A bibliometric analysis of collaboration skills in education (2019-2021)

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ABSTRACT

One indicator of 21st century skills is collaboration; essential skill students must acquire in century learning. This study aimed to reveal research trends over the last three years based on the start of COVID-19 by using content analysis and reviewing bibliometric results related to articles with collaboration keywords. For bibliometric mapping analysis, a total of 500 articles were accessed, and for content analysis, 31 articles were selected between 2019-2021 based on Google Scholar's database corresponding to the education field study of the research. The results showed that digital "health education collaboration" was the most searched keyword, while researchers focused on collaboration in education between 2019-2021. The most commonly used words in abstracts are teaching, creativity, ability, and community. It was evident that the latest articles primarily focused on skills. Bhone Myint Kyaw; AE Kinio is the most cited author in this field. The most cited journals are the Journal of Medical Internet Research, Journal of Surgical Education, The Journal of Technology Transfer, the most prominent journal. The content analysis results showed that "21st-century skill, problem, and implementation" has become the most studied variable in the article.

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1. INTRODUCTION

One indicator of 21st century skills is the collaboration skills students must acquire in 21st century learning [1]–[3]. Collaboration is also officially listed in international surveys in providing country performance rankings by Organisation for Economic Co-operation and Development (OECD) [4]. Collaboration is considered one of the skills a general requirement in the world of work [5]; for example, collaboration can bridge higher education to clinical and improve the quality of workers [6], [7]. This is also corroborated by research [8] proven to support interpersonal skills. This is relevant because positive collaboration experiences can improve skills in interpersonal interactions in the future [9]–[11]. Collaboration can provide an understanding of sharing strengths and weaknesses in groups. Collaboration it supports individuals in solving the problems they face to achieve their desired goals [12]. The collaboration consists of two or more individuals who intentionally work together to get something accomplished together.

Learning activities are provided in collaboration; each individual will observe and be aware of social processes and see the consequences of joint efforts in setting targets set in learning. Collaboration can create a relationship of interdependence and positive mutual responsibility to encourage greater awareness of the learning process [13]. These are in sequence with the opinion [14]–[16]. Each individual must know the group's responsibilities to improve performance and a strong relationship of collaboration that has been declared. Collaborative-based learning can improve students' learning motivation as well as learning achievement and self-efficacy abilities in individuals [17], enjoy learning, and recognize the importance of learning simultaneously for future careers [18]–[24]. Collaboration is also a means of active learning when students encounter complex tasks [25]. The difficulty is a significant factor in growing and influencing other factors. Of course, this must be accompanied by students sharing ideas, collaborating and supporting each other, and discussing views between individuals to complete what they want to achieve [26]–[28].

The conception of collaboration has been integrated into the learning of many studies aimed at promoting understanding and implementation to encourage students to collaborate [29], [30]. As well as encouraging individuals to have more in-depth discussions even online through [31], [32]. Therefore, collaboration schools are also crucial for the professional learning of teachers and the preparation in preparing the curriculum [5], [33], [34]. Many review studies on collaboration have implied published in recent years. However, it is only limited to collaboration in education, generally focused on interdisciplinary fields that cover a wide range of objects. One of them was researched by Moirano *et al*. [35] review about interdisciplinary relating to dual creativity.

This study aims to investigate the use of collaboration in education, between 2019-2021, at the time of the onset of COVID-19, to see the distribution of variables supporting collaboration in the field of education. This is relevant to the research conducted by [36]. Collaboration is considered a vital indicator post COVID-19. This article relates to variables studied, trends in methods used, data collection, sampling methods, population samples, sample sizes, and data analysis methods. In addition, a bibliometric analysis of frequently used keywords, the top 10 articles with the highest number of citations, words in the abstract, author, and country of origin in the last three years, was carried out. All articles are published on collaboration education from 2019 to 2021, and an overview and presented-Varoanel in the biblio-analysis of the mapping metrics used by the VOS Viewer program. The study aims to reveal the methodological study trends in the last three years regarding collaboration. Through the analysis of bibliometric mapping, it is assumed that the findings of researchers who focus on bibliometric mapping and literature review will make helpful contributions to future researchers and find opportunities and updates to contribute more. The research questions created in this study were set by Herzing's Publish or Perish program with a focus on metadata sources from the google scientist database; the questions are listed: i) How is the distribution of keywords frequently used in articles about collaboration in education?; ii) What are the top 10 articles with the most citations?; iii) How is the distribution of the most frequently used words related to collaboration?; iv) How is the distribution of the most author citations based on the top 10 articles?; v) What is the distribution of the country of origin of each author?; vi) What are the methodological trends in articles about collaboration in education?; and vii) What are the most preferred data collection tools in articles about collaboration in education?

2. RESEARCH METHOD
2.1. Article selection process for bibliometric analysis
This article was collected related to themes about collaboration in the world of education between 2017-2021 that have been explored. The selected literature sources are from Scopus and the Google Scholar database. The chosen keywords were "collaboration" and "education" in the topic section, using the advanced search function on Google. The search found that 31 articles related to collaboration in education were reviewed (Access date: May 2020). Full text of all downloaded articles. Each piece was analyzed and based on inclusion and exclusion criteria-addition criteria related to collaboration; inclusion criteria related to the world of education. In addition, articles that do not match are filtered and excluded. Therefore, the content analysis includes articles published in 2019-2021.

2.2. Data analysis
In writing this article, the analysis used is a bibliometric analysis using Pop software [37], [38]. Then use Vos's viewer software to visualize bibliometric networks [39]. The software can work efficiently by collecting extensive data and providing unique visuals, analyses, and investigations [40]. Vos's viewer can create publication maps, author maps based on shared citations, and keyword maps. In addition, this study presents classifications based on [41] used to analyze the selected articles. This analysis consists of methodological trends and a data collection tool. Then the result will then be a descriptive statistic used to present and analyze the research results.

3.   RESULTS
3.1.   Most used keyword in the articles related to the use of collaboration skills in education

Based on the data text for the most used keywords, the author uses co-accuracy analysis. The minimum number set is six, and the number of keywords selected automatically is seven. The map is presented in Figures 1 and 2. It shows three clusters, and the most frequently used keyword is 'Collaboration.' There are 'impact' and development. These 3 are the most used keywords. These results show that most articles focus on collaboration and the environment related to effectiveness and development.
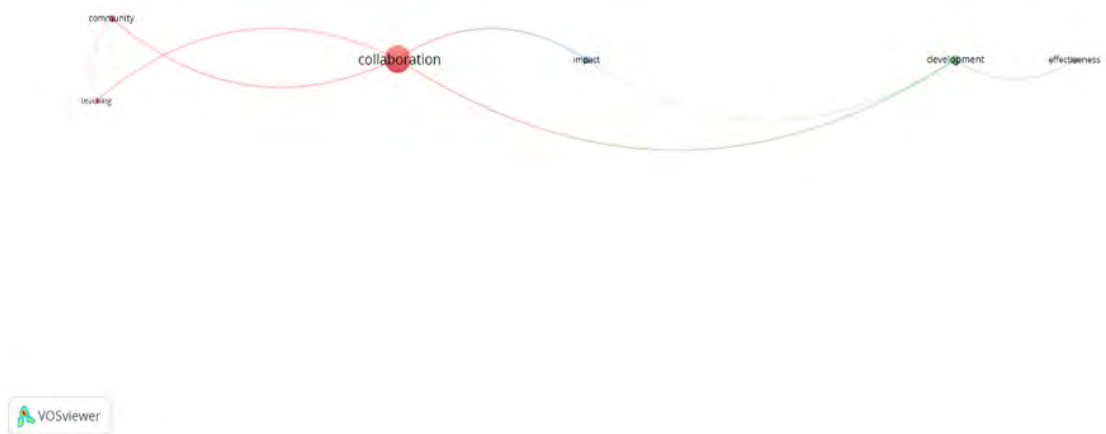
Figure 1. The most used keywords in articles relating to the use of collaboration in education
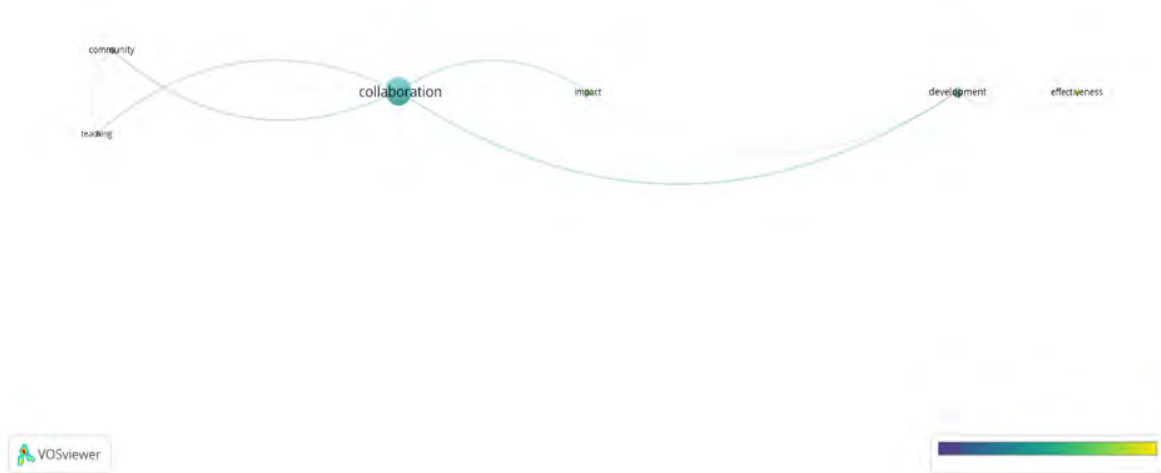

Figure 2. Visualization of overplays of articles using the keywords

3.2.   Top 10 cited articles

The author presents the most relevant contributions to this study. The step is to take 31 articles with the keyword 'collaboration' with the highest citation score (top 10 articles quoted from 500 articles). The results are concerned in Table 1.

Table 1. Top 10 cited articles

Year	Author	Title	Journal	Cites	Publisher
2019	Bhone Myint Kyaw; Nakul Saxena; Pawel Posadzki; Jitka Vseteckova; Charoula Konstantia Nikolaou; Pradeep PaulGeorge; Ushashree Divakar; Italo Masiello; Andrzej A Kononowicz; Nabil Zary; Lorainne Tudor Car	Virtual Reality for Health Professions Education: Systematic Review and Meta-Analysis by the Digital Health Education Collaboration	Journal of Medical Internet Research	105	Jmir.org
2019	AE Kinio, L Dufresne, T Brandys, P Jetty	Break out of the classroom: the use of escape rooms as an alternative teaching strategy in surgical education	Journal of surgical education	87	Elsevier
2019	Gerard Dunleavy; Charoula Konstantia Nikolaou; Sokratis Nifakos; Rifat Atun; Gloria Chun Yi Law; Lorainne Tudor Car	Mobile Digital Education for Health Professions: Systematic Review and Meta-Analysis by the Digital Health Education Collaboration	Journal of Medical Internet Research	54	Jmir.org
2019	Andrzej A Kononowicz; Luke A Woodham; Lorainne Tudor Car; Jan Carlstedt-Duke; Josip Car; Nabil Zary	Virtual Patient Simulations in Health Professions Education: Systematic Review and Meta-Analysis by the Digital Health Education Collaboration	Journal of Medical Internet Research	53	Jmir.org
2019	Fan-Chuan Tseng, Mu-Hsuan Huang & Dar-Zen Chen	Factors of university-industry collaboration affecting university innovation performance	The Journal of Technology Transfer	42	Springer
2019	U Boltaboeva, U Sh, N Rahmonova	Creative person-the role in the live world in educating an actor	European Journal of Arts	39	cyberleninka.ru
2019	Saputra, Maskhur Dwi; Joyoatmojo, Soetarno; Wardani, Dewi Kusuma; Sangka, Khresna Bayu	Developing Critical-Thinking Skills through the Collaboration of Jigsaw Model with Problem-Based Learning Model	International Journal of Instruction	37	ERIC
2019	Dehqonov Ravshan Tursunova, Gulsanem; Abdunazarov, Zokhidjon	Pedagogical approaches to the formation of musical literacy of students in the system of higher education	An International Multidisciplinary Research Journal	38	Indianjournals.com
2019	Roland Sieghartsleitner; Claudia Zuber, Marc Zibung, and Achim Conzelmann	Science or Coaches" Eye? – Both! Beneficial Collaboration of Multidimensional Measurements and Coach Assessments for Efficient Talent Selection in Elite Youth Football	Journal Science & Medicine	34	Nchbi.nlm.nih.gov
2019	Rahman, M. M.	21st Century Skill 'Problem Solving': Defining the Concept	Asian Journal of Interdisciplinary Research	32	Papers.ssrn.com

The data distribution visualization display on the GS related to the keyword 'collaboration', which is complete in the search, can be viewed in Figure 3, the overlay visualization can be viewed in Figure 4. Both of display showed different visualizations. Figure 3 shows the relationship between the most frequently connected keywords and figure 4 illustrates the Visualization of density in Google Scholar database.
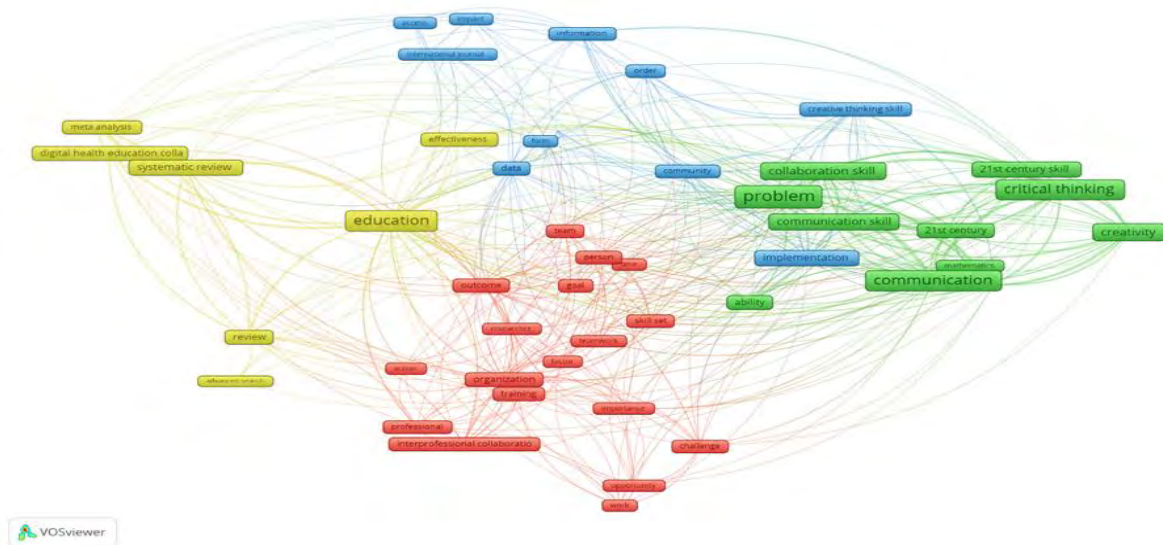
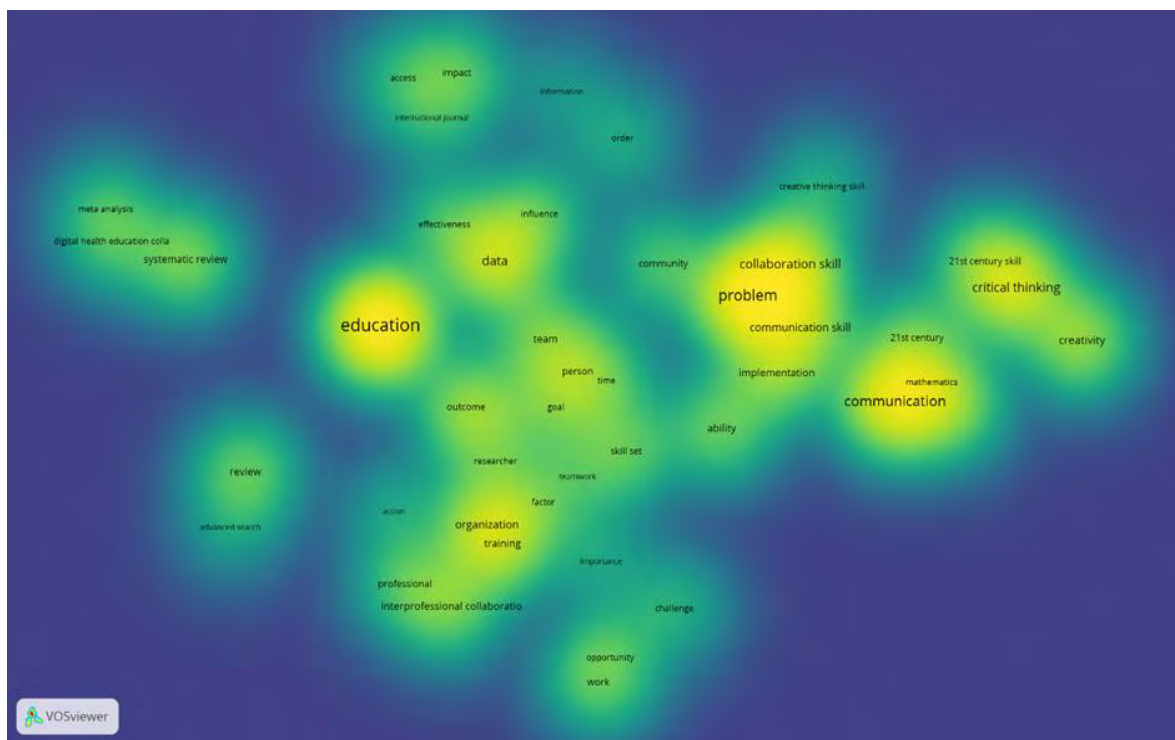Figure 3. Network visualization on the GS database

Figure 4. Visualization of density in GS database

These results are displayed from the title, keywords, and abstract. This result uses occurrences six and found 79 items that meet the criteria of 132. Common words are excluded in this item. Each item represents a keyword that shows the level of distribution. Four groups were identified.

3.3. Most cited authors

The co-author's analysis of collaboration among authors can be viewed in Figure 5. In this network, each author represents each connection to the other. Figure 5 Shows a network analysis of authors in the top 10 most citations from 2019-2021 as co-authors. Evidently, 'Kyaw bm' is a writer who relates a lot to other people.
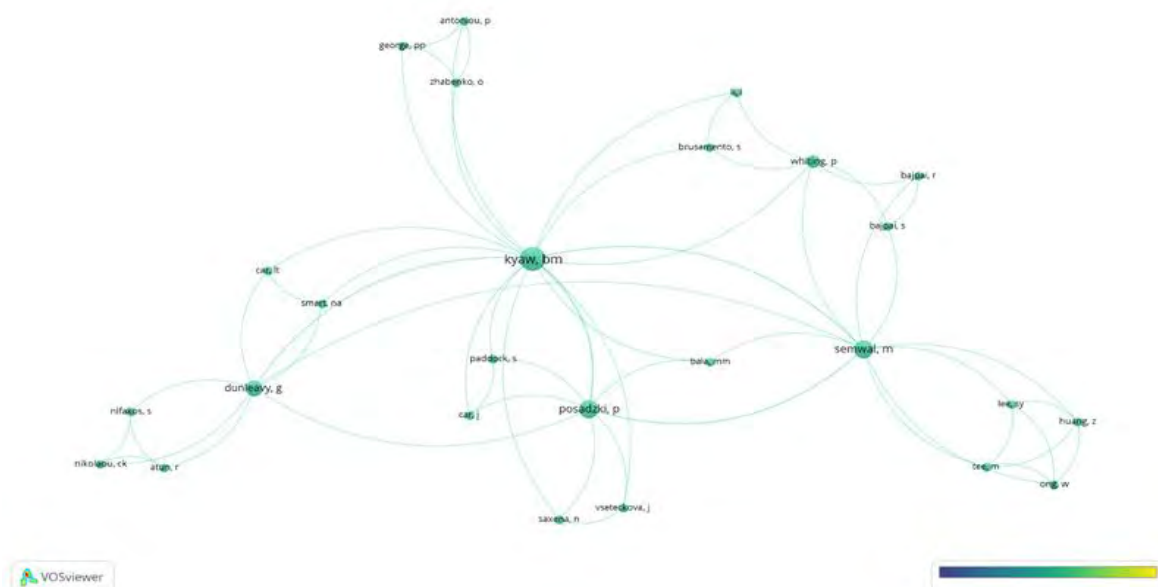
Figure 5. Most cited authors (citation analysis)

3.4. Affiliation statistic

The analysis of the distribution of collaboration patterns by country can be viewed in Figure 6, presenting the place of the authors who contributed to the 'collaboration' article. Author affiliation has been taken from RIS in Bib Excel (10 most citations). This analysis was extracted using the open-source online platform GPS visualizer [42].
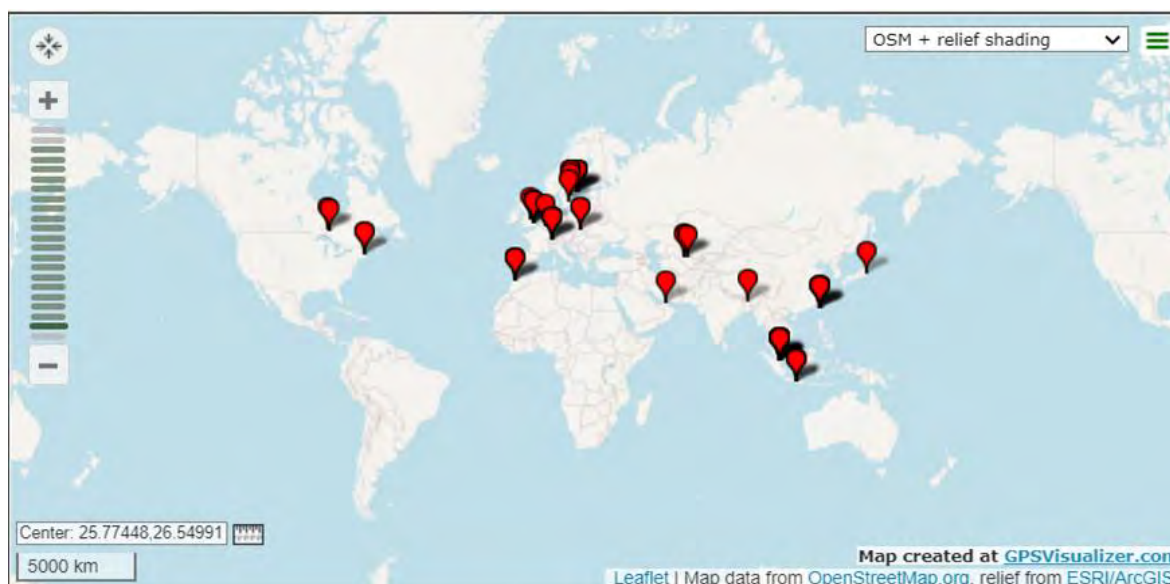

Figure 6. The geographical location of contributing authors

3.5. Content analysis findings
3.5.1. Method trends

Figure 7 shows that 53% articles employed quantitative methods, and 26% qualitative. Hence, only 5% employed mixed method, and 16% are experimental/systematic literature review. In the last three years, the most favored method is the quantitative method.
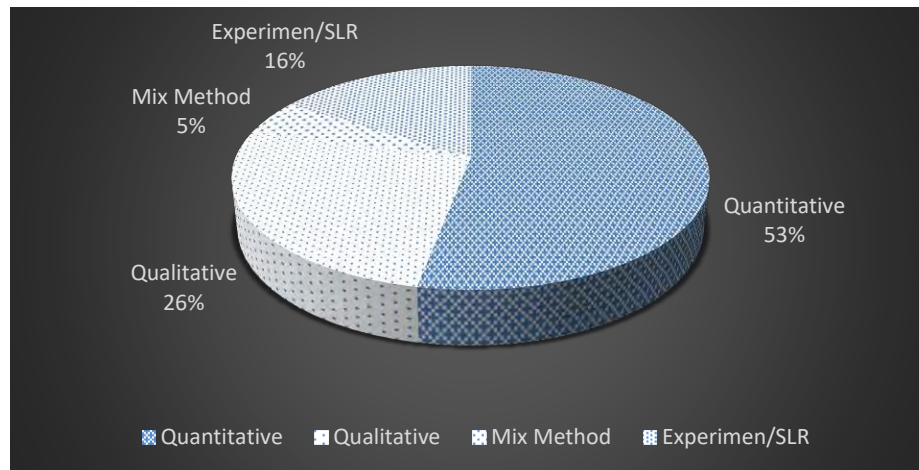
Figure 7. Frequency of use of research methods in the last three years

3.5.2. Data collection tools

The results appear that the most frequently used data collection tools in the last three years (2019-2021) are questionnaires 48%, surveys 4%, observation 9%, documentation 13%, interviews 22%, and SLR 4% as presented in Figure 8. The use of questionnaires increased in 2019-2020. The questionnaire became the most widely used data collection tool in this study.
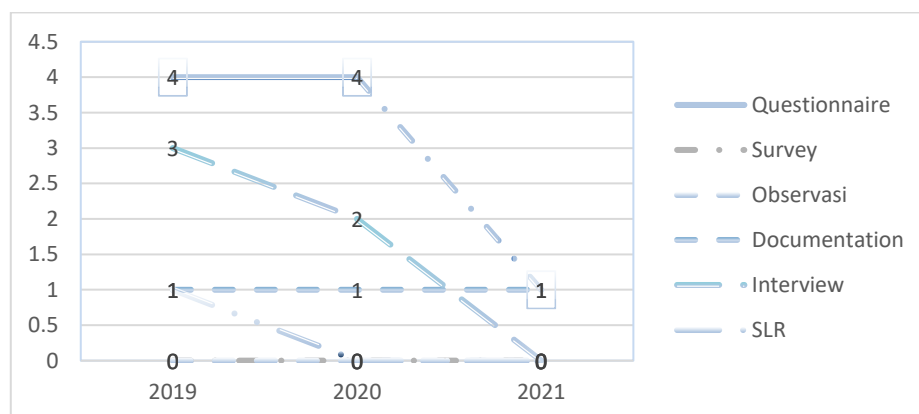

Figure 8. Distribution of research method by year

4. DISCUSSION

This research shows the trend of the most frequently used research methods in the last three years, based on bibliometric results in collaboration skills. The results of the bibliometric study in Figures 1 and 2 show that the most searched and used keyword is 'Collaboration.' In addition, there are 'impact' and 'development.' The study results show that most articles focus on skills and development. This finding aligns with the trend of must-have skills in the 21st century; specifically, skill enhancement can improve students' collaboration skills [43]. This finding emphasizes that research related to 21st-century skills has increased yearly. Researchers in the field of education have recognized the learning potential formed through collaboration in the classroom [44], [45]. Research by [46], [47] recommends that collaboration can improve students' learning outcomes. In recent years collaboration arrangements have made collaborative deployments quite common all over the world [26], [27], [48].

The findings are in Table 1. The top 10 citations show that the average with complete sources comes from the publishers jmir.org' and 'Elsevier. This confirms that the publisher is the largest and most recognized today. In Figures 3-4, it is known that the visualization on each item represents the words that are sought after. However, the word 'collaboration' looks green, meaning that these words have not been studied

much and still need much research in developing this research field in Figure 5. The analysis of the co-authors shows that 'Kyaw bm' is the author with the most contact with others. This is not surprising because they are probably the primary authors of the field of education. The results of the analysis of the distribution of authors by country are in Figure 6. This shows that, on average, the authors have spread throughout the world, but for most countries, they are still around the 'European' continent. These content analysis findings, Figure 7. Quantitative studies (53%) are the most widely used method in the last three years. This is because the quantitative method allows most researchers to test the effect of collaboration on other variables objectively. Further results support this assumption that qualitative (26%), mixed-method (5%), and experiment-literature review (16%) are the most preferred research methods. Quantitative methods are a favorite of researchers in use because quantitative methods can save time and costs. The mixed-method is deficient because it indicates that this study is difficult to do and takes more time [49]. Qualitative research is second favorite and most widely used. This is due to the increasing tendency to use quantitative and mixed studies in recent years [50], [51].

The findings are presented in Figure 8. It shows that the most frequently used data collection tools are questionnaires (48%), interviews (22%), documentation (13%), surveys (4%), and literature reviews 4%. The tendency to use quantitative partly results in most of the data being collected using questionnaires, so it is not surprising that research is a widely used data collection method. The use of interviews increased in 2019-2020. These findings are in order with research conducted by [52]. The most widely used data collectors are interviews [50]. However, it all goes back to factors that cause differences, such as the database, study variables, and methods used.

5.   CONCLUSION

Overall, this study showed that "21st-century skill, problem, and implementation" has become the most studied variable in the article. Some suggestions based on the findings of this study the authors present: i) This research only includes 31 articles filtered based on education; this is limited. It will be more complex if, in the future, researchers can add a large number; ii) This study only discusses one skill variable in the 21st century; it may be more useful in the future if other researchers can add and compare other skill variables; iii) This research only comes to the use of data collection methods and tools. It will be more in-depth if future researchers can discuss more deeply, such as samples and populations; iv) This research only focuses on the last three years. Recommend for those who will come to summarize more than three years of investigation to be able to discuss in-depth.

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