Collaborative Learning for Professional Development:
A Review of Research Methods and Instruments

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Abstract

This paper analyzes teacher collaboration research studies based on the research methods and tools used in these studies. As a research methodology, 36 studies were systematically collected from research databases such as EBSCO, ERIC, and search engines such as Google Scholar, based on the selection criteria and themes. Across the studies, they were analyzed using thematic data analysis. According to the findings, collaborative dimensions and activities, teachers' beliefs and perceptions on their collaboration, teachers' room to communicate, teacher-to-teacher dialogue, the way teachers work together, and collaborative attitudes are factors in developing research methods and tools used in previous studies of teacher collaboration in schools. Furthermore, previous studies have included various participants such as administrators, teachers, staff members in schools, parents, families, community members and school board members. Informal collaboration, professional learning experience and peer collaboration, school culture, social networks, leadership and school management teams, sustainability in financial and physical conditions of schools and well-planned in-service teacher education programs based on collaborative knowledge creation are factors that influence teacher collaboration. Different conceptual frameworks and instruments have been used to describe teacher collaboration, such as the Teacher Collaboration Improvement Framework (TCIF), the Community of Practice (CoP), the Teacher Collaboration Assessment Survey (TCAS) and the Professional Learning Community-Revised (PLCR) instrument. According to the findings, more research on the term "interprofessional collaboration" in the field of teacher education is required because collaboration between representatives of different professions is now essential for school improvement. The findings of this study have the potential to contribute to future research in teacher collaboration and interprofessional collaboration in education.

Key words: instruments, collaborative learning, professional development, interprofessional collaboration

1. Introduction

Collaboration, as one of the professional practices, can help teachers develop learning opportunities and improve working relationships (Akinyemi et al., 2019; Riveros, 2012). Collaborative reflection can improve learning organizations and organizational change (Beatty, 2000). Professional collaboration prevents teacher burnout, and their extensive beliefs about the values of professional collaboration serve as a tool for their professional development (Williams, 2010). Furthermore, when teachers spend more time collaborating on instruction with their colleagues, student learning improves. Moreover, principal's shared instructional leadership can improve teacher collaboration (Goddard & Madsen, 2010).

Trust, respect, and effective interpersonal communication are critical components of the collaborative process. Collaboration between principals, in addition to collaboration among teachers, can strengthen administrative skills and improve practice. At the same time, collaboration between parents and schools is required so that parents take an interest in their children's education and participate in school decision-making (Slater, 2004).

1.1. Present study

Several studies have been conducted to investigate the relationship between collaboration and professional development. Previous studies have provided insights into teacher collaboration as well as other related variables such as leadership, student achievement, school culture, motivation, and so on.

So, the aim of the study is to analyze research articles that employed specific research methods and instruments to study collaborative learning of teachers in schools, and to compare the various scope and procedure of these research methods and tools for getting new insights for teacher collaboration. This systematic analysis of the research instruments can assist researchers in clearly seeing the factors that must be considered in teacher collaboration research and in noticing new variables that relate to collaborative learning in teacher education.

Based on this aim, the following research questions will be highlighted:

(1)   Which factors were considered in developing research methods and tools used in the previous studies of teacher collaboration in schools?

(2)   Which types of participants were engaged in the previous studies of teacher collaboration?

(3)   Which other related factors to collaboration were found to enhance teacher collaboration in the previous studies?

(4)   Which conceptual frameworks and instruments were used to study collaboration in the previous studies?

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2. Literature review

2.1. Definition of collaboration

Many authors have explained the nature of collaboration. According to Fullan and Hargreaves (1991), "effective collaborations operate in the world of ideas, examining existing practices critically, seeking better alternatives and working hard together at bringing about improvements and assessing their worth" (p.55). They stated that collaboration is related to exchanging ideas.

Dufour (2004) also described the culture of collaboration as "the powerful collaboration that characterizes professional learning communities as a systematic process in which teachers work together to analyze and improve their classroom practice" (p.8).

Furthermore, Vangrieken and colleagues (2015) clarified many related concepts such as professional learning community, community of practice, team, and group to describe collaboration. The professional learning community, community of practice, team, and group were defined as follows in their study:

i.   The professional learning community can be understood as overarching different teams or other teams or other forms of teacher grouping in schools, gathering all (or a large part) of school in a collaborative culture. It is characterized by shared values and vision and is learning-oriented.

ii.   A community of practice is a term by Jean Leave and Etienne Wegner in 1991 that refers to "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly".

iii.   A team can be defined as a collection of individuals who identify themselves as a and interact as a team to reach certain shared goals for which they share responsibility and hold themselves mutually accountable.

iv.   A group is a collection of individuals who share a common social categorization and identity, but the focus remains on individual goals and individual accountability

2.2.   Previous studies

This section contains a list of previous studies that investigated collaboration and other related factors.

Postholm (2016) discovered that collective collaborative learning can help teachers improve their professional development, which is a positive way to enhance professional development of teachers. Kuusisaari (2013) stated that innovative ideas emerged and were created in collaboration with other teachers during teacher discussions. Furthermore, the findings of his study indicated that long-term in-service education based on learning theories and collaborative knowledge creation is an effective way to support teachers' professional development.

Moolenaar (2012) described how teachers' individual networks affect student performance as a result of collaboration. Moreover, he also stated that relationships between teachers are critical for issues such as student learning, teaching, and educational change. According to Lee (2007), younger teachers who have had more exposure to collaborative teaching methods appear to be more confident and have more positive attitudes towards collaboration with their colleagues. However, he stated that due to the heavy workload of teachers and the physical setting of work areas, peer collaboration cannot be sufficiently encouraged.

Regarding schools as learning environments, de Jong et al. (2019) and Attard Tonna & Shanks (2017) discovered that the school context or workplace is important for the collaborative activities that teachers engage in and has an impact on teachers' learning. Altun & Cengiz (2012) agreed with this finding, proving that to provide effective professional development opportunities to teachers, a collaborative working environment should be created in schools. Besides, Smith & Scott (1990) demonstrated that the collaborative school creates a climate and structure that encourages teachers as professionals to collaborate with one another and with the principal and other administrators to improve the school and their professional development.

Shakenova (2017) mentioned the factors that encourage teacher collaboration: having access to physical spaces, shared understanding, trust, dialogue-active participation, respect, teachers' initiatives team, and positive attitudes toward teaching. They also include having enough time to meet colleagues both formally and informally, having common goals with colleagues, having the chance to observe colleagues or to be observed, and having access to physical spaces. On the other hand, Thornton (2006) highlighted the constraints that must be taken into account when thinking about improving teacher collaboration. The highly centralized curriculum and associated textbooks, the culture of blame, the teachers' own experiences, as well as financial and contextual constraints were included.

According to Forte & Flores (2014), in fostering a collaborative culture in schools, leadership also acts as a mediator. They explained that school principals must function as leaders in the educational process and must encourage teamwork among their teaching staff and assist them to engage in a more open professional community. Furthermore, Bouchamma et al. (2012) pointed that the principals need to pay a close attention to the issue of teacher workload.

Besides, collaboration can also develop teacher leadership. Carpenter and Sherretz (2012) discovered that working together can provide a learning environment that promotes teacher leadership by motivating them. In their study, they described that the school should establish times for teachers to discuss ideas about their best teaching techniques and professional development so that this type of information flow establishes the school as a learning community that can assist teachers as leaders.

2.3. Interprofessional collaboration

The definition of "interprofessional collaboration" will be provided in this section.

According to Sachs (2003), collaboration is considered to be one of the five fundamental components of teacher professionalism and it has two aspects. The first aspect is the collaboration of teachers within one school to build professional knowledge and the second one is the collaboration with other actors inside and outside the school to help them develop their own competences. Interprofessional collaboration is also known as multiprofessional collaboration. Böhm-Kasper et al. (2016) defined multiprofessional collaboration as:

"A collaborative act of two or more professionals from different professional groups who work in the education sector. This must be distinguished from professional collaboration at schools which refers to the collaboration of members of the same profession, e.g. teachers" (p. 32).

There are three levels of multiprofessional collaboration: mutual exchange of materials and information, division of labor and co-construction (Böhm-Kasper et al., 2016). Moreover, personal commitment is essential for successful interprofessional collaboration. Similarly, equality, appreciation, welcome, openness, and confidence are required for building a healthy environment for interprofessional collaboration, and all professionals collaborate to achieve future goals (Hesjedal et al., 2015).
According to Leeman et al. (2018), mutual trust, common relevance, shared responsibility and mutual respect for differences in the priorities and ways of working between the teachers and researchers are facilitators for successful interprofessional collaboration between teachers and researchers in the educational research. Furthermore, they emphasized the need for shared commitment in this kind of collaboration.

3. Methodology

The searching and selection process of the research articles in this study followed the phases in the "Systematic Reviews in the Social Sciences: A Practical Guide" (Petticrew & Roberts, 2006). There are four steps: (1) identification, (2) screening, (3) eligibility and (4) inclusion. In searching the literature, the research articles were collected from the following online databases as EBSCO, ERIC and from such search engine as Google Scholar. The search strings were "Teacher Collaboration AND Research Instruments," Teacher Collaboration within Schools AND Research Instruments OR tools OR Measures," "Teacher Collaboration AND Analysis of Instruments OR Tools." We identified 300 articles and then screened the titles and abstracts of the articles based on the relevance of the studies to our topic. Finally, 160 articles were screened.
From 160 articles, we selected the number of 82 of full-text articles that were assessed for eligibility based on these inclusion criteria: (1) publication period between 2002 to 2020, (2) formal education context (primary, secondary, and tertiary), (3) teacher education (pre-service and in-service training), and (4) should be written in English and exclusion criterion as from the Special Needs education. Finally, we included 36 articles in our study and 46 articles were excluded because they used experimental or quasi/experimental methods. Finally, the full texts of all selected articles that met our quality criteria were read in-depth and the themes were analyzed by thematic data analysis across the studies. The flow chart of the article search can be seen in the following figure.
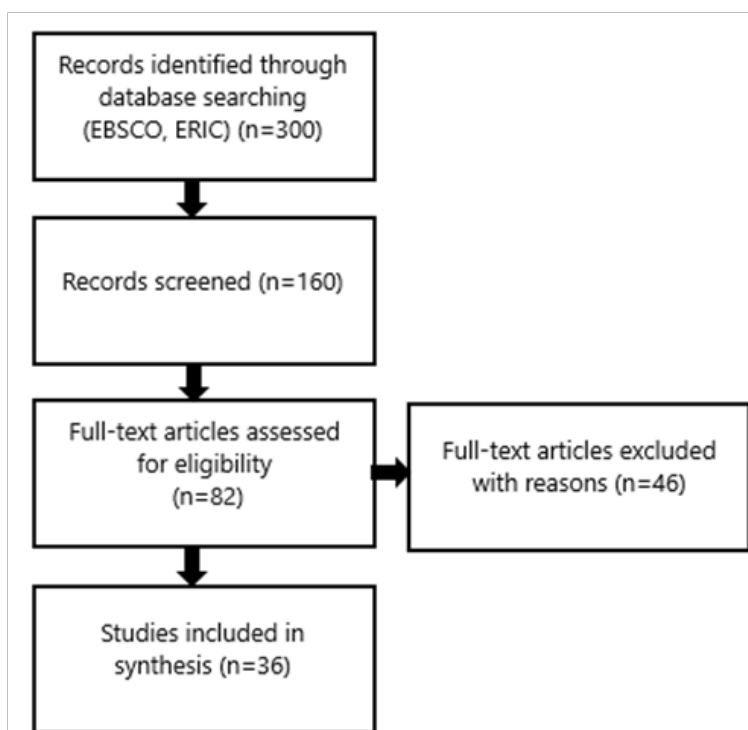

Figure 1. The Flow Chart of the Article Search
Source: Author

3.1. Characteristics of selected articles

There are 36 articles total, 32 of which are empirical studies and 4 of which are theoretical works. Out of 32 empirical studies, 17 articles used a qualitative research approach, 12 articles used a quantitative research methodology, and 3 articles used a mixed method research methodology. These studies used questionnaires, semi-structured interviews, face-to-face interviews, focus group interviews, observation, and document analysis as their research methods. The following table lists the articles that were chosen for this study.

Table 1. Articles selected for this Study

Empirical studies			Theoretical studies
Qualitative	Quantitative	Mixed – method	
Tallman (2019)	Woodland et al. (2013)	Böhm-Kasper et al. (2016)	Moolenaar (2012)
Gajda & Koliba (2008)	Vangrieken et al. (2017)	Lee (2007)	Feldman (2020)
Akinyemi et al. (2019)	Olivier et al. (2009)	Forte & Flores (2014)	Vangrieken et al. (2015)
Altun & Cengiz (2012)	Gümüşeli & Eryilmaz (2011)		Schleifer et al. (2017)
Hesjedal et al. (2015)	De Vries et al. (2014)		
Kutsyuruba (2013)	Ainley & Carstens (2018)		
Slater, (2004)	Ngang (2012)		
Leeman et al. (2018)	Doppenberg et al. (2012)		
Postholm, (2016)	Banerjee et al. (2017)		
Thornton (2006)	García Torres (2019)		
Carpenter & Sherretz (2012)	Meredith et al. (2017)		
Bruce et al. (2011)	Lu & Hallinger (2018)		
Balyer et al. (2015)			
Attard Tonna & Shanks (2017)			
Williams (2010)			
Kuusisaari (2013)			
Lockton (2019)			
17	**12**	**3**	**4**

3.2. Results and analysis

The findings of the study will be presented in this section.

3.2.1. Factors considered in developing research methods and tools used in the previous studies of teacher collaboration in schools

In this first subsection, the factors considered in developing/ selecting research methods and tools used in the previous studies of teacher collaboration in schools will be discussed. From the analysis, it was found that different forms of collaborative activities were used to measure teacher collaboration in the instruments and tools used in earlier studies.

Table 2. Factors Considered in Developing Research Methods and Tools in Previous Studies

Studies	Variables
Ngang (2012)	Collaborative dimensions 1. Creating energy in the classroom 2. Building capacity 3. Securing environment 4. Extending the vision 5. Meeting 6. Minimizing crisis dimensions 7. Seeking and charting improvement
Doppenberg et al. (2012)	Collaborative activities 1. Storytelling and scanning, 2. Aid, and assistance, 3. Sharing, 4. Joint work and 5. Collegial support
De Vries et al. (2014)	Teachers' beliefs regarding 1. Student orientation, 2. Subject orientation, 3. Updating, 4. Reflection 5. Collaboration
Thornton (2006)	1. Teachers' room to communicate 2. Teacher-teacher dialogue 3. The way teachers work together 4. Teachers' perceptions on their collaboration
Vangrieken et al., (2017)	Collaborative attitudes 1. Preparing lessons 2. Choosing topics and skills to be taught 3. Decisions about curriculum 4. Choice and use of textbooks 5. Student assignments, setting goals for students 6. Student evaluation 7. Teaching methods and strategies 8. The use of time and planning 9. Managing student behavior

According to Table 2 mentioned above, the previous research studies that used collaborative dimensions in developing research tools are described.

The instrument used in Ngang's (2012) study involved collaborative dimensions such as creating energy in the classroom, building capacity, securing environment, extending the vision, meeting, minimizing crisis dimension, and seeking and charting improvement. Doppenberg et al. (2012) employed a collaborative tool to map teacher collaboration. This tool included collaborative activities such as: (1) storytelling and scanning, (2) aid and assistance, (3) sharing, (4) joint work and (5) collegial support to map teacher collaboration.

Teachers' beliefs in continuous professional development should be considered while developing research methods and collaborative tools. The instrument used in the quantitative study conducted by De Vries et al. (2014) focused on the following factors: teachers' beliefs regarding student orientation, subject orientation, updating, reflection and collaboration. The student and subject orientation items were adapted from the following studies: Denessen (1999) and Vogels (2009). The items for the updating, reflective and collaboration appeared after it has based on the items of qualitative research of Kwakman (1999, 2003) and has adapted with the pilot study of Dijkstra (2009 as cited in De Vries et al., 2014).

According to the qualitative study of Thornton (2006), teacher collaboration can be influenced by these variables: the teachers' room to communicate, teacher-to-teacher dialogue, the way teachers work together and teachers' perceptions on their collaboration. Additionally, a tool was utilized in Vangrieken and colleagues' (2017) quantitative study to examine the attitudes toward collaboration. This instrument is based on the research of De Vries et al. (2013) and includes activities such as preparing lessons, choosing topics and skills to be taught, making decisions about curriculum, choosing and using textbooks, student assignments, setting goals for students, evaluating students, teaching methods and strategies, the use of time and planning and managing student behavior (Vangrieken et al., 2017).

3.2.2. Types of Participants Involved in Previous Studies
The second subsection will discuss and explain the different types of participants involved in earlier research on teacher collaboration.

Table 3. Types of Participants

Studies	Types of Participants
Slater (2004), Olivier et al. (2009)	Parents, teachers, and administrators
Woodland at al. (2013)	Teachers, principals, assistant principals, team leader, administrative staff members, teachers of special subjects, curriculum leaders school counsellor, school psychologist, therapist
Vangrieken at al. (2017)	Teachers from all grades and educational tracks are represented (general secondary education, technical secondary education, secondary arts education, vocational secondary education).
Böhm-Kasper et al. (2016)	Teachers and Educators
De Vries et al. (2014), Kutsyuruba (2013), Tallman (2019), Thornton (2006), Ngang (2012), Doppenberg et al. (2012), García Torres (2019), Kuusisaari (2013), Lockton (2019), Forte & Flores (2014),Meredith et al., (2017), Lee (2007), Williams (2010), Attard Tonna & Shanks (2017)	Teachers
Akinyemi et al. (2019)	Teachers, principals, Heads of Department, Cluster leaders, subject advisors and one education district official.
Hesjedal et al. (2015)	Teachers and social workers
Gajda & Koliba (2008)	Teaching staffs, Leadership team
Balyer et al. (2015), Gümüşeli & Eryilmaz (2011)	Principals
Carpenter & Sherretz (2012)	Principals and staff in schools
Leeman et al. (2018)	Vocational teachers and managers University-based researchers/teacher educators
Altun & Cengiz (2012)	Teachers and head-teacher, one deputy head-teacher
Postholm (2016), Ainley & Carstens (2018)	School leaders, teachers, and teacher educators
Bruce et al., (2011)	University researchers and teacher researchers
Lu & Hallinger (2018)	Teachers and members of the school management teams
Banerjee et al. (2017)	Students

According to Table 3, different types of participants engaged in these previous studies. They can be called stakeholders who are either directly or indirectly affected by the success of an educational system (for example: administrators, teachers, staff members in schools, parents, families, community members and school board members). According to Slater (2004), the collaborative process with stakeholders includes trust, respect, and effective interpersonal communication for the school improvement process.

3.2.3 Collaboration and Other Related Factors
The third subsection will explain collaboration and other related factors.

Table 4. Factors Influencing to Enhance Teacher Collaboration

Studies	Factors
Thornton (2006)	Informal collaboration
Lee (2007)	Professional learning experience and peer collaboration

Tallman (2019)	School Culture
	    i. a culture of inclusion and trust,
	    ii. shared leadership,
	respect (mutual respect)

Gümüşeli & Eryilmaz (2011)	Collaborative School Culture Survey (CSCS)
	    i. collaborative leadership
	    ii. professional development
	    iii. teacher collaboration
	    iv. collegial support
	    v. unity of purpose
	    vi. learning partnership

Moolenaar (2012)	Social Network

Carpenter & Sherretz (2012)	Teacher leadership
	    i. opportunities for professional development
	    ii. co-teaching
	    iii. collective teacher efficacy

Lu & Hallinger (2018)	School Management team
Altun & Cengiz (2012)	Sustainability in financial and physical conditions of schools
Kuusisaari (2013)	Well-planned in-service teacher education program which are based on collaborative knowledge creation

According to Table 4, the factors positively influencing teacher collaboration are informal collaboration, professional learning experience and peer collaboration, school culture, social network, leadership and school management team, sustainability in financial and physical conditions of school. They also include a well-planned in-service teacher education program based on collaborative knowledge creation.

Thornton's (2006) qualitative study claimed that informal collaboration of teachers in schools is as important for mutual support as formal collaboration. Lee (2007) found that professional learning experience and peer collaboration are necessary factors to be considered for the studies of teacher collaboration. Furthermore, pre-service and in-service professional development have an impact on teacher collaboration.

The other essential factor is school culture. Tallman's (2019) study showed that the culture of collaboration can impact the professional and personal growth of teachers. He pointed out that the experience of collaboration as a culture can be considered as a culture of inclusion and trust, shared leadership, and respect (mutual respect).

 In the research of Gümüşeli & Eryilmaz (2011), they used Collaborative School Culture Survey (CSCS) developed by Gruenert (1998) that measured the relation between collaborative school culture and student achievement. That survey was based on the following factors: collaborative leadership, professional development, teacher collaboration, collegial support, unity of purpose and learning partnership. Another factor is social network that takes place among teachers in education and can enhance collaboration among teachers (Moolenaar, 2012).

In considering leadership, both principal leadership and teacher leadership are important. The qualitative study, Carpenter & Sherretz (2012), emerged three themes of teacher leadership: opportunities for professional development, co-teaching and collective teacher efficacy. Schleifer and his colleagues (2017) pointed out the responsibilities of leaders for teacher collaboration. They are as follows: the principals and school board members need to assess the current practices of the schools, try to encourage stakeholders to engage in these practices and to implement collaborative practices in schools.

At the same time, school management team is also responsible for teacher collaboration. In the study BY Lu & Hallinger (2018), two instruments were used to examine the impact of the cooperation of school management team on collaboration among teachers. School team members used to fill out the surveys for the Cooperation originally developed in North America (Alper et al., 1998) and Constructive Controversy (Tjosvold et al, 1986). The teachers completed the Walker & Ko (2011) survey on teacher collaboration (cited in Lu & Hallinger (2018)).

Furthermore, Altun & Cengiz recommended that sustainability in financial and physical conditions of schools are important for teacher collaboration because teachers can participate in collaborative activities if they are not worried about financial difficulties. In addition, well-planned in-service teacher education programs which are based on collaborative knowledge creation are effective for teacher collaboration (Kuusisaari, 2013).

3.2.4. Different Conceptual Frameworks and Instruments to Study Teacher Collaboration

In this fourth subsection, the studies that used different conceptual frameworks and instruments to describe teacher collaboration will be presented (see Table 5).

Table 5. Group of studies showing different conceptual frameworks and instruments for teacher collaboration

Studies	Framework and Instrument
Gajda & Koliba (2008)	Teacher collaboration improvement framework (TCIF).
Akinyemi et al., (2019).	Communities of practice (CoP)
Woodland et al., (2013).	Teacher Collaboration Assessment Survey (TCAS) • collaborative team cycle inquiry
Olivier et al. (2009)	Professional learning community – Revised (PLCR)

According to Table 5, in the first study, Gajda and Koliba used teacher collaboration improvement framework (TCIF) that includes the following factors:

i.   It raises collaboration literacy that fosters a shared understanding of communities of practice (CoP) and professional learning communities.

ii.   It identifies and inventories communities of practice (CoP) that figures out who is working with whom and for what purpose.

iii.   Furthermore, it reconfigures teacher teams, and this membership distribution should be purposeful and fair. It assesses the quality of collaboration and determines the levels and nature of team functioning.

iv.   Likewise, it also makes corrections to support and direct individuals and teams in need of improvement. Finally, it recognizes accomplishments to celebrate achievements of teacher teams with high intellectual output (Gajda & Koliba, 2008).

Similarly, in the second study, Akinyemi and colleagues used the framework of community of practice (CoP) to describe teacher collaboration. CoP has many advantages such as:

i.   It can enhance mutual relationships and trust among teachers. Teachers participated effectively and had mutual relationship in collaborative learning activities in communities of practice.

ii.   The teachers working together like that teacher clusters and networks can share various knowledge and skills to enhance professional development (Akinyemi et al., 2019).

The third study (Woodland et al., 2013) presented the validation of Teacher Collaboration Assessment Survey (TCAS) that has been used to realize teacher collaboration better in the Northeast and Mid-Atlantic regions of the United States since 2008. This survey used collaborative team cycle inquiry and it measured four key domains of teacher collaboration: (a) dialogue, (b) decision-making, (c) action taking and (d) evaluation.

In the fourth one, Olivier et al. (2009), the researchers used the term "professional learning communities (professional learning communities)" to assess the collaborative culture in schools and the researchers used the "Professional learning community – Revised (PLCR) instrument". The variables involved in this instrument are (1) shared and supportive leadership, (2) shared values and vision, (3) collective learning and application, (4) shared personal practice, (5) supportive condition-relationships and (6) supportive conditions-structures to enhance professional learning in schools.

3.3. Discussion
In analyzing the research articles in this study, it was found that the specific research methods and tools employed in these research articles may characterize collaboration and other related with it factors, as indicated in Table 6.

Table 6. Collaboration and related factors

Studies	Factors
Tallman (2019), Altun & Cengiz (2012), De Vries et al. (2014)	Individual teacher's perceptions and beliefs in collaboration
Woodland et al. (2013), Akinyemi et al. (2019), Slater (2004), Thornton (2006), Feldman (2020), Balyer et al. (2015), Ngang (2012); Doppenberg et al. (2012); Lee (2007); Kuusisaari (2013); Kutsyuruba (2013); Forte & Flores (2014); Meredith et al. (2017); Moolenaar (2012)	Group collaboration as formal and informal groups
Vangrieken et al., (2017)	Teacher autonomy
Gümüşeli & Eryilmaz (2011)	School culture
Williams (2010)	Teacher self-efficacy
Carpenter & Sherretz (2012); Lockton (2019); Attard Tonna & Shanks (2017)	Leadership
Lu & Hallinger (2018)	School management team
Banerjee et al. (2017), García Torres, (2019).	Output of collaboration • Motivation • Job satisfaction • Professional development of teachers • Student achievement
Böhm-Kasper et al. (2016), Hesjedal et al. (2015), Leeman et al. (2018)	Interprofessional collaboration or multiprofessional collaboration

The specific research methods and tools used in the research articles can elaborate individual teacher's perceptions and beliefs in collaboration (Tallman, 2019; Altun & Cengiz, 2012; De Vries et al., 2014), group collaboration both in formal and informal groups (Woodland et al., 2013; Akinyemi et al., 2019; Slater, 2004; Thornton, 2006; Feldman, 2020; Balyer et al., 2015; Ngang, 2012; Doppenberg et al., 2012; Lee, 2007; Kuusisaari, 2013; Kutsyuruba, 2013; Forte & Flores, 2014; Meredith et al., 2017; Moolenaar, 2012), collaboration and other concepts as teacher autonomy (Vangrieken et al., 2017), school culture (Gümüşeli & Eryilmaz, 2011), teacher self-efficacy (Williams, 2010), leadership (Carpenter & Sherretz, 2012; Lockton, 2019; Attard Tonna & Shanks, 2017), school management team (Lu & Hallinger, 2018), motivation, job satisfaction, and professional development of teachers and student achievement as outputs of collaboration. (Banerjee et al., 2017; García Torres, 2019).

Some studies showed the importance of collaboration in teacher education. Gajda & Koliba presented teacher collaboration improvement framework to evaluate the quality and improvement of teacher collaboration performance (Gajda & Koliba, 2008). Bruce and colleagues (2011) highlighted that the research collaboration between university researchers and teachers can yield several benefits. The partnership between them can help teachers to develop research skills, strengthen the relationship between them and improve their professional learning development as a researcher and as a learner. Moreover, according to Postholm (2016), teacher educators' competence in research can support learning both in teacher education and school education and it can also enhance the collaboration between them.

Moreover, interprofessional collaboration is found to be an interesting topic in educational studies. The term "interprofessional collaboration" is important for the collaboration between different professionals that are necessary for school improvement. In some studies, interprofessional collaboration is described as multiprofessional collaboration. In this explanatory sequential mixed-method study, the authors studied multiprofessional collaboration and developed an instrument to measure multiprofessional collaboration. Based on the previous

research, they built an instrument that included these scales such as teacher self-efficacy and the four scales such as work engagement, exchange, division of labour and co-construction. Shared between teachers goals were used to measure the collaboration between teachers and other educational professionals (Böhm-Kasper et al., 2016).

Likewise, the qualitative study by Hesjedal and colleagues (2015) gave a thematic analysis on facilitation of successful interprofessional collaboration in multidisciplinary teams, and eight sub-themes appeared as results. The analysis revealed that the following factors can facilitate successful interprofessional collaboration: (i) having enthusiasm, (ii)focusing on children in their daily life, (iii) having equality in the teams, (iv)welcomed and an open atmosphere, (v) preparation, (vi) agreement for working tasks, (vii) be supportive and (viii) being future oriented team members.

In an interprofessional action research conducted by teachers and university-based researchers/teacher educators in a vocational college, the observations during the reading sections and field notes and interviews examined the professional learning of teachers for the pedagogical approach of a new curriculum. Teachers' interviews focused on the materials, pedagogy and evaluation strategies and the professional development of teachers and the evaluation process of collaborative research and development. Students' interviews focused on choice of books and interest topic and their personal aims and motivation, students' evaluation on teachers' pedagogical approach (Leeman et al., 2018).

4. Conclusion and recommendations

The overarching aim of this study was to analyze the research articles of the study of collaborative learning of teachers in schools based on their specific research methods and tools. It focused on the factors considered in developing/selecting research methods and tools used in the previous studies of teacher collaboration in schools, involved participants, related factors of collaboration and conceptual framework and instrument in the previous studies to study collaboration. The summary of the findings is shortly presented below:

(1)   The collaborative dimensions, collaborative activities, collaborative attitudes, teachers' beliefs in continuous professional development, teachers' room to communicate, teacher-teacher dialogue, the way teachers work together and teachers' perceptions on their collaboration are considered while developing/selecting research methods and tools used in the previous studies of teacher collaboration in schools.

(2)   Stakeholders (for example: administrators, teachers, staff members in schools, parents, families, community members and school board members) who are anyone in the welfare and success of a school are either directly or indirectly affected by the success of an education system.

(3)   Informal collaboration, professional learning experience and peer collaboration, school culture, social networks, leadership and school management teams, sustainability in financial and physical conditions of schools and well-planned in-service teacher education programs based on collaborative knowledge creation are the factors positively influencing teacher collaboration.

(4)   The conceptual framework such as Teacher Collaboration Improvement framework (TCIF), Communities of Practice (CoP), the instruments as Teacher Collaboration Assessment Survey (TCAS), the collaborative team cycle inquiry and Professional learning community revised (PLCR) were used in the previous studies to study collaboration.

(5)   Interprofessional collaboration is found to be an important term and more studies related to interprofessional collaboration are

needed in collaboration research studies in teacher education.

The findings that are found in this study can help future researchers in analyzing the research tools to explore collaborative learning of teachers in schools. This analysis could help in identifying the areas of teachers' collaborative learning that have well-developed instruments and those that are relevant based on theories but less elaborated in research instruments. This study can be beneficial for future research in teacher collaboration and interprofessional collaboration in education.

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