The Evolution of Collaboration Skills Research in Education : Trends, Intellectual Structure, and Research Topics

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Abstract: This study aims to examine the evolution of collaboration skills in the field of education including publication trends, intellectual structure, and research topics. This study uses the bibliometric method which is part of the literature review, with descriptive data analysis. Analysis was carried out on 723 documents from the Scopus database that had been selected. The results show that the trend of document publications on collaboration skills began to increase at the beginning of the 2001s until reaching the highest number of publications in 2023 with 104 documents. In the early period (1986-2004), there were five schools of thought that became the foundation of its intellectual structure, namely *the practice of collaboration*, *small group learning*, *learning theory and its implementation*, *software design*, and *engineering studies*. Meanwhile, in the next period (2005-2023) there are *learning theory and its implementation*, *collaborative learning*, *interprofessional education*, *cooperative learning*, and *computer-supported learning*. If the schools of thought in the two periods are compared, it can be seen that there has been an evolution of the intellectual structure of collaboration skills. Evolution also occurred in the collaboration skills research topics, which can be seen from the keywords data that often appeared in the early period, namely *active learning*, *communication skills*, and *cooperative learning*. In the following period, it changed to *collaboration*, *interprofessional education*, and *higher education*. These research findings can provide information regarding the knowledge base of collaboration skills and related research topics that have been carried out.

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Introduction

Collaboration is a certain type of social interaction where each individual in a group can actively and constructively resolve a socio-cognitive conflict (Lee et al, 2015). Collaboration skills are a person's ability to work together well and show commitment to achieving common goals, by considering a diversity of perspectives, involving active contributions, listening, and supporting each other (Hidayati, 2019). In the 21st century, collaboration has become one of the crucial skills in human life, especially in terms of work (Ekeh, 2023; Grote & Kozlowski, 2023; Liebech-Lien & Sjølie, 2021; OECD, 2017; Saleh et al., 2020). Human activities in terms of work cannot be separated from the social interactions that occur within them. A human being cannot be an expert in all fields. They often experience difficulties in pursuing their various interests and needs individually. Therefore they need to collaborate (Redhana, 2019). Collaboration allows an individual to build ideas, produce innovations, and complete complex tasks more quickly (Maulidah, 2019). Technological developments in this century allow social interaction between individuals to occur without the limitations of space and time. So to support the collaboration process in the

social environment of society, every individual needs to have good collaboration skills (Jayadi et al., 2020).

Considering the importance of collaboration skills, there has been a lot of research in the field of education that analyzes and seeks to develop these skills in prospective human resources in various countries, which includes studies in the disciplines of engineering, medicine, social sciences, and so on. We found that there has been a bibliometric analysis research related to collaboration skills in the field of education. Marmoah et al (2022) in their research have used the Google Scholar database to analyze how is the methodological study trends regarding collaboration in education documents from the COVID-19 era (2019-2021). This study has been equipped with data related to the most frequent keywords, and the geographical distribution of contributing authors. However, there has been no further discussion regarding the evolution of collaboration skills research in the field of education which includes publication trends, development of intellectual structures, and research topics.

A bibliometric analysis regarding the evolution of collaboration skills research in education should be undertaken urgently. This study can be a strong basis for academics who want to conduct research on collaboration skills, so they can get a complete picture, analyze gaps, obtain new ideas, and map the contribution of their research to a particular field (Donthu et al., 2021). Studies related to publication trends and intellectual structure in a certain period can help to understand the various schools of thought that play a role in building the knowledge base of collaboration skills and their relationship to each other. Meanwhile, studies related to the topics in collaboration skills research can provide an overview of their emergence patterns (Leung et al., 2017).

Different from previous research, this research examines documents from the Scopus database over a wider time (1986-2023). This research aims to describe the evolution of collaboration skills research in the field of education, with research questions: (1) what are the trends in document publications regarding collaboration skills in the field of education?; (2) how does the intellectual structure of collaboration skills develop in the field of education over time?; and (3) how research topics regarding collaboration skills in the field of education have developed over time?.

Research Method

This research uses the bibliometric method which is part of the literature review (Hallinger, 2020; Zupic & Čater, 2015), with descriptive data analysis techniques. The data collection and review process was carried out using PRISMA procedures (Moher et al., 2009). In this research, documents were collected through the Scopus database. The Scopus database was chosen because of its multidisciplinary and broader coverage in the field of education according to the topic in this research (Hallinger, 2020; Muhammad et al., 2023). After several attempts, document collection was carried out by entering the keywords "collaboration skills" OR "collaborative skills" AND "education" in the Scopus database on March 27, 2024. From this search, we obtained 833 pieces of documents. The document then goes through a screening process by limiting the maximum period for document publication to 2023, and excluding all types of documents other than articles, conference proceedings, books, and book chapters. Furthermore, another selection process was carried out for each document based on its relevance to the research study, so that the final total of documents that met the requirements and were suitable for review was 723 documents.
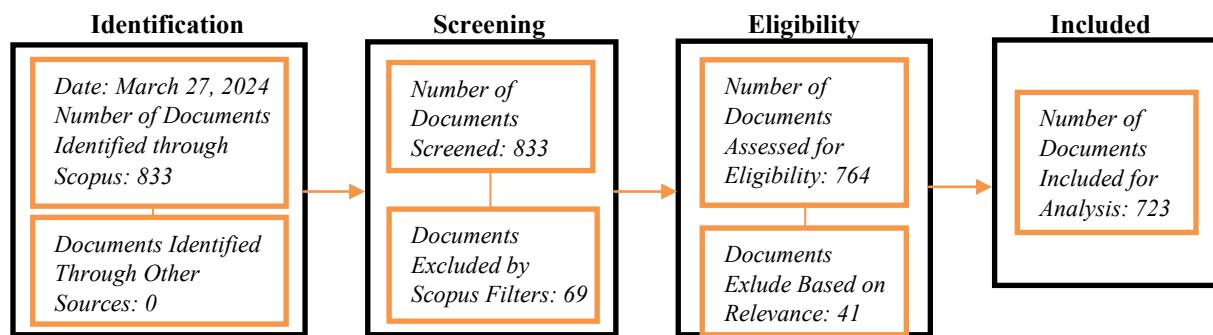
Figure 1. Stages of Collecting and Reviewing Documents Regarding Collaboration Skills

In this research, Author co-citation analysis was carried out to obtain data regarding the frequency with which two authors are cited together in each reference document so that empirical relationships between authors can be identified which builds the intellectual structure of collaboration skills in the field of education (Hallinger, 2020). To obtain data regarding publication topics related to collaboration skills, a co-occurrence analysis was also carried out (Donthu et al., 2021). These two analyses were carried out with the help of VOSviewer and divided the document into two periods to get a clear mapping.

Results and Discussion
The Trends of Document Publications on Collaboration Skills

Based on an analysis of 723 documents that have been collected from Scopus, The growth of documents from year to year can be depicted in Figure 2 below.
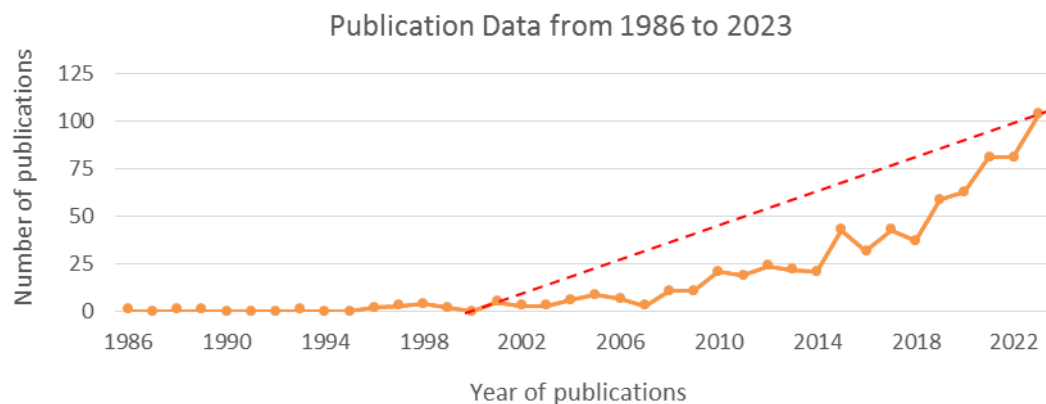

Figure 2. The Growth of Document on Collaboration Skills (1986-2023)

In Figure 2, it can be seen that the publication of documents regarding collaboration skills in the field of education began to increase at the beginning of the 2001s. Despite experiencing ups and downs, document publications in the following years showed good development until they experienced the highest publication in 2023 with 104 documents. The documents regarding collaboration skills described in this research consist of various types of documents including articles (59.0%), conference papers (35.0%), book chapters (5.3%), and books (0.7%).

These documents were published in several sources including 476 sources. The five sources that publish the most collaboration skills documents in this database are *ASEE Annual Conference And Exposition Conference Proceedings* (31 documents), *Journal of Physics Conference Series* (19), *Journal of Interprofessional Care* (15), *ACM International Conference Proceeding Series* (14), and *Aip Conference Proceedings* (13).

The Intellectual Structure Regarding Collaboration Skills (1986-2004)

Co-citation analysis in the beginning period was carried out by input minimum citation of author ≥ 3 citations and a 'thesaurus file' because there is a problem in the form of the author name Johnson L.J which is displayed in two versions. The results of co-citation analysis from 34 documents can be seen in Figure 3.
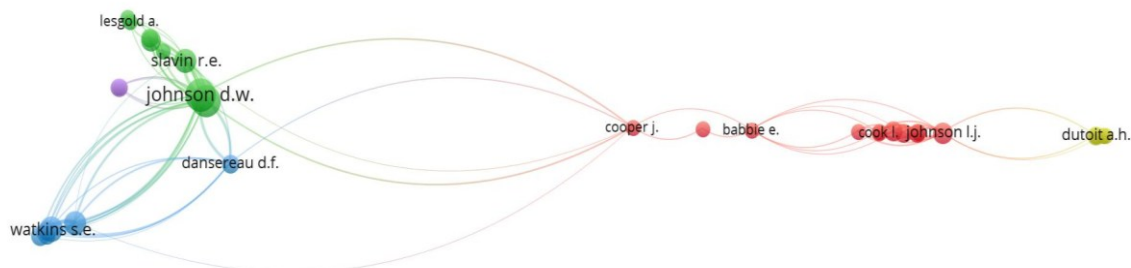

Figure 3. Network Visualization of Co-Cited Author (1986-2004)

Figure 3 shows 34 cited authors from a total of 722, that are connected. These authors are grouped based on their school of thought into five clusters which are represented by each color in Figure above. In more detail, author data in the largest to smallest clusters can be seen in Table 1.

Table 1. The cluster of Cited Authors on Documents from 1986 to 2004

Cluster	Authors
Red *(The Practice of Collaboration)*	Babbie E, Cook L, Cooper J, Foley R, Friend M, Idol L, Johnson L.J, Knitzer J, Kolbe K, Nelson C, Pugach M.C, West J.F.
Green *(Small Group Learning)*	Aiken R.M, Johnson D.W, Johnson R.T, Kagan S, Lesgold A, Mcmanus M.M, Slavin R.E, Soller A.
Blue *(Learning Theory and Its Implementation)*	Belarbi A, Chandrashekhara K, Dansereau D.F, Eller V.M, Hall R.H, Kolb D.A, Watkins S.E.
Yellow *(Software Design)*	Bruegge B, Curtis B, Dutoit A.H, Humphrey W.S.
Purple *(Engineering Studies)*	Coleman D.J, Gagnon P, Smith K.A.

Analysis of schools of thought was carried out by looking at the study topics discussed by most authors in each cluster (Yan & Wu, 2024). The three biggest co-cited author schools of thought that emerged in the early period, namely *the practice of collaboration*, *small group learning*, and *learning theory and its implementation*. The practice of collaboration as the largest school of thought in the 1986-2004 period, examines the reality and how the process of cooperation and collaboration should occur in schools, both in terms of students and school professionals. Based on the five schools of thought in Table 1, we can see that the two smallest schools of thought are closely related to the engineering field, namely *the software design* and *engineering studies* schools of thought. This shows that the intellectual structure of collaborative skills in the early period was also carried out within the engineering field.

In Figure 3, information is also depicted regarding authors who played a role in building the intellectual structure of collaboration skills in the early period. The size of the bubble shows the number of citations obtained by the author, and the lines represent the relationship between authors. The thickness of the line shows how strong the relationship is between the authors who are cited together (Leung et al., 2017). In this case, the co-cited authors who played the biggest role in the early period can be seen in Table 2.

Table 2. Co-Cited Author with the Biggest Role from 1986 to 2004

Author	Citations	Total Link Strength	Author	Citations	Total Link Strength
Johnson D.W.	19	226	Johnson L.J.	6	84
Johnson R.T.	16	212	Mcmanus M.M.	6	78
Watkins S.E.	9	207	Eller V.M.	5	135
Hall R.H.	8	194	Friend M.	5	76
Slavin R.E.	8	103	Kolb D.A.	5	31

Table 2 shows that the two co-cited authors who played the biggest role in building the intellectual structure of collaboration skills in the early period were Johnson D.W. and Johnson R.T., proven by their number of citations and total link strength. These two authors have strong expertise in cooperative learning. Many of their works have become one of the foundations for small group learning developments today. One of their works in the last decade that has been widely cited is *"Cooperative learning: The foundation for active learning"* which discusses the relationship between cooperative learning and active learning, as well as the theoretical basis, types, outcomes, and basic elements of cooperative learning (Johnson & Johnson, 2018).

The Intellectual Structure Regarding Collaboration Skills (2005-2023)

The co-citation analysis of 691 documents in this period, was carried out by setting a minimum citation of author $\geq$ 20 citations. The difference in determining the minimum citation of an author with the previous period is due to the significant difference in the number of collaboration skills documents in these two periods. The results of co-citation analysis can be seen in Figure 4.
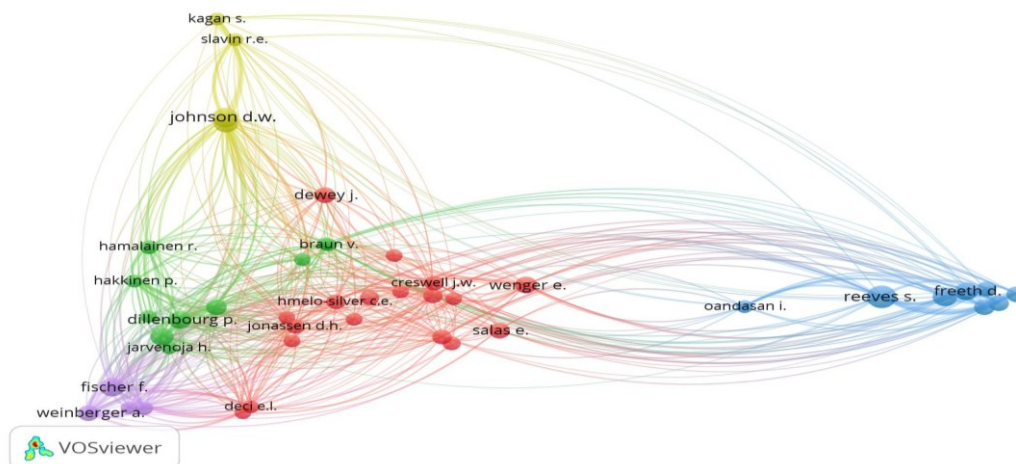

Figure 4. Network Visualization of Co-Cited Author (2005-2023)

Figure 4 shows that there are 44 out of 34.971 cited authors resulting from co-citation of documents in 2005-2023 who are connected. Just like the analysis results in the previous period, these co-cited authors were grouped into five clusters according to their various schools of thought that built the intellectual structure of collaboration skills in this period. In more detail, we can see this data in Table 3.

Table 3. The Cluster of Cited Authors on Documents from 2005 to 2023

Cluster	Authors
Red *(Learning Theory and Its Implementation)*	Anderson T, Bandura A, Collins A, Creswell J.W, Deci E.L, Dewey J, Eguchi A, Felder R.M, Friend M, Garrison D.R, Hmelo-Silver C.E, Jonassen D.H, Novak J.D, Ryan R.M, Salas E, Schmidt H.G, Vygotsky L.S, Wenger E.
Green *(Collaborative Learning)*	Braun V, Clarke V, Dillenbourg P, Hakkinen P,

	Hamalainen R, Jarvela S, Jarvenoja H, Kirschner P.A, Kolb D.A, Naykki P.
Blue *(Interprofessional Education)*	Barr H, Freeth D, Goldman J, Hammock M, Koppel I, Oandasan I, Reeves S, Zwarenstein M.
Yellow *(Cooperative Learning)*	Johnson D.W, Johnson R.T, Kagan S, Slavin R.E.
Purple *(Computer-Supported Learning)*	Fischer F, Mandl H, Rummmel N, Weinberger A.

The various schools of thought in the collaboration skills documents for the 2005-2023 period, which are listed in Table 3, show several developments and changes in the structure intellectual of collaboration skills. In this period, the three biggest schools of thought were *learning theory and its implementation*, *collaborative learning*, and *interprofessional education*. When compared with the previous period, *the learning theory and its implementation* school of thought, which was originally the third largest school of thought, became the first largest in this period. The number of co-cited authors in this school of thought has increased to 18 co-cited authors, this indicates that research on collaboration skills in the 2005-2023 period related to learning theory is growing increasingly diverse. This is understandable because learning theory itself is the fundamental thing that underlies various developments in the field of education and learning, such as the study by Bandura (2019) regarding social learning theory which is one of the basics that has helped encourage the development of various learning approaches that exist today.

The small group learning school of thought experienced a split into two schools of thought in the 2005-2023 period, namely *collaborative learning* and *cooperative learning*. Both contain the concept of small group learning, encourage students with various differences to learn together, and develop several social skills in students (Davidson & Major, 2014; Johnson & Johnson, 2018; Vuopala et al., 2016; Yang, 2023). This evolution can be an indication that small group learning has had a big influence on the intellectual structure of collaboration skills in the field of education, even since the early period. Small group learning can engage students in active learning, promote collaboration, and improve the quality of learning (Davidson & Major, 2014; Michaelsen et al., 2023). *The practice of collaboration* which was previously the largest school of thought, in this period became integrated with the *collaborative learning* school of thought.

The interprofessional education school of thought includes various authors who have conducted studies related to the education system in the healthcare sector. Interprofessional education is a collaborative learning practice in healthcare that provides a platform for students from various professions to learn together about each other to improve the quality of patient care and health outcomes (Diggele et al., 2020; Guraya & Barr, 2018). In the last ten years, interprofessional education has been discussed in many policies and research (Reeves, 2016). Various schools in healthcare disciplines such as medicine, nursing, and pharmacy carry out interprofessional education to overcome various challenges in their fields (Foronda et al., 2016). The existence of schools of thought related to engineering and healthcare in their development shows that the study of collaboration skills in the field of education has an interdisciplinary knowledge base.

If we look at the location of *the computer-supported learning* school of thought in Figure 3, we can see that this school of thought has a close connection with the collaborative learning school of thought. This can be understood because in the last decade, many computer-supported learning studies have been integrated with collaborative learning (e.g. Rummel, 2018). Data regarding authors who have an important role in this period can be seen in Table 4 below.

Table 4. Co-Cited Author with the Biggest Role from 2005 to 2023

Author	Citations	Total Link Strength	Author	Citations	Total Link Strength
Reeves S.	126	1120	Dillenbourg P.	60	792
Johnson D.W.	78	883	Jarvela S.	58	745
Johnson R.T.	69	798	Freeth D.	56	700
Barr H.	67	776	Wenger E.	44	168
Fischer F.	64	1395	Dewey J.	42	160

Based on the results of author co-citation analysis above, it can be seen that the co-cited author who played the biggest role in building the intellectual structure of collaboration skills for this period was Reeves S. Reeves S is an author who has conducted many studies regarding interprofessional education. One of his studies in the last 10 years that is widely cited is "*A BEME systematic review of the effects of interprofessional education: BEME Guide No. 39*", which outlines the development of interprofessional education studies by analyzing 46 documents regarding this matter (Reeves et al., 2016).

Tren of Research Topics on Collaboration Skills

Based on co-occurrence analysis carried out on author keyword data in documents for the 1986-2004 period (minimum keyword occurrences: $\geq$ 2 without thesaurus file), and the 2005-2023 period ($\geq$ 5 with thesaurus file), the results were obtained in the form of an overlay visualization as in Figures 5 and 6 below.
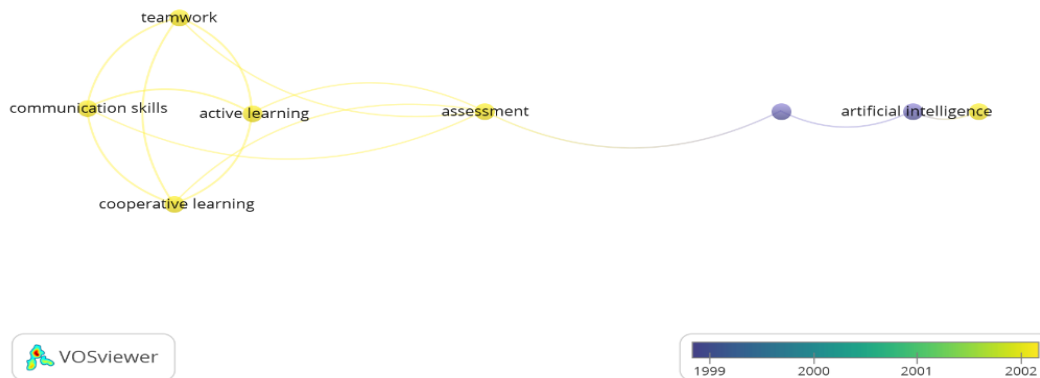

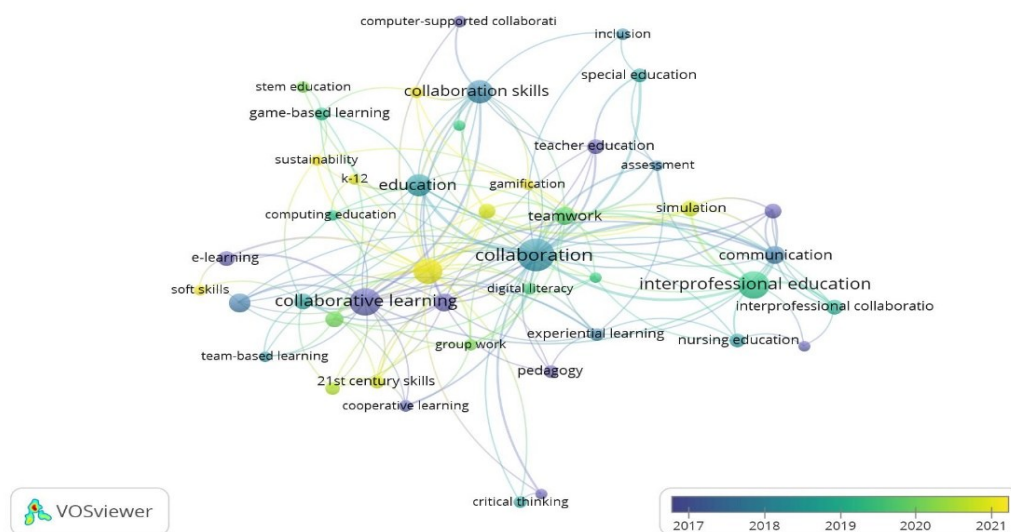**Figure 5. Overlay Visualization of Co-Occurrence Keyword (1986-2004)**

Figure 6. Overlay Visualization of Co-Occurrence Keyword (2005-2023)

Figure 5 displays 8 of total 50 keywords in the 1986-2004 period. Meanwhile, Figure 6 displays 40 of total 1717 keywords in the 2005-2023 period. These two figures show the network of developments in collaboration skills research topics from year to year in each period. The brighter color of the bubble means that the keyword appears in more updated collaboration skills documents. If we look at the distribution of keywords in the two periods, we can see differences in publication topic trends between the two. This difference occurs because the number and scope of publications are increasing with changing times. We can see data regarding the keywords that appear most frequently in Table 5 below.

Table 5. Keywords with the Most Occurrences in Each Period

1986-2004			2005-2023		
Keyword	Occurrences	Total Link Strength	Keyword	Occurrences	Total Link Strength
Active learning	2	7	Collaboration	70	70
Communication skills	2	7	Interprofessional education	48	39
Cooperative learning	2	7	Collaborative learning	46	39
Teamwork	2	7	Higher education	38	42
Assessment	2	5	Collaboration skills	32	27
Artificial intelligence	2	2	Education	28	22
Collaborative learning	2	2	Engineering education	18	9
Education	2	1	Communication	17	25

Based on the table above, several things can be understood regarding trends in collaboration skills research topics. In the early period, the topics that dominated collaboration skills research were *active learning*, *communication skills*, and *cooperative learning*. Meanwhile, in the following period it changed to *collaboration*, *interprofessional education*, and *higher education*.

In the trend of research topics on collaboration skills in the field of education from time to time, topics related to *collaborative learning* and *communication* are two things that have always been studied and have even experienced a rapid increase in the following period compared to other keywords in the early period. Many collaborative learning studies have been carried out to strive for good collaboration between students (e.g. Le et al., 2018; Morgan, 2016; Nokes-Malach et al., 2015; Häkkinen et al., 2017). The development of collaboration skills studies related to collaborative learning cannot be separated from the increasingly massive efforts of various stakeholders in education and learning which encourage students to get used to positioning themselves socially in their environment over the last decade (Schoor et al., 2015). Studies on collaboration skills are often linked to communication (e.g. Child & Shaw, 2019; Liesa-Orús et al., 2020; Mende et al., 2021; Sari et al., 2017). This happens because both are skills that are needed in the 21st century and to have good collaboration skills, each individual must be able to establish good communication with others.

The results of this study are a form of contribution to support future progress in collaboration skills research (Donthu et al., 2021). Several patterns presented in this study regarding publication trends, intellectual structure, and research topics, can indicate trends and gaps in the evolution of collaboration skills research in the field of education. Research on collaboration skills in the Scopus database has recently developed in the healthcare discipline with the concept of interprofessional education. Most research on collaboration skills is related to models or approaches that support their realization in learning, especially collaborative learning. Studies regarding collaboration skills associated with learning models

other than collaborative learning and within the scope of high school for example, do not appear to have been widely carried out. Therefore, the results of this study can be used by researchers as a reference or knowledge base for developing and predicting possible new trends in research related to collaboration skills (Ellegaard & Wallin, 2015).

Conclusion

Based on the results and discussion explained above, it can be concluded that the trend of document publications on collaboration skills in the field of education began to increase at the beginning of the 2001s until reaching the highest number of publications in 2023 with 104 documents. In the early period of the development of collaborative skills research in the field of education (1986-2004), there were five schools of thought that became the foundation of its intellectual structure, namely *the practice of collaboration*, *small group learning*, *learning theory and its implementation*, *software design*, and *engineering studies*. Meanwhile, the five schools of thought in the next period (2005-2023) are *learning theory and its implementation*, *collaborative learning*, *interprofessional education*, *cooperative learning*, and *computer-supported learning*. If the schools of thought in these two periods are compared, it can be seen that there has been an evolution in the intellectual structure of collaboration skills. Evolution also occurred in the trend of collaboration skills research topics which can be seen from the keywords data that often appeared in the early period, namely *active learning*, *communication skills*, and *cooperative learning*. In the following period, it changed to *collaboration*, *interprofessional education*, and *higher education*. The findings in this research can provide information regarding the knowledge base of collaboration skills and related research topics that have been carried out.

Recommendation

Based on the analysis in this research, there are several recommendations suggested. First, it is necessary to carry out further bibliometric analysis that examines collaboration skills research in the field of education with more specific disciplines such as social sciences, and with different databases such as Web of Science or Dimensions to complement the limitations in this research. Second, higher education and researchers should conduct more studies that focus on topics of collaboration skills in the field of education that are still rarely researched, such as those related to their development at the high school level, and their relationship with various learning models and components.

References

Bandura, A. (2019). The social learning theory of aggression. In Falk, R., Kim, S.S. (Ed.). *The War System* (pp. 141–156). New York: Routledge.

Child, S. F. J., & Shaw, S. (2019). Towards an Operational Framework for Establishing and Assessing Collaborative Interactions. *Research Papers in Education*, *34*(3), 276–297. https://doi.org/10.1080/02671522.2018.1424928

Davidson, N., & Major, C. H. (2014). Boundary Crossings: Cooperative Learning, Collaborative Learning, and Problem-Based Learning. *Journal on Excellence in College Teaching*, *25*(4), 7–55. https://www.sun.ac.za/english/learning-teaching/ctl/Documents/Davidson%202014%20BoundaryCrossings.pdf

Diggele, C. van, Roberts, C., Burgess, A., & Mellis, C. (2020). Interprofessional Education: Tips for Design and Implementation. *BMC Medical Education*, *20*(2), 1–6. https://doi.org/10.1186/s12909-020-02286-z

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to Conduct a Bibliometric Analysis: An Overview and Guidelines. *Journal of Business Research*, *133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Ekeh, M. C. (2023). Developing Early Graders' Collaborative Skills through Group-Work, Play-Based Pedagogy. *International Journal of Learning, Teaching and Educational Research*, *22*(4), 160–177. https://doi.org/10.26803/IJLTER.22.4.10

Ellegaard, O., & Wallin, J. A. (2015). The Bibliometric Analysis of Scholarly Production: How Great is The Impact?. *Scientometrics*, *105*(3), 1809–1831. https://doi.org/10.1007/s11192-015-1645-z

Foronda, C., MacWilliams, B., & McArthur, E. (2016). Interprofessional Communication in Healthcare: An Integrative Review. *Nurse Education in Practice*, *19*, 36–40. https://doi.org/10.1016/j.nepr.2016.04.005

Grote, G., & Kozlowski, S. W. J. (2023). Teamwork Doesn't Just Happen: Policy Recommendations from Over Half a Century of Team Research. *Behavioral Science & Policy*, *9*(1), 59–76. https://doi.org/10.1177/2

Guraya, S. Y., & Barr, H. (2018). The Effectiveness of Interprofessional Education in Healthcare: A Systematic Review and Meta-Analysis. *Kaohsiung Journal of Medical Sciences*, *34*(3), 160–165. https://doi.org/10.1016/j.kjms.2017.12.009

Häkkinen, P., Jarvela, S., Makitalo-Siegl, K., Ahonen, A., Naykki, P., & Valtonen, T. (2017). Preparing Teacher-Students for Twenty-First-Century Learning Practices (PREP 21): A Framework for Enhancing Collaborative Problem-Solving and Strategic Learning Skills. *Teachers and Teaching*, *23*(1), 25–41. https://doi.org/10.1080/13540602.2016.1203772

Hallinger, P. (2020). Mapping Continuity and Change in the Intellectual Structure of the Knowledge Base on Problem-Based Learning, 1974–2019: A Systematic Review. *British Educational Research Journal*, *46*(6), 1423–1444. https://doi.org/10.1002/berj.3656

Hidayati, N. (2019). Collaboration Skill of Biology Students at Universitas Islam Riau, Indonesia. *International Journal of Scientific and Technology Research*, *8*(11), 208–211.

Jayadi, A., Putri, D. H., & Johan, H. (2020). Identifikasi Pembekalan Keterampilan Abad 21 pada Aspek Keterampilan Pemecahan Masalah Siswa SMA Kota Bengkulu dalam Mata Pelajaran Fisika. *Jurnal Kumparan Fisika*, *3*(1), 25–32. https://doi.org/10.33369/jkf.3.1.25-32

Johnson, D. W., & Johnson, R. T. (2018). Cooperative Learning: The Foundation for Active Learning. In Brito, S.M. (Ed.). *Active learning - Beyond the future* (pp. 59–71). Croatia: IntechOpen.

Le, H., Janssen, J., & Wubbels, T. (2018). Collaborative Learning Practices: Teacher and Student Perceived Obstacles to Effective Student Collaboration. *Cambridge Journal of Education*, *48*(1), 103–122. https://doi.org/10.1080/0305764X.2016.1259389

Lee, D., Huh, Y., & Reigeluth, C. M. (2015). Collaboration, Intragroup Conflict, and Social Skills in Project-Based Learning. *Instructional Science*, *43*(5), 561–590. https://doi.org/10.1007/s11251-015-9348-7

Leung, X. Y., Sun, J., & Bai, B. (2017). Bibliometrics of Social Media Research: A Co-Citation and Co-Word Analysis. *International Journal of Hospitality Management*, *66*, 35–45. https://doi.org/10.1016/j.ijhm.2017.06.012

Liebech-Lien, B., & Sjølie, E. (2021). Teachers' Conceptions and Uses of Student Collaboration in the Classroom. *Educational Research*, *63*(2), 212–228. https://doi.org/10.1080/00131881.2020.1839354

Liesa-Orús, M., Latorre-Cosculluela, C., Vázquez-Toledo, S., & Sierra-Sánchez, V. (2020). The Technological Challenge Facing Higher Education Professors: Perceptions of ICT Tools for Developing 21st Century Skills. *Sustainability*, *12*(13), 1–14.

Marmoah, S., Gestiardi, R., Sarwanto, S., Chumdari, C., & Maryani, I. (2022). A Bibliometric Analysis of Collaboration Skills in Education (2019-2021). *Journal of Education and Learning (EduLearn)*, *16*(4), 542–551. https://doi.org/10.11591/edulearn.v16i4.20337

Maulidah, E. (2019). Character Building dan Keterampilan Abad 21 dalam Pembelajaran di Era Revolusi Indutri 4.0. In *Prosiding Seminar Nasional PGSD UST (Vol. 1)*. https://jurnal.ustjogja.ac.id/index.php/sn-pgsd/article/view/4740

Mende, S., Proske, A., & Narciss, S. (2021). Individual Preparation for Collaborative Learning: Systematic review and Synthesis. *Educational Psychologist*, *56*(1), 29–53. https://doi.org/10.1080/00461520.2020.1828086

Michaelsen, L. K., Knight, A. B., & Fink, L. D. (2023). *Team-Based Learning: A Transformative Use of Small Groups in College Teaching*. New York: Routledge.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *Annals of Internal Medicine*, *151*(4), 264–269. www.annals.org

Morgan, J. L. (2016). Reshaping the role of a special educator into a collaborative learning specialist. *International Journal of Whole Schooling*, *12*(1), 40–60. https://files.eric.ed.gov/fulltext/EJ1095368.pdf

Muhammad, I., Triansyah, F. A., Fahri, A., & Lizein, B. (2023). Analisis Bibliometrik: Penelitian Self-Efficacy Pada Sekolah Menengah Atas (1987-2023). *Edukatif : Jurnal Ilmu Pendidikan*, *5*(1), 519–532. https://doi.org/10.31004/edukatif.v5i1.4713

Nokes-Malach, T. J., Richey, J. E., & Gadgil, S. (2015). When is It Better to Learn Together? Insights from Research on Collaborative Learning. *Educational Psychology Review*, *27*(4), 645–656. https://doi.org/10.1007/s10648-015-9312-8

OECD. (2017). *PISA 2015 Assessment and Analytical Framework: Science, Reading, Mathematic, Financial Literacy and Collaborative Problem Solving, Revised Edition*. Paris: OECD Publishing.

Redhana, W. I. (2019). Mengembangkan Keterampilan Abad ke-21 dalam Pembelajaran Kimia. *Jurnal Inovasi Pendidikan Kimia*, *13*(1), 2239–2253. https://doi.org/10.15294/jipk.v13i1.17824

Reeves, S. (2016). Why We Need Interprofessional Education to Improve The Delivery of Safe And Effective Care. *Interface: Communication, Health, Education*, *20*(56), 185–196. https://doi.org/10.1590/1807-57622014.0092

Reeves, S., Fletcher, S., Barr, H., Birch, I., Boet, S., Davies, N., McFadyen, A., Rivera, J., & Kitto, S. (2016). A BEME Systematic Review of The Effects of Interprofessional Education: BEME Guide No. 39. *Medical Teacher*, *38*(7), 656–668. https://doi.org/10.3109/0142159X.2016.1173663

Rummel, N. (2018). One Framework to Rule Them All? Carrying Forward The Conversation Started by Wise and Schwarz. *International Journal of Computer-Supported Collaborative Learning*, *13*(1), 123–129. https://doi.org/10.1007/s11412-018-9273-2

Saleh, R. R. M., Suparman, Poniyati, Ardiana, Ruhama, M. A. H., Im, R., & Djawa, Y. (2020). Analysis and Design Module Based on PJBL to Improve Mathematical

Communication Skills. *Journal of Advanced Research in Dynamical and Control Systems*, *12*(7), 493–501. 10.5373/JARDCS/V12I7/20202031

Sari, K. A., Prasetyo, K., & Wibowo, W. S. (2017). Development of Science Student Worksheet Based on Project Based Learning Model to Improve Collaboration and Communication Skills of Junior High School Student. *Journal of Science Education Research*, *1*(1), 1–6. https://doi.org/10.21831/jser.v1i1.16178

Schoor, C., Narciss, S., & Körndle, H. (2015). Regulation During Cooperative and Collaborative Learning: A Theory-Based Review of Terms and Concepts. *Educational Psychologist*, *50*(2), 97–119. https://doi.org/10.1080/00461520.2015.1038540

Vuopala, E., Hyvönen, P., & Järvelä, S. (2016). Interaction Forms in Successful Collaborative Learning in Virtual Learning Environments. *Active Learning in Higher Education*, *17*(1), 25–38. https://doi.org/10.1177/1469787415616730

Yan, M., & Wu, X. (2024). Prosody in Linguistic Journals: A Bibliometric Analysis. *Humanities and Social Sciences Communications*, *11*(1). https://doi.org/10.1057/s41599-024-02825-9

Yang, X. (2023). A Historical Review of Collaborative Learning and Cooperative Learning. *TechTrends*, *67*(4), 718–728. https://doi.org/10.1007/s11528-022-00823-9

Zupic, I., & Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, *18*(3), 429–472. https://doi.org/10.1177/1094428114562629