RESEARCH ARTICLE

Theoretical frameworks of self-efficacy in collaborative science learning practices: A systematic literature review

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Abstract: Theoretical framework is one of the main parts of the research paper, so that researchers are expected to be able to determine the relevant theory that underlies their research. The purpose of conducting this systematic literature review (SLR) is to review of theoretical framework, compare, and describe various theoretical research frameworks in an investigative manner on the theme of self-efficacy in collaborative science learning that underlies publications in Scopus indexed journals in the last ten years. In this regard, we used the phrase "self-efficacy in collaborative science learning" on the disbursement menu in the Scopus database and found 711 articles. There were 63 articles that met the criteria for analysis. The inclusion and exclusion model used is PRISMA. The newly discovered aspects consist of community of practice, professional learning community, and reflection, which are as a result of the development of a theory of change and a theory of instruction constructed from theoretical frameworks in the recent collaborative science learning practices literature. Therefore, the development of this theory can be considered as a theoretical basis for developing the self-efficacy of prospective science teachers in collaborative learning in the future. The purpose of conducting this systematic literature review (SLR) is to review, compare, and describe various theoretical research frameworks in an investigative manner on the theme of self-efficacy in collaborative science learning that underlies publications in Scopus indexed journals in the last ten years. In this regard, we used the phrase "self-efficacy in collaborative science learning" on the disbursement menu in the Scopus database and found 711 articles. There were 63 articles that met the criteria for analysis. The inclusion and exclusion model used is PRISMA. The newly discovered aspects consist of community of practice, professional learning community, and reflection, which are as a result of the development of a theory of change and a theory of instruction constructed from theoretical frameworks in the recent collaborative science learning practices literature. Therefore, the development of this theory can be considered as a theoretical basis for developing the self-efficacy of prospective science teachers in collaborative learning in the future.

Keywords: collaborative science learning; self-efficacy; systematic literature review; theoretical framework.

Introduction

In everyday conversation, it is very common for someone to say I have a theory, and in the end someone may claim to have several. However, in research methods, very few researchers have a theory that they can call their own theory. In education and the social sciences in particular, researchers are unlikely to be able to develop a theory (Kivunja, 2018). The theoretical framework is one of the main parts of the research paper (Simon, 2022) so that researchers are expected to be able to determine the relevant theory that underlies their research. By writing down relevant theories, writers can identify concepts that are appropriate to research topics, provide basic hypotheses, choose appropriate research methods, and enable readers to critically evaluate publications (Niederriter et al., 2020; Simon, 2022).

Collaborative science learning is believed to be a strategy used in personal and professional self-development. Hence, there are professional development studies that fosters an effective collaborative culture (Cho & Lim, 2017; De Backer, Van Keer, & Valcke, 2022; Hou et al., 2023; Muñoz Miguel et al., 2023) and they are also an important element in personal development program (Shang & Wu, 2022; Su et al., 2023; Thibodeau et al., 2016). It is believed that there are several educational research studies that examine how collaborative science learning has the opportunity to support self-efficacy of prospective-teacher students where the only empirical evidence comes from Volet et al. (2019), who have identified the involvement of prospective elementary school teachers in collaborative science learning activities.

In accordance with social cognitive theory, collaborative science learning provides learning experiences with collaborative principle that can develop the courage and self-efficacy of prospective teachers to appear in front of the class (Symes et al., 2023). Self-efficacy is a strong predictor of behavior or self-confidence, and self-confidence is known to have a significant influence on individual performance in collaborative groups or learning communities (De Backer, Van Keer, De Smedt, et al., 2022). According to social cognitive theory, prospective teachers with high self-efficacy pay greater attention to the concepts to be conveyed and are able to produce fun learning (Ho et al., 2023). However, after further discussion, it turns out that the definition of fun learning seems difficult to generalize (Mohamadi et al., 2011).

This SLR focuses on theoretical frameworks that have not been reported by other researchers. The findings of this study are expected to be useful for other researchers who are currently developing research with a similar theme but have not yet found a theory that is appropriate to current developments. Our findings will complete the transformation of the two existing basic theories of collaborative science learning called the theory of change and the theory of instruction (Willegems et al., 2017). The development of these two theories is very useful for research findings based on the effectiveness of collaborative science learning model in the classroom. Especially, it is very possible to become a reference and guide for researchers and also for developers of learning models which of course cannot be separated from the theoretical basis underlying the development of learning strategies. The previous systematic literature review has discussed the types of methods used in collaborative science learning research. There is no literature review on the theoretical framework that builds collaborative science learning research.

Therefore, the purpose of this SLR is to review the theoretical framework, compare and describe various studies in Scopus-indexed journals investigative on collaborative science learning research. This SLR utilizes articles published by journals related to the theme of self-efficacy in collaborative science learning and its implications in the form of a theoretical framework that underlies research in the last decade. The findings of this study are expected to contribute to the development of Research and Development (R and D) research studies and research on the application of the Collaborative Science learning model in the quasy-experiment method which is rich in theory. In this study, our focus is on the theoretical framework that underlies a publication that has never been studied by other researchers, so that it can provide updates to the world of education. We use an information scope review that includes only original research/articles, thus providing an overview of the researcher's focus and alignment with this theme. Therefore, we formulated three domains that complement and develop the existing theories (theory of change and theory of instruction) in collaborative science learning (Willegems et al., 2017). The development of this theory is very possible and important to consider as a reference for policy makers in the field of science, researchers who apply science learning models, prospective science teacher students, and the society in general, who are seeking learning approaches and strategies that focus on increasing the self-efficacy of science teacher candidates.

Method

In this study, researchers used the SLR method, which is believed to be a technique capable of identifying, analyzing, and evaluating various information in the literature/references to answer research questions (Husamah et al., 2022a; Snyder, 2019; Xiao & Watson, 2019). SLR follows a rigorous and systematic process to identify, retrieve and synthesize all relevant studies on a topic (Husamah et al., 2022b).

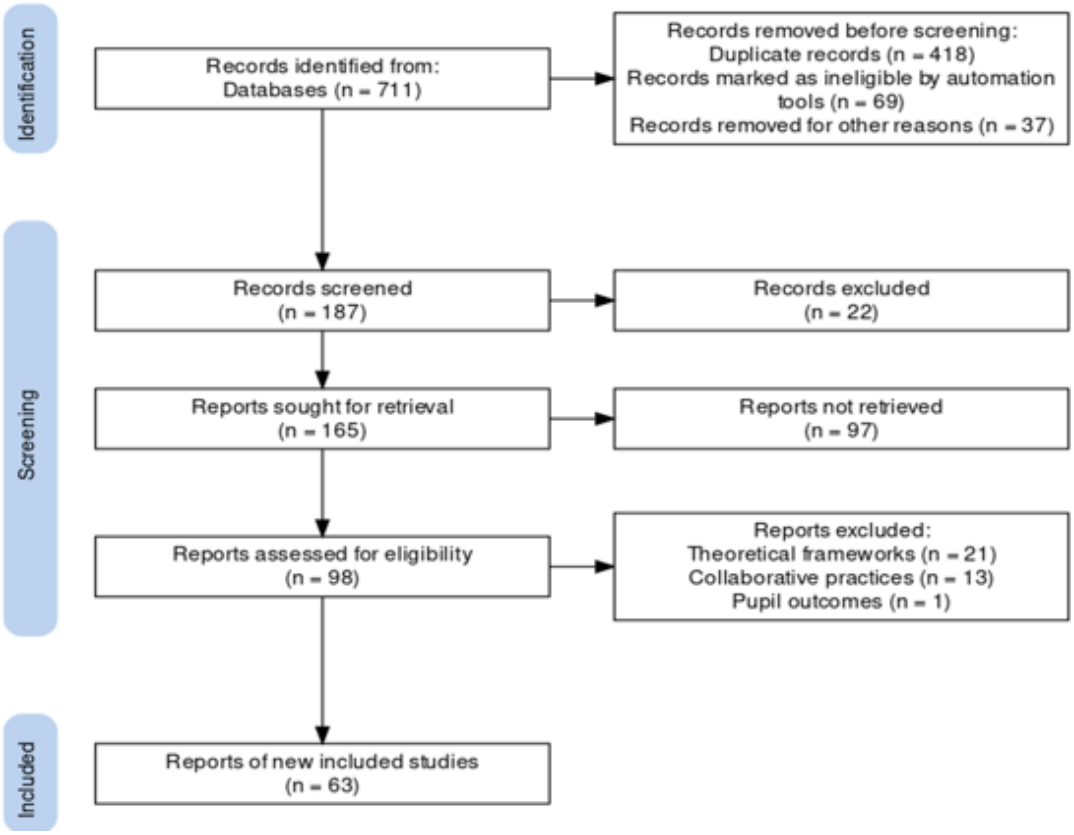

Figure 1. Systematic review flow diagram of self-efficacy and collaborative science learning. Caption: the PRISMA flow diagram (Haddaway et al., 2022) for the systematic literature review detailing the database searches, the number of abstracts screened and the full texts retrieved.

We used the words “self-efficacy AND collaborative science learning” in the disbursement menu in the Scopus database. The data obtained was stored in *CSV and *RIS formats which were then synchronized into the Reference Manager (Zotero). VOS-viewer software was used to visualize the distribution of data so that information can be presented in more detail. The search history on Scopus is as follows: “TITLE ("self-efficacy AND collaborative science learning") AND LIMIT TO (OA, “all”) AND LIMIT TO (DOCTYPE, “ar”) AND LIMIT TO (LANGUAGE, “English”) AND LIMIT TO ((PUBYEAR 2023) OR LIMIT TO (PUBYEAR, 2022) OR LIMIT TO (PUBYEAR, 2021) OR LIMIT TO (PUBYEAR, 2020) OR LIMIT TO (PUBYEAR, 2019) OR LIMIT TO (PUBYEAR, 2018) OR LIMIT TO (PUBYEAR, 2017) OR LIMIT TO (PUBYEAR, 2016) OR LIMIT TO (PUBYEAR, 2015) OR LIMIT TO (PUBYEAR, 2014) OR LIMIT TO (PUBYEAR, 2013)) AND (LIMIT-TO (SUBJAREA, "SOCI"))”. With these search terms and patterns, we managed to find 711 articles. We employed models of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) to do inclusion dan exclusion. PRISMA is a tool and a guide used to evaluate systematic reviews or meta-analyses (Page et al., 2021). The following diagram has been used by Husamah et al. (2022) and Nurwidodo et al. (2023). The following important points form the basis of the inclusion criteria that we used in this SLR, such as (1) articles published in January 2013 to February 2023 (in the last 10 years); (2) only articles that are open access; (3) publications include research/original articles; (4) the subject area of the article is social sciences; and (5) Articles published in English and articles only related to "self-efficacy in collaborative science learning" research studies. The following figure presents the order of inclusion and exclusion that we carried out, please see Figure 1.

Results and Discussion

Figure 2 shows that the most referenced references are Sherwell, C., Mccarthy, M., Carroll, A., Bourgeois, A., Rafter, M., Cunnington, R., Seary, T., Goh, F., Baffour, B., Palghat, K., and Gillies, R.M. In addition, Figure 3 shows the relationship of all authors illustrated using the VOSViewer application.

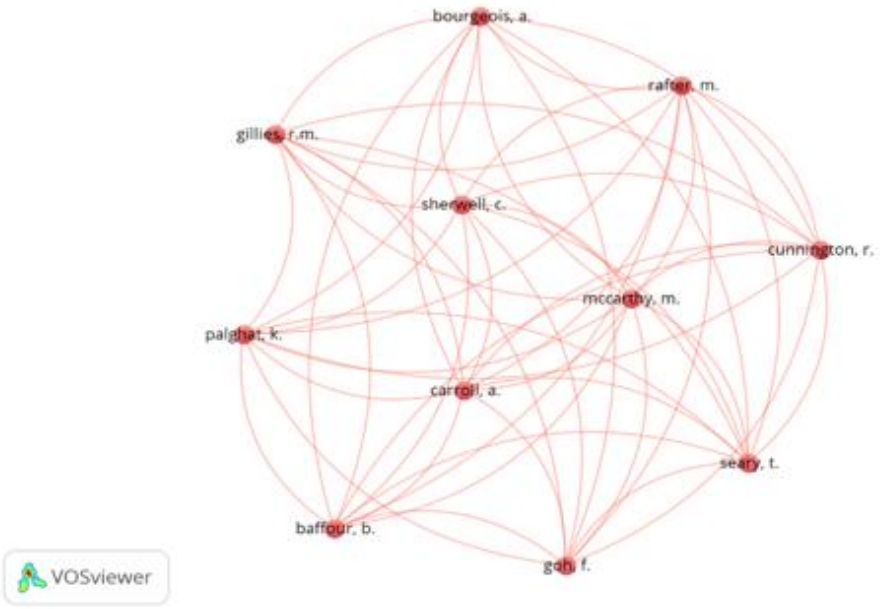

Figure 2. Dominant authors and the relationship between authors in the theme of self-efficacy in collaborative science teaching

It was found that there were three experts who carried out and had published research studies on self-efficacy in collaborative science learning such as Sherwell, C., Mccarthy, M., dan Carroll, A (Figure 1). It can be said that these three experts are the most highlighted figures who connect other authors, as they have been widely cited as references for many other researchers. Based on the curriculum vitae found from search results on the internet, Sherwell, C or Dr. Chase Sherwell is a lecturer and researcher in the Faculty of Humanities and Social Science in University of Queensland (UQ). His studies integrate multi-disciplinary methods to investigate learning and self-regulation such as self-efficacy in the classroom, the workplace, and in everyday life. Dr. Chase has a strong background in psychological, cognitive, and educational research using a variety of modern and collaborative techniques and approaches. He was also trusted to be the head of the learning laboratory at UQ, Australia. This learning laboratory aims to develop collaborative methods to improve the skills and professional development of prospective teachers. Additionally, Chase is interested in transforming learning, teaching and training in diverse university contexts through the implementation of varied learning models in the classroom. Based on Google Scholar searches, over the past 5 years, Chase Sherwell has published 14 Scopus indexed articles and has been cited 68 times. With so many publications on the theme of self-efficacy, it is not surprising that the figure is one of the researchers to be proud of in research on self-efficacy in the world of education.

Meanwhile self-efficacy is related to motivation, e-learning, learning systems, teaching, and professional learning. As for the collaborative learning theme, it is related to COVID-19, students, curriculum, learning, higher education, and simulation. The interesting thing (Figure 3) is the emergence of the simulation keyword in 2021. The emergence of the simulation keyword which is correlated with higher education indicates that the role of simulation in supporting the teaching and learning process during a pandemic is quite a concern for researchers. Simulation is believed to be one way to develop and increase self-efficacy in collaborative science learning for prospective teachers in tertiary institutions.

Figure 2 also displays the output of the VOSViewer showing the names that connect and link the authors such as Sherwell, C., McCarthy, M., and Carroll, A. These names can be said to be interrelated, collaborating or citing each other, where the three names have become the main references in the theme of self-efficacy in collaborative science learning from 2013 to 2023. Meanwhile, Figure 3 shows the trend of keywords that are widely used by authors in writing the theme of self-efficacy in collaborative science learning.

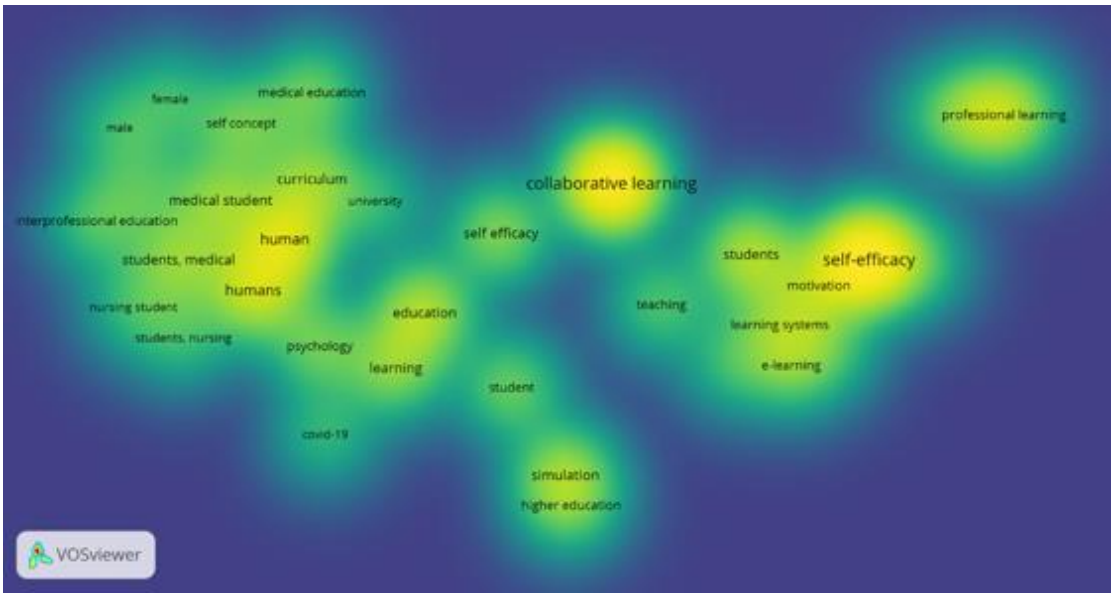

Figure 3. VOS-viewer display for types of analysis “Co-occurrence → keywords”

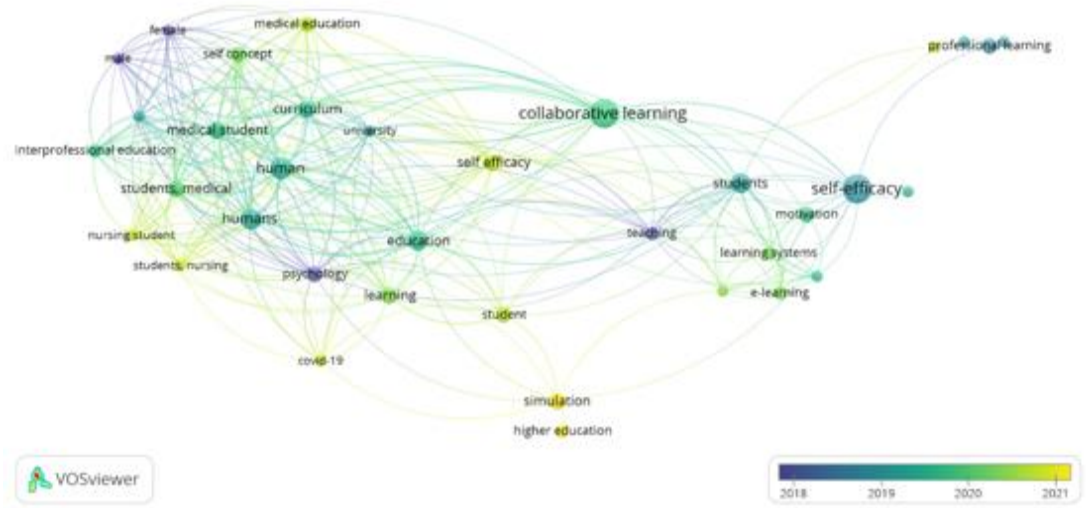

Figure 4. Research trends with the keyword self-efficacy in collaborative science learning

Moreover, based on the data in Figure 4, it can be seen that the keywords collaborative science learning and self-efficacy are dominantly used in publications. The collaborative science learning keywords relate to teaching, students, education, curriculum, and university. Publications with the keyword "self-efficacy" relate to motivation, learning systems, e-learning, students, and professional learning. Regarding this, several experts have associated collaborative science learning with university, especially with regard to increasing the self-efficacy of prospective teacher students. In the last 10 years, the concept of self-efficacy has also become a trending variable in the application of collaborative science learning.

Figure 5 shows collaboration in the publication of articles carried out by authors, both cross-country collaborations, collaborations between universities within one country, and those that do not collaborate. Based on Figure 5, it can be said that there were more articles published with non-collaborative status, which were as many as 35 articles (55%). Figure 4 is an illustration of the distribution of scientist collaboration. Based on Figure 5, it can be said that there were more articles published with non-collaborative status, which were as many as 35 articles (55%).

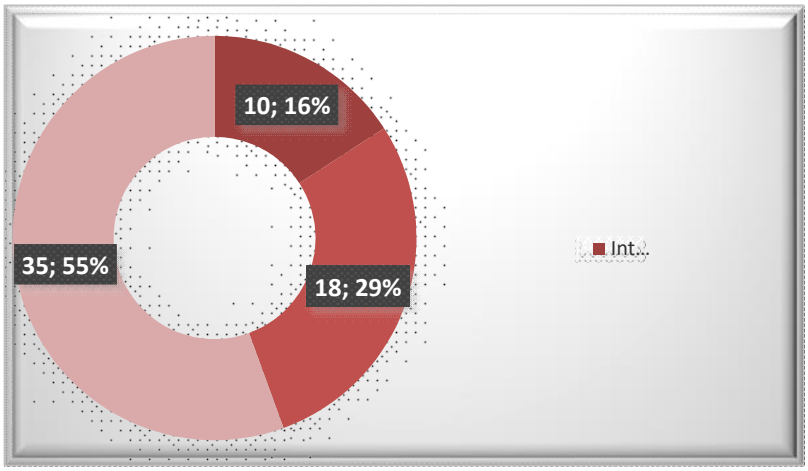

Figure 5. The collaboration of authors in writing articles

The trend of funding sponsor of research related to “self-efficacy in collaborative science learning” themes is presented in Table 1. Researchers categorized sponsor funding sources into two main criteria, namely *no funding* which means there is no written information in articles related to funding (23 articles) and *no financial support*, which means there is no written statement in the articles regarding financial support (12 articles). The second criterion is the 'funded by' criterion, which consists of grants from universities (8 articles) and grants from the government (20 articles). It turned out that there were as many as 23 articles or 36.51% of the articles analyzed that had not followed and fulfilled one of the ethics in publication, that is clearly stating the name of the institution that funded their research and publication.

Table 1. Criteria for sponsorship of self-efficacy in collaborative science learning research

No		Criteria		Quantity
1	No Funding	1	Sponsorship detail is not written down	23
		2	No financial support is written down	12
2	Funded by	1	Grant from university	8
		2	In-country Grant (the government)	20
Total				63

We reviewed 63 articles and tried to formulate a theory or conceptual framework for the theme of self-efficacy in collaborative science learning in the last decade as presented in Table 2**.**

Table 2. Educational theories self-efficacy in collaborative science learning practices

No	Modelling self-efficacy in collaborative science learning practices	Frameworks or educational theories self-efficacy in collaborative science learning	
1	*Collaborative action research* (Aldridge et al., 2021; Banegas et al., 2020), *lesson study* (Kelley et al., 2020; Schipper et al., 2020; YeşiLçinar & Aykan, 2022), *collaborative Inquiry* (Esparza et al., 2022; Zhong, 2013), *development of specific collaboration skills* (Nelson, 2021; Tilak et al., 2022; van Blankenstein et al., 2019), and *inquiry skill development* (Esparza et al., 2022; Kelley et al., 2020; Schipper et al., 2020; Zhong, 2013)	1. Connectivism theory 2. Constructivism (Vygotsky) theory 3. Situated learning theory	**Theory of change**

2	*Teacher knowledge* (Cañabate et al., 2019; EL-Deghaidy et al., 2017; Esparza et al., 2022; Kelley et al., 2020; Kholifaturrohmah & Mulasiwi, 2021; Md Sari & Yin Yin, 2021; Pujaningsih & Ambarwati, 2020; Schipper et al., 2020; Zou et al., 2021), *teacher attitudes* (Goldstein, 2016; Pujaningsih & Ambarwati, 2020; Zhong, 2013), and *new relationship with experienced teacher* (Barker et al., 2022)	1. Planned behavior theory 2. Grounded theory 3. Reasoned action theory	
3	*Community of practice* (Kelley et al., 2020; Liljenberg, 2021; Pareto & Willermark, 2022; Tilak et al., 2022), *sustained conversation within multiple perspectives* (Goldstein, 2016; Whitley, 2021), *openness to participate in teacher research in the future* (Coutts, 2019; Md Sari & Yin Yin, 2021; Pareto & Willermark, 2022; Pujaningsih & Ambarwati, 2020), *development of a community of professionalism* (Kelley et al., 2020; Liljenberg, 2021), and *professional learning community* (Kelley et al., 2020; Tilak et al., 2022)	1. Community of inquiry framework 2. Intervention mapping framework 3. Social work theory 4. Social identity theory	
4	*Pupil outcomes* (Ibbotson & See, 2021), *student-centred teaching* (Chase et al., 2013), *gaining insight in pupil learning* (Barker et al., 2022; Cañabate et al., 2019; Coutts, 2019; Tilak et al., 2022), *higher order questioning* (Hsu et al., 2021; Sorvari et al., 2020), and *development of behaviours* (Hsu et al., 2021; Piro et al., 2014; Shin et al., 2022; Zhong, 2013)	1. Constructivism theory 2. Transformative theory 3. Cognitive load theory 4. Cognitive flexibility theory 5. Gagne's cognitivist theory 6. Social cognitive theory	**Theory of instruction**
5	*Teacher practice* (Barker et al., 2022; Bükki & Fehérvári, 2021; EL-Deghaidy et al., 2017; Esparza et al., 2022; Heikonen et al., 2020; Kelley et al., 2020; Nelson, 2021; Schipper et al., 2020), *professional development* (Aldridge et al., 2021; Bükki & Fehérvári, 2021; Compen et al., 2021; Darlow et al., 2015; Durksen et al., 2017; EL-Deghaidy et al., 2017; Esparza et al., 2022; Heikonen et al., 2020; Ke et al., 2021; Liljenberg, 2021; Molway, 2019; Ovenden-Hope et al., 2018; Thompson & Dooley, 2019), *opportunity to examine teaching* (Barker et al., 2022; Molway, 2019), and *increased attention to curriculum* (Brouwer et al., 2016; Darlow et al., 2015; Frantz et al., 2017; James et al., 2022; Kelley et al., 2020)	1. Social Model/ Bandura Theory 2. Interactive, constructive, active, passive (ICAP) framework 3. Experiential theory	
6	*Reflection* (Pareto & Willermark, 2022; Schwägele et al., 2021), *instructional improvement* (Matinde, 2019), *improved dialogue and alignment between theory and practice* (Esparza et al., 2022; Nelson, 2021; Tilak et al., 2022), and *professional identity* (Frantz et al., 2017).	1. Self-regulated learning theory 2. Self-determination theory 3. Identity theory	

The results of the analysis (Table 2) produce six clusters of strategies that are important in measuring self-efficacy in collaborative science learning. This division is built on the models, strategies, and approaches which were used by the 63 articles reviewed to describe emerging theoretical frameworks of self-efficacy in collaborative science learning. Theoretical frameworks that support the publication of self-efficacy in collaborative science learning have been extensively researched, applied, and tested in different classroom situations. These various experiments produce many views that have influenced the development, modification, and innovation of learning (L. M. Bennett & Gadlin, 2012; Esparza et al., 2022; Newman, 2004). Based on the results of the analysis, most of the application of collaborative science learning is based on behavioristic learning theory. This theory is also called behavioral learning theory which views that the learning process is the result of forming a relationship between stimulus and response which follows the learning process (Staats & Eifert, 1990). The results of the identification of 63 articles, compiled as many as six aspects that underlie the emergence of self-efficacy in collaborative science learning, such as (1) collaborative practice, (2) teacher knowledge, (3) community of practice, (4) pupil outcomes, (5) teacher practice, and (6) implementation of reflection.

The first cluster is a strategy related to collaborative practice. This formulation is built from the practice of lesson study, collaborative inquiry, development of specific collaboration skills, and inquiry skill development. The aspects involved in this collaborative practice are based on the view that the implementation of collaboration in learning can be identified from student interactions in the classroom (H. Bennett & Brunner, 2022; Peng et al., 2022). Lesson study is the strategy which is most favored by teachers for implementing collaborative practice. Lesson study is believed to have been able to reduce feelings of isolation and loneliness in carrying out her/his profession as a teacher. Thus, through lesson study, each teacher is able to increase self-efficacy and is able to find learning strategies that suit the characteristics of students (Schipper et al., 2020). The practice of lesson study is also related to active learning which is a product of the implementation of collaborative inquiry and student inquiry skills. Active learning is a learning cycle that runs collaboratively starting from 1) planning interventions; 2) implementing interventions and collecting data on their effectiveness; 3) observing student learning outcomes through data analysis; and 4) reflecting on the successes and shortcomings of their approach. This cycle suggests that collaborative practice is the basis for creating active learning (Esparza et al., 2022; Kelley et al., 2020; Marlina, Suwono, Yuenyong, Ibrohim, & Hamdani, 2023; Zhong, 2013).

The second cluster relates to teacher knowledge. This cluster is developed from two aspects, such as teacher attitudes and new relationships with experienced teachers. In this regard teaching is believed to be a very complex activity that refers to many types of knowledge (Esparza et al., 2022; Liljenberg, 2021). Expertise in teaching depends on flexible access to highly organized knowledge systems. It is clear that there are many knowledge systems that are fundamental to teaching, such as knowledge about students' thinking and learning and knowledge about subjects (Thompson & Dooley, 2019). Historically, teacher's knowledge has been defined as in-depth knowledge of teaching and learning processes and practices or methods (Barker et al., 2022). A teacher with in-depth knowledge understands how students build knowledge, acquire skills, and develop positive thinking habits towards learning (Marlina, et al., 2023; Schipper et al., 2020).

The third cluster relates to community of practice. This group was built from activities based on sustained conversations within multiple perspectives, openness to participate in teacher research in the future, development of a community of professionalism, and a professional learning community. Analyses of several articles in this group resulted in four theoretical frameworks, such as the community of inquiry framework, intervention mapping framework, social work theory, and social identity theory. The community of inquiry framework is a constructivist-based collaborative learning model framework that describes the important elements of successful teaching and learning experiences (Figure 5). This framework represents the theory found by more fully discussing the elements. This framework includes three elements that support the development of self-efficacy in the learning community known as cognitive presence, social presence, and teaching presence. These three elements furthermore strengthen the reasons for collaboration and teaching experience so that they are able to grow and develop self-efficacy for all members of the community (Castellanos-Reyes, 2020).

The fourth group is related to student outcomes. This cluster is formed from processes related to student-centred teaching, gaining insights into student learning, high-level questions, and related to behavioral development. Learning as the core process of education must be carried out by positioning students as the main actors. Thus, learning activities can be carried out by students with full awareness, will, and meaning by involving them actively in it. According to Coutts (2019), pupil concern is often interpreted as learning in groups with free expression to grow and facilitate a sense of responsibility and confidence to take the initiative in learning. Through the freedom to express oneself collaboratively, students' self-efficacy develops (development of behavior) (Hsu et al., 2021; Piro et al., 2014; Shin et al., 2022; Zhong, 2013) and in terms of asking (higher order questioning) (Sorvari et al., 2020). In depth, we can said that the learning process with the student-centered teaching model gives freedom to students to improve their competence in socializing, working in groups, collaborating, and

having the courage to express opinions according to their respective experiences. The proper application of student-centered teaching forms the basis for developing active learning and increasing student self-efficacy (Chase et al., 2013; Marlina et al., 2024).

The fifth cluster relates to teacher practice. This group is built on the basis of implementing professional development, opportunities to review teaching, and issues of increasing attention to the curriculum. Several studies have revealed that in teacher teaching practice, collaborative activities are an opportunity to develop teacher professionalism where there are different types of collaboration in learning. In phenomenological case studies, shared inquiry is used to refer to the most appropriate and smooth collaboration among teachers (Compen et al., 2021; Kelley et al., 2020). However, the hierarchical relationship between students and teacher's teaching practices is the least developed level of collaboration because students and teachers are still respectively seen as givers and recipients of knowledge (Barker et al., 2022; Molway, 2019). Hence, the role of the teacher as a facilitator in learning still needs to be improved.

The sixth cluster relates to the implementation of reflection. This cluster is built on the basis of instructional improvement practices, improved dialogue, and alignment between theory and practice, and professional identity. In this case, reflection becomes an important aspect in the implementation of collaborative science learning (Papa et al., 2020). There are three theories that underlie the implementation of reflection: self-regulated learning theory, self-determination theory, and identity theory. Particularly, self-regulated learning theory is part of cognitive learning theory stating that behavior, motivation and aspects of the learning environment will affect a learner's achievement. In addition, reflection is also related to the ability to control behavior that comes from within the individual where decisions will later be applied in activities related to other people (Gambo & Shakir, 2021). Meanwhile, self-determination theory states that continuous reflection can foster self-efficacy, pride, and social identity so that it is related to identity theory (Chiu, 2021).

Within the theory of change, the domains of communities of practice and professional learning communities emerge, which have a marked impact on self-efficacy measurement. Likewise, domain of reflection also has enriched content on instruction theory. In Indonesia, particularly, both reflection and collaboration are the keys in producing students who have high self-efficacy, noble character, global diversity, mutual cooperation, independence, critical thinking, and creativity (Manalu et al., 2022). The emergence of the domains of community of practice, professional learning community, and reflection indicates that research studies in the last decade cannot be separated from collaborative and reflective principles. Importantly, it can be emphasized that these two principles are believed to be important and, in the spotlight, especially in developing self-efficacy in collaborative science learning. Therefore, the development of a conceptual framework for studying the effect of collaborative science learning on self-efficacy can be considered as a theoretical basis for investigating the effectiveness of developing more operational, comprehensive, measurable, and targeted self-efficacy in the future.

Conclusion

Based on the data, it can be seen that the main keywords that appear most frequently and are interrelated are education, collaborative science learning, and self-efficacy. These three keywords are dominantly used in publications. Keyword education is related to university, self-concept, medical student, and interprofessional education. The collaborative science learning theme is related to students, curriculum, learning, simulation, higher education, and covid-19. Furthermore, it is also found that many articles were published without collaboration. Rarely are articles written with international collaboration status. Another interesting fact is that there are many publications that are not funded or did not clearly state the sponsorship sources. Meanwhile, for the funded publications, research funds that come from in-country government are greater than research funds that come from universities. Our next finding relates to the theory underlying the study on self-efficacy in collaborative science learning. There are six models that coverage studies on self-efficacy in collaborative science learning, such as (1) collaborative practice, (2) teacher knowledge, (3) community of practice, (4) pupil outcomes, (5) teacher practice, and (6) reflection. Four of these models (i.e., collaborative practice, teacher knowledge, teacher practice, and pupil outcomes) have become aspects that form the two most well-known basic theories in collaborative science learning in the past few decades, such as the theory of change and the theory of construction. The other most interesting finding in this study is that there are two other aspects that also contributed to building the theory of change, which are the community of practice and the professional learning community. Meanwhile, reflection is a perfecting aspect in the development of theory of instruction, specifically on the theme of self-efficacy in collaborative science learning. In brief, the three new aspects found as a result of the development of a theory of change and a theory of instruction are constructed from theoretical frameworks in the recent literature on collaborative science teaching practice. Thus, they can be considered as theoretical bases for investigating the effectiveness of developing self-efficacy in a more operational, comprehensive, measurable and directed manner in the future.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

R. Marlina: methodology and writing original article; **H. Suwono**: review and revision; **I. Ibrohim**: review and editing; **C. Yuenyong**: editing and revision; **H. Husamah**: conducting the research and collecting data; **H. Hamdani**: collecting and analysis data.

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