A bibliometric study of Rubrics in self – assessment

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Abstract:
Self-assessment in learning is an important skill that needs to be formed for students in the current teaching process. In order for students' self-assessment to take place regularly, it is necessary to have supportive assessment tools, in which rubric is considered an effective support tool in the self-assessment process. This article provides a bibliographic assessment of rubric's use in the learner's self-assessment process. Data were obtained from Scopus, where 69 databases related to the research issue from 2006 to 2021 were used.

Keywords: Rubrics, self – assessment, self – evaluation, formative assessment, education.

1. Introduction

Nowaday, Classroom teachers of the 21st century use Rubrics to assess everything from students' writing to their ability to follow prescribed directions(Rezaei & Lovorn, 2010). In the teaching process, the teachers always need to care about their students' skills and abilities and Rubrics can help all teachers and students deal with that. In today's educational environment of high stakes assessment, many educators regularly and confidently employ rubrics as a way to assess students' work. This is an indication that rubrics are highly regarded as tools that increase reliability and validity in assessment. It should be noted; however, that simple implementation of rubrics may not guarantee effective assessment(Breland, 1983), (*Developing Effective Success Rubrics: Kappa Delta Pi Record: Vol 41, No 3*, n.d.). Several researchers have reported that teachers' assessment is more reliable if a rubric is used (Jonsson & Svingby, 2007),(Silvestri & Oescher, 2006). A rubric is defined as a set of criteria for grading assignments. A rubric can be either holistic or analytical, or it may be a combination of the two. A holistic rubric is used to assess the overall quality of a student's response. Holistic rubrics are more product-oriented than process-oriented, and are primarily concerned with the total performance or product rather than with the individual steps taken to arrive at the final product (*Rubrics and Their Use in Inclusive Science - Kevin D. Finson, Christine K. Ormsbee, 1998*, n.d.). An analytic or multiple trait rubric consists of multiple, separate scales, and therefore provides a set of scores rather than just one. For example, a given writing assignment could be assessed with an analytic rubric made up of three scales wherein five points is given for creativity, four points is given for reasoning or critical thinking, and six points is given for sentence structure(Rezaei & Lovorn, 2010).

Evaluating publications about Rubrics in self - assessment allows the analysis of studies carried out from the roles to built a rubrics. Analyzing trends in research, perspectives and contributions of different actors is essential for assessing scientific literature concerning the development of rubrics in self – assessment. Using techniques applied to literature reviews can create an overview of the subject. Applications of systematic reviews in self - assessment are recent but have been shown to be effective in synthesizing knowledge about self - assessment literature and indicating priorities for future research.

This analysis is useful and important both for authors and for users such as teachers or students. For authors it is essential in order to understand the situation of the problem, new trends, and emerging areas, as this study can offer an overview of the research about rubrics in self – assessment. For users it is also important, as they need to be more informed in order to design, use and put into practice.

The main goal of this paper is to illustrate and carry out a bibliographic and visualization analysis of the literature related to Rubrics in self – assessment.

RQ1. *How many research-related publications were there in each year, from 2006 to 2021?*
RQ2. *What are the prominent keywords?*
RQ3. *What are the most important countries concerning the production of research papers in Rubrics in self – assessment?*

RQ4. *What the papers are the highest citation about rubrics?*

2. Method

2.1. Data source and procedure

Bibliometric co-citation analysis is a meta-analytical tool that demonstrates interconnections among research articles and topics(Cote et al., 1991);(Kim & McMillan, 2008). It enables researchers and authors to gain a clear view of the structure of the given field (*Bibliometric Methods in Management and Organization - Ivan Zupic, Tomaž Čater, 2015*, n.d.). In bibliometric review, the first step is to identify databases that help study (Albort-Morant & Ribeiro-Soriano, 2016). Scopus database was used to extract the data. Based on previous research into possibilities of obtaining information from digital libraries, the Scopus database was selected to link and analyse its content(Klapka & Slaby, 2018). Moreover, the database, in development for two years, was developed working with 21 research institutions and more than 300 researchers and librarians(Burnham, 2006). Therefore, Scopus is one of the most comprehensive peer-reviewed journal database and it can provide perfect scientific academic information.

All searches were performed on the Scopus database on 2 October 2022, and the data required for the bibliometric analysis were obtained and extracted. We decided to use a variety of documents in the database including articles, books, rubrics related articles, book chapters and other types of documents available in the database. The search terms include all documents containing the terms "Rubrics"AND " self assessment", OR "Rubrics" AND " self evaluation", OR "Rubric" AND "Formative assessment". Besides, in order to find complete information about journals, the time frame is not limited, but the first data we collected began to be recorded in 2006. And the language factor "English" as well as open source data are included in the search limit to ensure the universality of the research content.

2.2. Analytical methods and software

This research used data from the Scopus database. The reason for using this database was the fact that it was one of the two most widely recognized international databases, together with Web of science. VOSviewer software used to show the relationships as well as the tendency to use rubrics in process evaluation. VOSviewer can display maps constructed using any suitable mapping technique. Hence, the program can be employed not only for displaying maps constructed using the VOS mapping technique but also for displaying maps constructed using techniques such as multidimensional scaling. VOSviewer runs on a large number of hardware and operating system platforms and can be started directly from the internet (Eck & Waltman, 2009). This is especially suitable when visualizing large maps, is easy to interpret and is most commonly used to create maps based on network data(Jeong et al., 2016).
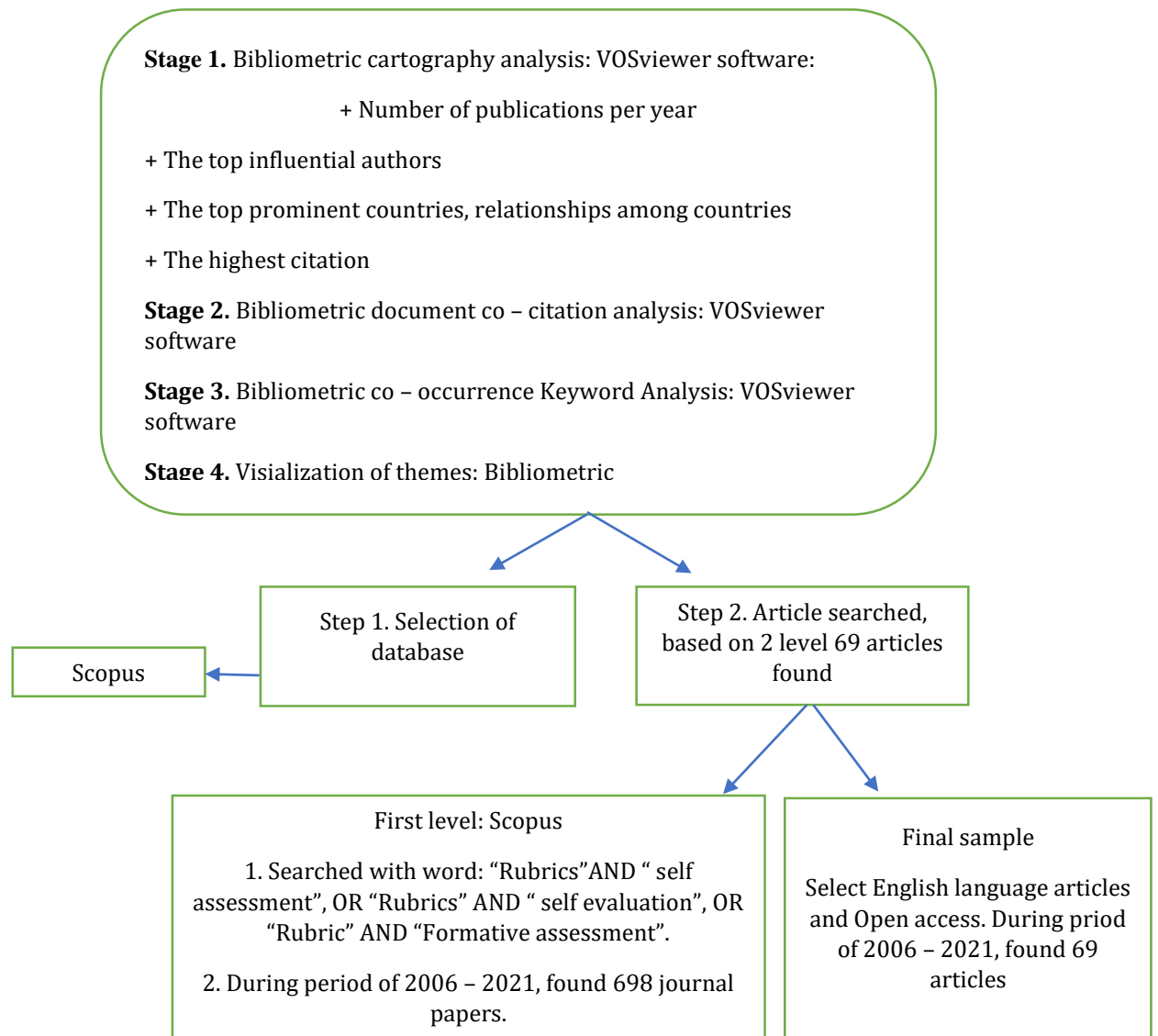
Stage 1. Bibliometric cartography analysis: VOSviewer software:

+ Number of publications per year

+ The top influential authors

+ The top prominent countries, relationships among countries

+ The highest citation

Stage 2. Bibliometric document co – citation analysis: VOSviewer software

Stage 3. Bibliometric co – occurrence Keyword Analysis: VOSviewer software

Stage 4. Visialization of themes: Bibliometric

Step 1. Selection of database

Scopus

Step 2. Article searched, based on 2 level 69 articles found

First level: Scopus

1. Searched with word: "Rubrics"AND " self assessment", OR "Rubrics" AND " self evaluation", OR "Rubric" AND "Formative assessment".

2. During period of 2006 – 2021, found 698 journal papers.

Final sample

Select English language articles and Open access. During priod of 2006 – 2021, found 69 articles

Figure 1. Methodological approach (Author's Presentation).

3. Result and Discusstion

RQ1. *How many research-related publications were there in each year, from 2006 to 2021?*
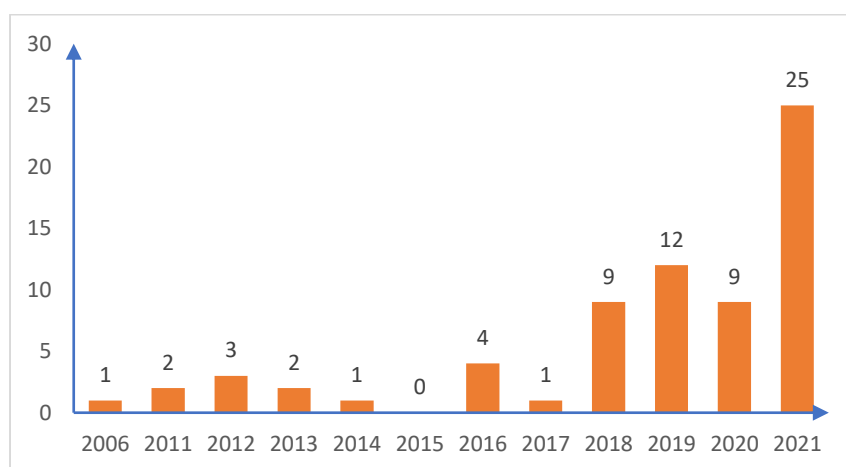

Figure 2. Total of studies by year

From 2006 to 2021, it can be divided into 2 periods with marked differences in the number of publications related to Rubrics in self-assessment. Looking at the chart, it can be seen that from 2006 to 2015 the number

of research papers is always low, averaging less than 4 articles. From 2006 to 2012 the number of studies tended to increase slightly from 1 to 3 articles, then this number decreased to 1 article in 2014, especially in 2015 there were no research papers on Rubrics in self - assessment. However, from 2016 to 2021, there is a strong growth in the number of studies on this issue. In 2016 there were 4 publications, this number was 1 in 2017, but by 1 year later this number increased 9 times, and continued to record an increase to 12 publications in 2019. Only one year later, the number of publications increased to 12 publications. The number of research papers is only 9, equivalent to the number of research articles in 2018. The last year of the research period saw a tremendous growth of up to 25 articles, 25 times more than the first research and 2.1 times the year. 2019, the year recorded with the second most research papers after 2021.

RQ 2. *What are the prominent keywords?*

The keyword study observes the distribution of the most frequent keywords. This analysis was developed through keywords co-occurrence. The aim was to visualize the state of the art and the trends of the main research topics in the area of rubrics in self - assessment. Specifically, this study focused on the author keywords appearing below the abstract. From this data, Figure 3 shows the main keywords and the size of the nodes (the larger the keyword and the node, the more papers the keywords appeared in). The lines show the frequent co-occurrence of keywords together in the diverse papers, while the shorter the distance between the nodes, the stronger the relationship these keywords have relatively, comparing co-occurrence with other keywords (Garrigos-Simon et al., 2019). The terms associated with the keyword Rubrics in self - assessment include human, self – evaluation, medical student, students, medical, curriculum, assessment, students, formative assessment, rubrics, learning, article.
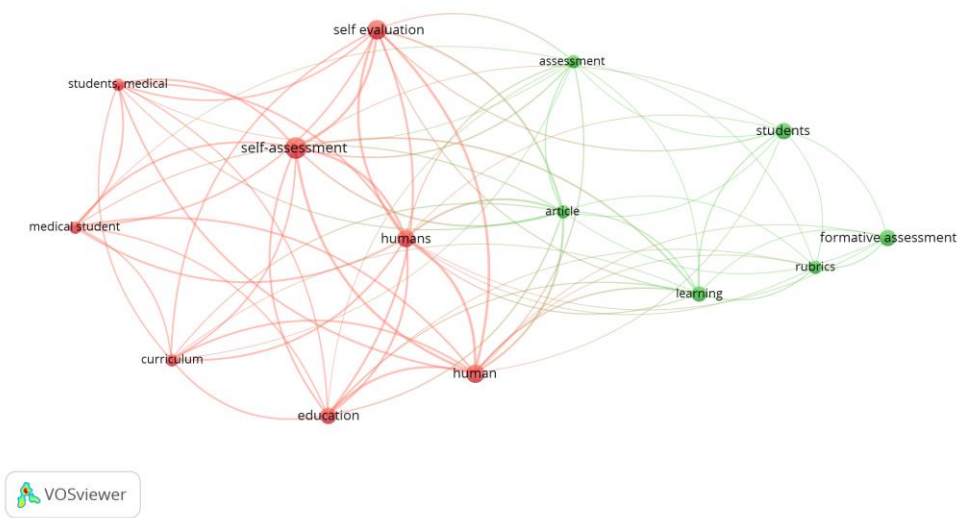

Figure 3. *Co-occurrence network of author keywords of Rubrics in self – assessment related publications*

RQ3. *What are the most important countries concerning the production of research papers in Rubrics in self – assessment?*

There are many countries doing research on this issue. However, in the scope of the study, the author only shows in Figure 3 the countries with 2 or more related documents. From the picture above, it is not difficult to see that the United States is the country with the largest number of publications with 18 research papers related to this issue. This number is 9 times higher than other countries with only 2 publications, completely overwhelming other countries such as Belgium, Brazil, Russia and Lebanon. Occupying second place is Spain with 8 (11.6%) of the total number of research papers, but this number is still much lower than the United States to 10 articles. In third place is Indonesia with 7 (10.1%) of the total number of research papers. The 4th and 5th places go to Colombia (6 cards) and Canada (5 songs respectively). Two articles less than Canada is Austria, with the same number of publications belonging to the remaining countries of Belgium, Brazil, Russia

and Lebanon. Among the 10 countries with the highest number of publications on Rubrics in self-assessment, mainly the Americas (4/10 countries), then Europe and finally Asia and Oceania.
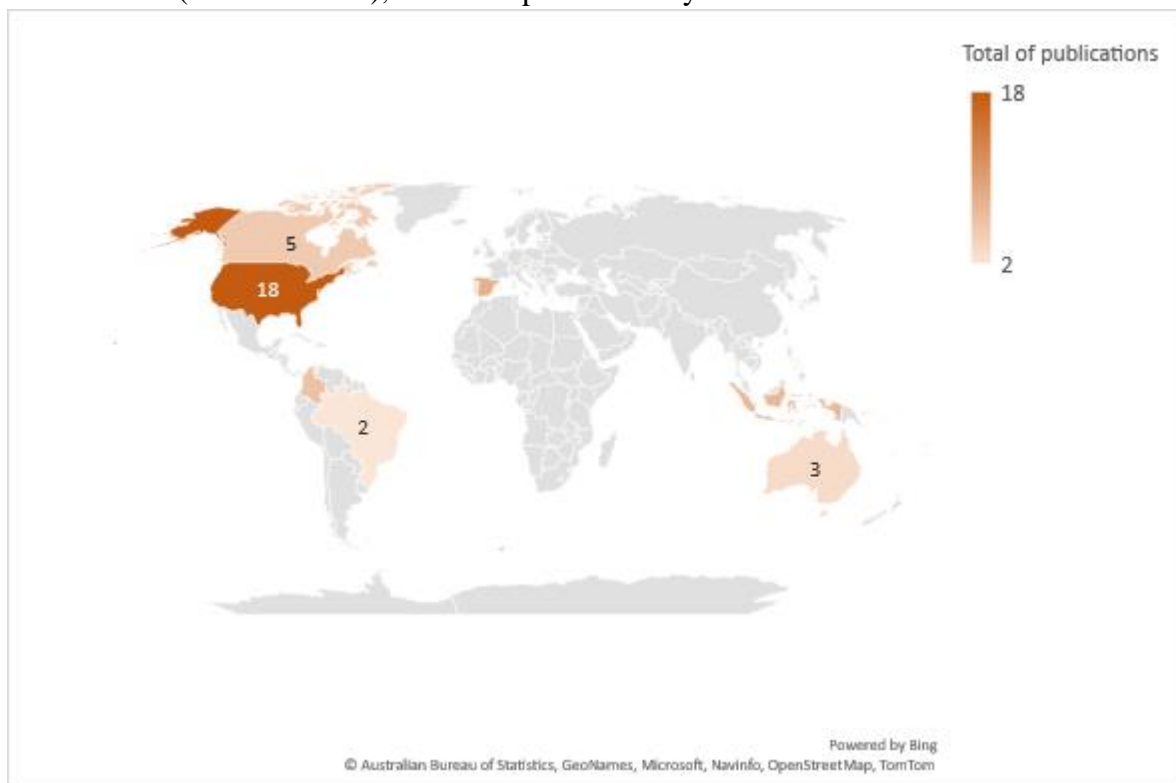
Belgium	Brazil	Russian	Lebanon	Australia	Canada	Colombia	Indonesia	Spain	United States
2	2	2	2	3	5	6	7	8	18

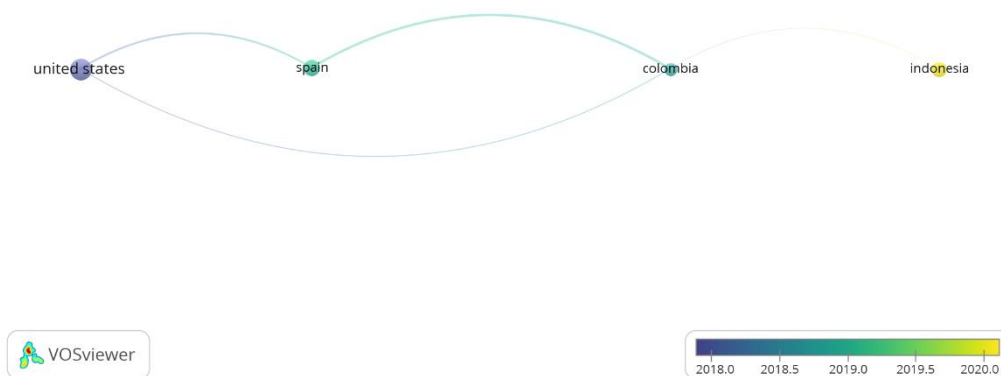*Figure 3. The countries concerning the production of research papers in Rubrics in self – assessment*

Figure 4. Network Visualization of Country Research

Figure 4 shows the relationship between countries when conducting research. From the 10 countries collected, there are only 4 countries that have connectedness, namely i) Cluster 1 contains United States and Spain, ii) Cluster 2 contains Spain and Colombia, iii) Cluster 3 contains Colombia and Indonesia and iv) Cluster 4 contains United States and Colombia.

From the 4 countries that are involved and interconnected. United States has 1 link, which is connected to Spain, Spain is connected to Colombia, Colombia has 1 link with Indonesia but the link shown weak compare with other links. Beside, United States is connected to Colombia. This shows that the articles related to the materials published in the journals that we study are international in scale and have connections between one country and another. Overlay visualization shows the relationship between countries accompanied by the time the research is updated.

RQ4. *What papers are the highest citation about rubrics?*

Regarding the most influential papers in the field of Rubrics in self - assessment. Table 1 presents the top 11 papers with the most citations and their characteristics. An examination of the number of citations reveals the quality of a document, and also its popularity and influence within a research field (Blanco-Mesa et al., 2017).

The article wrote by Etkina E and many others was ranked in the first position for the number of citations (148) in the area of Rubrics in self – assessment. This document analyzed a set of formative assessment tasks and rubrics that were developed for use in an introductory physics instruction to help students acquire and self-assess various scientific process abilities(Etkina et al., 2006). The second most cited paper, (36 citations) was a paper by Kanthan R., Senger J.-L.B. This number was 4.1 times less than the first rank. The aim of this study was to determine the extent of students' awareness and understanding of the reflective process and the meaning of 'self-reflection' within the contextual framework of their learning environment in the first-year of their medical/dental education (*An Appraisal of Students' Awareness of "Self-Reflection" in a First-Year Pathology Course of Undergraduate Medical/Dental Education | BMC Medical Education | Full Text*, n.d.). The third position belongs to Ramia E et al with 25 citations, the paper indicated assess whether the personal and professional development (PPD) subdomains (self-assessment, leadership, innovation and entrepreneurship, and professionalism) are integrated in a pharmacy curriculum(Ramia et al., 2016). The next positions saw much fewer citations from 11 to 23 in 7 years (2012 – 2019).

Table 1. Top 11 papers with the highest citations in Rubrics

Rank	Journal	Articles	Authors	Year	TC
1	Physics Education Research	Scientific abilities and their assessment	Etkina E., Van Heuvelen A., White-Brahmia S., Brookes D.T., Gentile M., Murthy S., Rosengrant D., Warren A. (Etkina et al., 2006)	2006	148
2	BMC Medical Education	An appraisal of students' awareness of "self-reflection" in a first-year pathology course of undergraduate medical/dental education	Kanthan R., Senger J.-L.B.(*An Appraisal of Students' Awareness of "Self-Reflection" in a First-Year Pathology Course of Undergraduate Medical/Dental Education | BMC Medical Education | Full Text*, n.d.)	2011	36
3	BMC Medical Education	Mapping and assessment of personal and professional development skills in a pharmacy curriculum	Ramia E., Salameh P., Btaiche I.F., Saad A.H.(Ramia et al., 2016)	2016	25
4	Eurasia Journal of Mathematics, Science and Technology Education	An Adaptive e-learning system for enhancing learning performance: Based on dynamic scaffolding theory	Wu C.-H., Chen Y.-S., Chen T.-C.(Wu et al., 2017)	2018	23
5	Journal of Writing Research	Evaluative misalignment of 10th-grade student and teacher criteria for essay quality: An automated textual analysis	Varner L.K., Roscoe R.D., McNamara D.S.(Varner et al., 2013)	2013	19
6	Journal of Interactive Media in Education	Using semantic technologies for formative assessment and scoring in large courses and MOOCs	Lancho M.S., Hernández M., Paniagua Á.S.-E., Encabo J.M.L., De Jorge-Botana G.(Santamaría Lancho et al., 2018)	2018	15

7	Comunicar	eRubrics in cooperative assessment of learning at university	Cebrian-De-La-Serna M., Serrano-Angulo J., Ruiz-Torres M.(Cebrián de la Serna, 2014)	2014	13
8	BMC Medical Education	Improving clinical judgment by simulation: A randomized trial and validation of the Lasater clinical judgment rubric in Chinese	Yang F., Wang Y., Yang C., Zhou M.H., Shu J., Fu B., Hu H.(Yang et al., 2019)	2019	12
9	Eurasia Journal of Mathematics, Science and Technology Education	Effects of simulation-based formative assessments on students' conceptions in physics	Park M.(Park, 2019)	2019	11
10	Journal of Writing Research	Eliciting formative assessment in peer review	Goldin I.M., Ashley K.D.(Goldin & Ashley, 2012)	2012	11
11	International Journal of Environmental Research and Public Health	The COPEWELL rubric: A self-assessment toolkit to strengthen community resilience to disasters	Schoch-Spana M., Gill K., Hosangadi D., Slemp C., Burhans R., Zeis J., Carbone E.G., Links J.(Schoch-Spana et al., 2019)	2019	11

TC: Total citations

4. Conclusion

The article went to learn about the use of Rubrics in self-assessment and found that after 2015 there were quite a few studies focusing on this issue, in which the United States was considered the most typical country with many works. research, however, between countries, there is relatively little linkage or collaboration between the authors in the research. With the keyword highlighted, research has shown that research trends on process assessment with students and medical students are the subjects that use a lot of rubrics in self-assessment. And finally, understanding research papers with a high citation rate will help future researchers learn the strong theoretical bases of the research problem.

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