/10573560600837578

*Shchetynina, O., Kravchenko, N., Horbatiuk, L., Alieksieieva, H., & Mezhuyev, V. (2022). Trello as a tool for the development of lifelong learning skills of senior students. *Postmodern Openings*, *13*(2), 143–167. https://doi.org/10.18662/po/13.2/447

Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019). How to do a systematic review: A best practice guide for conducting and reporting narrative reviews, meta-analyses, and meta-syntheses. *Annual Review of Psychology*, *70*(1), 747–770. https://doi.org/10.1146/annurev-psych-010418-102803

Stark, E. (2019). Examining the role of motivation and learning strategies in the success of online vs. face-to-face students. *Online Learning*, *23*(3). https://doi.org/10.24059/olj.v23i3.1556

*Tamura, T., & Uesugi, Y. (2019). Involving students in lesson study: a new perspective. *International Journal for Lesson and Learning Studies*, *9*(2), 139–151. https://doi.org/10.1108/IJLLS-04-2018-0026

Theobald, M. (2021). Self-regulated learning training programs enhance university students' academic performance, self-regulated learning strategies, and motivation: A meta-analysis. *Contemporary Educational Psychology*, *66*, 101976. https://doi.org/10.1016/j.cedpsych.2021.101976

Torres, A. C., Lopes, A., Valente, J. M. S., & Mouraz, A. (2017). What catches the eye in class observation? Observers' perspectives in a multidisciplinary peer observation of teaching program. *Teaching in Higher Education*, *22*(7), 822–838. https://doi.org/10.1080/13562517.2017.1301907

UNESCO. (2015). *Rethinking education: towards a global common good?* UNESCO. https://doi.org/10.54675/MDZL5552

White, M. C., & Bembenutty, H. (2013). Not all avoidance help seekers are created equal. *SAGE Open*, *3*(2), 215824401348491. https://doi.org/10.1177/2158244013484916

*Zheng, X., Kim, H., Lai, W., & Hwang, G. (2020). Cognitive regulations in ICT-supported flipped classroom interactions: An activity theory perspective. *British Journal of Educational Technology*, *51*(1), 103–130. https://doi.org/10.1111/bjet.12763

Zimmerman, Barry J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *81*(3), 329–339. https://doi.org/10.1037/0022-0663.81.3.329

Zimmerman, Barry J. (2000). Attaining Self-Regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7

Zimmerman, Barry J., & Moylan, A. R. (2009). Self-regulation: where metacognition and motivation intersect. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of Metacognition in Education*. Routledge.

*Zion, M., Adler, I., & Mevarech, Z. (2015). The effect of individual and social metacognitive support on students' metacognitive performances in an online discussion. *Journal of Educational Computing Research*, *52*(1), 50–87. https://doi.org/10.1177/0735633114568855

Zong, Z., Schunn, C. D., & Wang, Y. (2021). What aspects of online peer feedback robustly predict growth in students' task performance? *Computers in Human Behavior*, *124*, 106924. https://doi.org/10.1016/j.chb.2021.106924

Table 1. Overall characteristics of the included studies in the review (n = 18).

Characteristics	Study reference number	Percentage
Country		
China	8	5.6
Colombia	10	5.6
Finland	7	5.6
Greece	11, 12	11.1
Hong Kong	6	5.6
Indonesia	4	5.6
Israel	18	5.6
Japan	16	5.6
Netherlands	5	5.6
Taiwan	2	5.6
Ukraine	15	5.6
United Kingdom	14	5.6
USA	3, 10, 13	16.7
N/M	1, 17	11.1
Year of Publication		
2012 - 2016	1, 2, 3, 8, 10, 18	33.3
2017 - 2022	4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 16, 17	66.7
Sample Size		
9 to 100	1, 3, 4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 16, 17	77.8
> 101	2, 8, 10, 18	22.2
School level		
Lower Secondary	3, 4, 6, 16, 18	27.8
Upper Secondary	1, 2, 5, 7, 8, 9, 11, 12, 13, 14, 15, 17	66.7
Secondary (lower and upper)	10	5.6
Learning context		
Face-to-face learning	3, 4, 6, 8, 9, 10, 13, 14, 16	50.0
Face-to-face learning with digital tools	1, 5, 15, 17	22.2
Blended learning	7, 11, 12	16.7
Online learning	2, 18	11.1
Subject field of knowledge		
Arts and languages	3, 6, 10, 13, 14, 15	33.3
Social sciences	5, 7	11.1
Sciences	2, 4, 9, 18	22.2
Informatics	1, 11, 12, 17	22.2
Not specific to a single subject	8, 16	11.1
Methodological design		
Observational	16	5.6
Pre-experimental	1, 2, 3, 4, 5, 6, 7, 8, 10, 13, 14, 17, 18	83.3
Quasi-experimental	15	5.6
Experimental	9, 11, 12	16.7
Type of data collection		
Mixed	1, 5, 6, 8, 10, 11, 13, 14, 18	50.0
Qualitative	3, 7, 9, 16, 17	27.8
Quantitative	2, 4, 12, 15	22.2

Note: N/M = Not Mentioned

Table 2. Summary of the included studies.

Study reference number, Authors, year (country)	Participants' schooling level and ages (sample size)	How self-regulated learning is framed in the studies?	How are peer feedback (PF) and peer observation (PO) framed in the studies?	SRL improvement	Factors that promote or hinder SSRL through peer observation and feedback
1 Arguedas et al., 2016	Upper secondary (*n*=24)	As a variable or analytical dimension of emotion awareness.	PF as engagement and support to peers; PO as a part of a collaborative jigsaw learning activity.	Increased time management and effective knowledge management.	Not identified.
2 Chen & Wu, 2012 (Taiwan)	Upper secondary, age *M*=16.4 (*n*=178)	As an effect of a metacognitive strategy.	PF as complementary to an inquiry learning system prompts; PO absent.	Not identified.	Students who were motivated were more likely to report higher use of metacognitive strategies.
3 Ivey & Johnston, 2015 (USA)	Lower secondary (*n*=80)	As a variable or analytical dimension of reading competence.	PF as engagement in reading and discussion with peers; PO unreported or unexplored.	Greater emotional, behavioral, and academic self-regulation	Transformations were mediated by the students' collaborative work, including the relational properties of openness, trust, acceptance, and valuing of difference.
4 Kartono & Shora, 2020 (Indonesia)	Lower secondary (*n*=96)	As a variable or analytical dimension of mathematical reasoning abilities.	PF as formative feedback by peers in remedial learning; PO unreported or unexplored.	Increased logical thinking ability (i.e., cognitive skills).	Assigning roles to each group member made students more responsible for completing tasks and ensured that no single student dominated the group. The roles received at each meeting differed, allowing students to learn various skills and maintain their enthusiasm. PF helped students enhance their collaboration in learning activities. Teacher guidance supported students' discussion.
5 Kielstra et al, 2022 (Netherlands)	Upper secondary, age *M*=15.7 (*n*=44)	As a goal of collaboration and socially shared regulation.	PF as a part of group discussions; PO unreported or unexplored.	Not identified.	Script facilitated low-level metacognitive regulation.
6 Kong & Teng, 2023 (Hong Kong)	Lower secondary, age *M*=12 (*n*=20)	As a variable or analytical dimension of peer review.	PF as peer review of written texts; PO of performance level in written L2 English.	Not identified.	Students with low self-perceived competence reported low self-efficacy and motivation to be reviewers (and vice versa). The two most used strategies to ensure peer interaction were giving suggestions and asking for clarification. Self-efficacy influenced the effectiveness of the training and strategies employed.
7 Kuisma, 2018 (Finland)	Upper secondary, aged 14 to 15 (*n*=13); teachers (*n*=3),	As an effect of progressive inquiry learning in Geography.	PF as a behavior occurred in collaboration with a progressive inquiry activity; PO unreported or unexplored.	Progressive inquiry fosters SRL skills, such as effort regulation, time management, and environment management.	A talkative atmosphere, where students could ask questions and engage in discussions with their peers, promoted learning. Self-regulating strategies, as well as other social and emotional competencies, should be practiced, as they impact collaboration.
8 Lau, 2013 (China)	Upper secondary, (*n*=1121), teachers (*n*=31)	As a goal of SRL-based instruction in language.	PF as peer evaluation as a part of peer instrumental support; PO as a part of a teacher's SRL-based instruction activity.	Not identified	Intrinsic motivation and self-regulation favored regulating interactions in peer support. Teachers' guidance and affective feedback impacted students' motivation to regulate their communication with peers.
9 Lobczowski, et al, 2020 (USA)	Upper secondary (*n*=13)	As a variable or analytical dimension of social regulation of learning during scientific argumentation discourse.	PF as a socioemotional interaction in small-group discussion; PO unreported or unexplored.	Not identified.	Content difficulty hindered regulation. SRL is augmented through teacher support. Groups differed by the way students enacted planning activities, their emphasis on challenging others' ideas versus building shared understanding, and how socioemotional interactions drove discourse.

10 Mendieta et al, 2015 (Colombia)	Secondary, ages 10 to 19 (*n*=153)	As a goal of a collaborative strategic reading setting with ongoing self-assessment.	PF as the role of a student in a group working in a collaborative strategic reading intervention; PO required for the PF role in the collaborative reading strategy.	Increase in motivation.	Students showed more commitment and interest in learning when participating in a collaborative classroom.
11 Michailidis, et al., 2018 (Greece)	Secondary, age *M*=13.5 (*n*=52)	As a goal of the use of interaction analysis in asynchronous CSCL activities.	PF and PO as peer review and peer evaluation of an online game produced by the students.	Students from the experimental group scored higher on SRL than those in the control group.	Interaction analysis graphs increased students' motivation to reflect on and revise their posts, invest more in their reading, and regulate their actions, thereby enhancing and improving their contributions and peer interactions.
12 Michailidis, et al., 2022 (Greece)	Upper secondary, age *M*=14.5 (*n*=91)	As a variable or analytical dimension of learning strategies.	PF and PO as peer review and peer evaluation of an online game produced by the students.	Interaction analysis visualizations had an impact on metacognitive self-regulation and motivation (intrinsic goal orientation, task value, control of learning beliefs, and self-efficacy). The experimental group demonstrated increased self-regulation, time management, study environment, effort regulation, peer learning, and help-seeking behaviors, whereas the control group did not.	The availability of feedback information on the blog via interaction analysis enhanced students' SRL.
13 Mieder & Bugos, 2017 (USA)	Upper secondary, age *M*=15.40 (*n*=30)	As a goal of SRL-based instruction in music.	PO and PF as peer collaboration in student group observations/discussions (mediation, observation, monitoring, assessment, reflection, and goal setting).	The intervention increased perceived practice strategies and self-efficacy.	Not identified.
14 Newman, 2017 (UK)	Upper secondary, ages 13 to 15 (*n*=60)	As an effect of metatalk within collaborative dialogues.	PO and PF as collaborative talk between peers (participating, understanding, managing).	After engaging in collaborative tasks, students used self-evaluative metatalk to reflect and critique the quality of their participation (i.e., self-evaluation).	Communication skills, absence of slang, group cohesion, listening to others, and the need to agree and avoid criticism affected peers' collaboration. Collaborative tasks were deliberately designed to encourage consideration of alternatives, thereby enhancing students' skills in managing diverse perspectives.
15 Shchetynina, et al, 2022 (Ukraine)	Upper secondary (*n*=54)	As a variable or analytical dimension of the effectiveness of the use of an online collaborative learning platform.	PO and PF through posts and comments on task control and products in a Trello virtual board.	Following the intervention, the experimental group demonstrated higher values in goal setting, self-regulation, motivation, time management, self-directed learning, and self-development compared to the control group.	Not identified.
16 Tamura & Uesugi, 2020 (Japan)	Lower secondary, aged 13 to 14 (*n*=18)	As a variable or analytical dimension of student-led lesson studies.	PO and PF are a part of lesson study by learners, and through elected learning leaders and subject leaders.	Students developed self-management strategies (i.e., self-monitoring, motivation, and self-confidence).	Opportunity to observe others and collaborate with teachers to reflect on their learning process.
17 Zheng, et al, 2020	Lower secondary, age *M*=12.5 (*n*=56)	As a variable or analytical dimension of collaborative learning in flipped classroom interactions.	PO and PF as part of collaborative learning tasks triggered by a collaboration script (defining a topic, discussing processes and support, reflecting upon e-work).	Not identified.	Peer levels of self-regulation affected individual self-regulation skills and literacy skills. Metacognitive monitoring at the individual level promoted collaborative solving.
18 Zion, et al., 2015 (Israel)	Lower secondary (*n*=150)	As a goal of individual (Meta) and social (Collaborating Inquiry Community) metacognitive support in a CSCL environment.	PO and PF, as a part of peer discussions both face-to-face and in asynchronous online forums, as a part of the environmental inquiry-based projects in a CSCL environment.	Participants in the experimental groups outperformed their peers in terms of metacognitive performance.	Individual metacognitive support significantly affected the groups' online metacognitive performances. Social metacognitive support increased the students' involvement in their peers' learning processes. Strategic scaffolding improved students' online strategic performances.

Note: ATL = Approaches to Learning; NFC = Need for Cognition (Forsterlee & Ho, 1999); MPAR = Music Performance Assessment rubric; MSLQ = Motivated Strategies for Learning Questionnaire; SRQ = Self-Regulation Questionnaire (Brown, Miller, & Lawendowski, 1999); TOR-test: Task-oriented reading test; School levels are in accordance with the International Standard Classification of Education (ISCED) levels.

Table 3. Pedagogical strategies and explicit peer observation and feedback by study.

Title	Study reference number																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	*n*	%
Pedagogical strategies																				
Constructivism			x			x		x								x	x		5	27.8
Collaborative	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	18	100
Reflective								x					x	x		x			4	22.2
Inquiry-based	x	x		x			x								x			x	6	33.3
Explicit observation/feedback																				
Explicit peer observation						x	x	x		x		x	x	x		x	x		9	50.0
Explicit peer feedback	x	x	x	x	x	x		x	x	x	x	x	x	x	x		x	x	16	88.8

Note: Categories are not mutually exclusive.

Figure 1. Prisma diagram of search process.

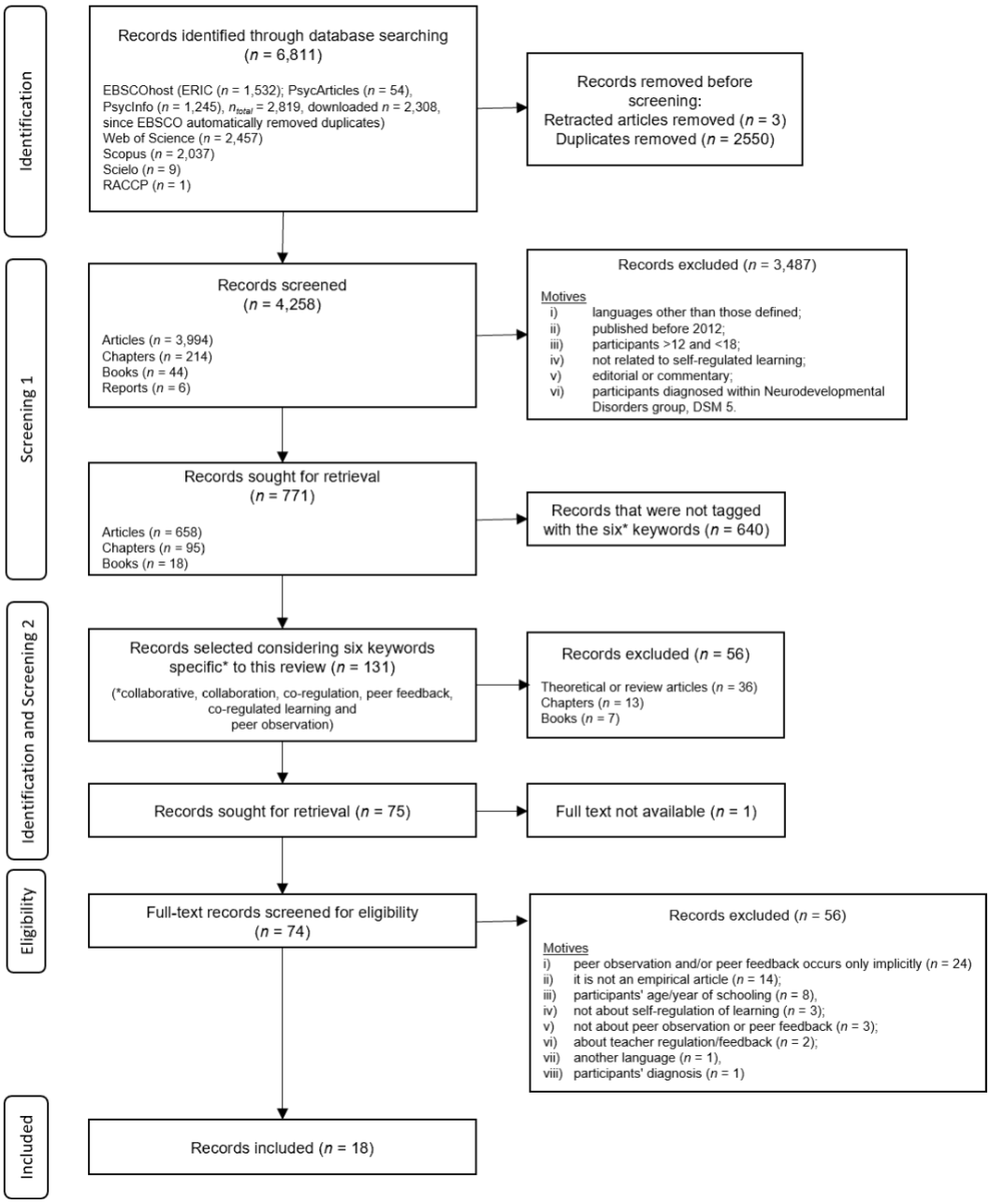


Figure 2. *Moderators of self-regulated learning through peer observation and feedback related with pedagogical practices or collaborative work.*

