The analysis of article citation in science education journals

by E. N. Savitri

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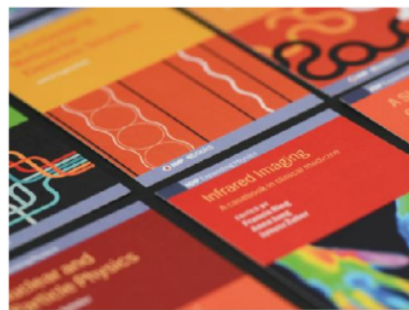
The analysis of article citation in science education journals

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Abstract. This research intends to analysing the citation of articles that have published in science education journals indexed by SINTA (Science and Technology Index). The research objects were 19 journals that rated Sinta 1 to 6. The articles were analysed descriptive-qualitatively through Google Scholar. There were six aspects of analysis including (1) number of citations; (2) average citation; (3) the most-cited article; (4) the least-cited article; (5) the most-cited theme; and (6) the least-cited theme. The analysis revealed that the highest citation was articles published in Jurnal Pendidikan IPA Indonesia with a total citation of 2,679 from 2012 to 2019. The lowest number of citations was in Spectra: Jurnal Kajian Pendidikan Science, for having nine citations within two years. The most-cited article reached 178 citations. However, most of the published articles have not been cited yet. Moreover, the most-cited theme was a science learning strategy. In conclusion, the articles published in journals of science education were in a low category because the average of articles citing is less than 10.

1. Introduction

The number of science education journals indexed in SINTA (Science and Technology Index) needs to be traced in order to obtain valid data about the number of journals that existed up to 2019. The keywords used were *Jurnal Pendidikan sains* and *Jurnal Pendidikan IPA*. Up to September 2019, there have been 2,921 science education journals in SINTA. This number is quite small for a big country like Indonesia; therefore, the manuscripts were assumed to have a high rate of citation. This assumption was analyzed in this study, so that information about the level of citation of articles published in science education journals is obtained. Referring to Lu et al. [1] citation of articles that have been published in journals depends on the quality of the article. Moreover, the impact of findings on the development of a scientific field determines how much the potential citation of an article [2].

The Indonesian researchers' quality of articles demands enhancements as the same classic problems are commonly found articles that have been published in various journals [3]. Based on the experience of reviewing articles for journal accreditation, the quality of articles is seen thoroughly starting from the introduction, methods, results and discussion, conclusions, and bibliography/references. The main weakness of the introduction is the lack of gap analysis, which could not be found in most of the education articles. The research method explanation is too short and lack of elucidation about the instruments to collect research data. The delivery of research results should be more attractive, and discussion should insert similar references used to juxtapose the obtained results. Conclusions are still limited to answering the problem formulation. Finally, the reference listed are the lack of primary sources. These minor qualities would result in a low rate of citation [4].

Articles published in a frequently-cited journal have an impact on the number of journal entries. The number of journal visitors is essential to increase author and reader access to a journal. The high level of visits illustrates the community's demand for the article published in a journal [5]. Referring to an article, which then listed in the references section, is a way of spreading the researchers' findings. In other words, the citation is a dissemination process of the researchers' ideas. Article citations determine the amount of article's site scores calculated based on the division between the cited articles and the number of articles published each year. A 'healthy' journal should possess a more significant number of citations than the number of articles published.

References in various scientific papers originate mostly from journals and books [6]. The journal ranks first as a cited reference, and this shows the quality of articles that have been published in the journal. The number of articles in various national and international journals provides a wide choice for each writer to obtain the required information. A scientific article is up-to-date to recent issues; then, it is more desirable than other reference sources. Furthermore, citation sourced from an electronic journal makes it easy to trace the truth of the cited information. As Arianto [7] said that electronic journals have easy access to trace so that every article published is quickly noticed for those who are willing to cite. Moreover, the advantage of articles published through electronic journals is higher than that of publishers of non-electronic journals because of its practical access.

The higher the level of citations, the greater the journal's reputation. Every journal manager surely hopes that the published articles will be useful for writers and readers, and exceedingly, for the journal and scientific field development. It goes without saying, the rate of citation will bring about the most-demanded topics, which reflect the current trend of research [8-9].

Citation needs to be done carefully, especially on how to quote as citation errors could result in the withdrawal of articles from a journal [10]. Error quoting may occur following the lack of knowledge about writing [11]. It is a state when researchers do not thoroughly read the full content, but fractions of sentences only — proper quoting means neither adding and nor subtracting truth from the source. Citation errors potentially cause problems in writing references as there could be a mismatch between the cited information from the reference source used.

Analysis conducted by [12] and [13] revealed that citation might cause potential changes in information from the first source to the next source. This change of information could result in misleading information. Thus, it is recommended to cite the primary source and improve the literacy of citation for researchers, mainly novice authors. Such literacy is required for the authors to get to know citation strategies and the impacts of incorrect citation [14].

Citation analysis is necessarily performed to determine the contribution of research findings to the development of science field [15]. The primary purpose of citation relates to article content as the more critical the findings, the higher the citation opportunities. Articles referring to quality references are more attractive to readers [16, 17]. Therefore, journal managers have to take into account the references taken in each article published in it. Research having remarkable findings is more likely preferred to be cited [18-19].

This research intended to carry out an analysis of citations on articles published in scientific journals. The analysis was limited to nationally accredited journals or indexed by SINTA. The authors expect that the research results could be referred to as a reflection for researchers in the science field, primarily in improving the quality of scientific papers. This research can also be used as input for journal managers in examining the articles submitted to their journals.

2. Research Methods

The study employed a qualitative approach referring to Afrizal [20]in which the citation of articles published in journals was examined. The data were gathered from SINTA (Science and Technology Index) and each journal website. SINTA provides several needed data such as Journal name, SINTA level, impact factor, H5-Index, and H-Index. On the other hand, the data taken from the website included the annual number of issues and the annual average number of articles. Keywords of *Pendidikan sains* and *Pendidikan IPA* were inputted in SINTA to determine the targetted journals.

Each journal was checked its SINTA level and the total number of citations from publication to September 2019.

The category of citation level was determined to refer to the guidelines for the evaluation of SINTA's journal accreditation published by Kemenristekdikti [21]The number of citations is 'high' if the article citation is > 25; 'moderate' if the citation is 11-25; 'low' if the citation is 6-10, 'less' if the citation is 1-5, and none if the citation is 0.

Visitation to each science education journal's website was done to record the number of issues and the annual average number of articles. The number of publications was counted from each number and volume, while the average number of articles published per year was known by examining each number and volume to calculate the number of articles published and then averaged. The number of articles published each year was collected in order to obtain data about the average number of articles published per year. This average was computed by dividing the number of articles published with the annual number of publications. The data obtained were presented in tabular and graphical form.

The SINTA website, which was used as the primary source of research data, is displayed in Figure 1.
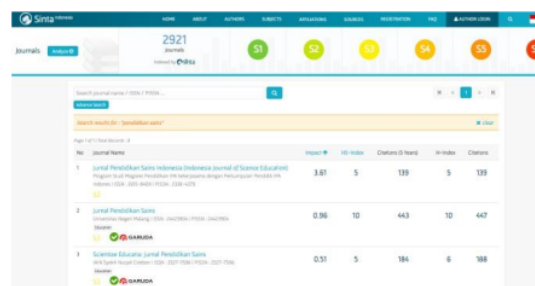
Figure 1. Journals of Science Education in SINTA [22]

The analysis from the SINTA website was followed up by visiting the website of each journal. The examples of the journal's main page are as presented in Figure 2.

Figure 2. The Examples of Targeted Journal's Main Page

3. Results and Discussion

Nineteen journals were detected in SINTA using the keywords of *Pendidikan sains* and *Jurnal Pendidikan IPA*. The exploration of each journal's website concerning the annual number of publications and the average number of articles is presented in Table 1.

Table 1. The Number of Articles Published in Science Education Journal Indexed by SINTA

Journal Title	Number of Issues per Year	Average Number of Articles per Year
Jurnal Pendidikan IPA Indonesia	4	60
Jurnal Inovasi Pendidikan IPA	2	24
JIPVA (Jurnal Pendidikan IPA Veteran)	2	16
JPP-IPA (Jurnal Penelitian Pendidikan IPA)	2	20
Jurnal Pendidikan Sains Indonesia	2	16
Jurnal Pendidikan Sains	4	20
Scientiae Educatia: Jurnal Pendidikan Sains	2	16
SEJ (Science Education Journal)	2	10
SOSIO-DIDAKTIKA: Social Science Education Journal	2	20
Unnes Science Education Journal	3	36
Journal of Innovative Science Education	2	30
JPPIPA (Jurnal Penelitian Pendidikan IPA)	2	20
Natural: Jurnal Ilmiah Pendidikan IPA	2	16
JPPS (Jurnal Penelitian Pendidikan Sains)	2	18
Edu Sains: Jurnal Pendidikan Sains & Matematika	2	12
Quantum: Jurnal Inovasi Pendidikan Sains	2	24
Jurnal Pendidikan Sains (JPS)	2	22
PSEJ (Pancasakti Science Education Journal)	2	14
Spektra : Jurnal Kajian Pendidikan Sains	2	16

All of the listed journals publish twice a year minimally and have minimally five articles. The rank of the nineteen journals based on the SINTA level, impact factor H5-Index, H-Index, and Citations are presented in Table 2.

Table 2. The rank of Science Education Journal Indexed by SINTA [23]

Journal Title	Sinta level	Impact	H5-Index	Citations (5 Years)	H-Index	Citations
Jurnal Pendidikan IPA Indonesia	S1	4.36	26	2573	27	2689
Jurnal Inovasi Pendidikan IPA	S2	2.6	11	419	11	421
JIPVA (Jurnal Pendidikan IPA Veteran)	S3	1.57	3	58	3	58
JPP-IPA (Jurnal Penelitian Pendidikan IPA)	S3	0.57	5	131	5	135
Jurnal Pendidikan Sains Indonesia	S3	3.44	5	132	5	132
Jurnal Pendidikan Sains	S3	0.91	10	433	10	437
Scientiae Educatia: Jurnal Pendidikan Sains	S3	0.51	5	179	5	183
SEJ (Science Education Journal)	S3	3.5	1	19	1	19
SOSIO-DIDAKTIKA: Social Science Education Journal	S3	0.38	10	455	10	456
Unnes Science Education Journal	S3	0.32	12	703	13	723
Journal of Innovative Science Education	S3	0	7	267	7	297
JPPIPA (Jurnal Penelitian Pendidikan IPA)	S4	2.2	3	42	3	42
Natural: Jurnal Ilmiah Pendidikan IPA	S4	0.59	3	31	3	31

JPPS (Jurnal Penelitian Pendidikan Sains)	S4	0.84	4	96	4	96
Edu Sains: Jurnal Pendidikan Sains & Matematika	S4	0.06	4	46	4	47
Quantum: Jurnal Inovasi Pendidikan Sains	S4	0.42	4	87	4	90
Jurnal Pendidikan Sains (JPS)	S4	0.06	4	46	4	47
PSEJ (Pancasakti Science Education Journal)	S4	0.85	4	52	4	52
Spektra : Jurnal Kajian Pendidikan Sains	S5	0.32	2	12	2	12

Journals indexed by SINTA are ranked in a various level so-called SINTA level. Those nineteen science education journals are categorized in various SINTA levels. There are three journals classified, respectively, in SINTA 1, 2, and 5 each. Moreover, nine journals are included in SINTA 3, and seven journals ranked in SINTA 4. The number of articles published and the total number of citations are displayed in Table 3.

Table 3. The Number of articles and citations [24]

Journal Title	Number of articles	Number of citations	Average of Citation
Jurnal Pendidikan IPA Indonesia	462	2689	5,8
Jurnal Inovasi Pendidikan IPA	54	421	7,8
JIPVA (Jurnal Pendidikan IPA Veteran)	36	58	1,6
JPP-IPA (Jurnal Penelitian Pendidikan IPA)	101	135	1,3
Jurnal Pendidikan Sains Indonesia	158	132	0,8
Jurnal Pendidikan Sains	56	437	7,8
Scientiae Educatia: Jurnal Pendidikan Sains	138	183	1,3
SEJ (Science Education Journal)	50	19	0,4
SOSIO-DIDAKTIKA: Social Science Education Journal	128	456	3,6
Unnes Science Education Journal	273	723	2,6
Journal of Innovative Science Education	126	297	2,4
JPPIPA (Jurnal Penelitian Pendidikan IPA)	101	42	0,4
Natural: Jurnal Ilmiah Pendidikan IPA	79	31	0,4
JPPS (Jurnal Penelitian Pendidikan Sains)	102	96	0,9
Edu Sains: Jurnal Pendidikan Sains & Matematika	132	47	0,4
Quantum: Jurnal Inovasi Pendidikan Sains	162	90	0,6
Jurnal Pendidikan Sains (JPS)	187	47	0,3
PSEJ (Pancasakti Science Education Journal)	50	52	1,0
Spektra : Jurnal Kajian Pendidikan Sains	63	12	0,2

The comparison of citation between the nineteen journals is given in a graphical form, as in Figure 1.
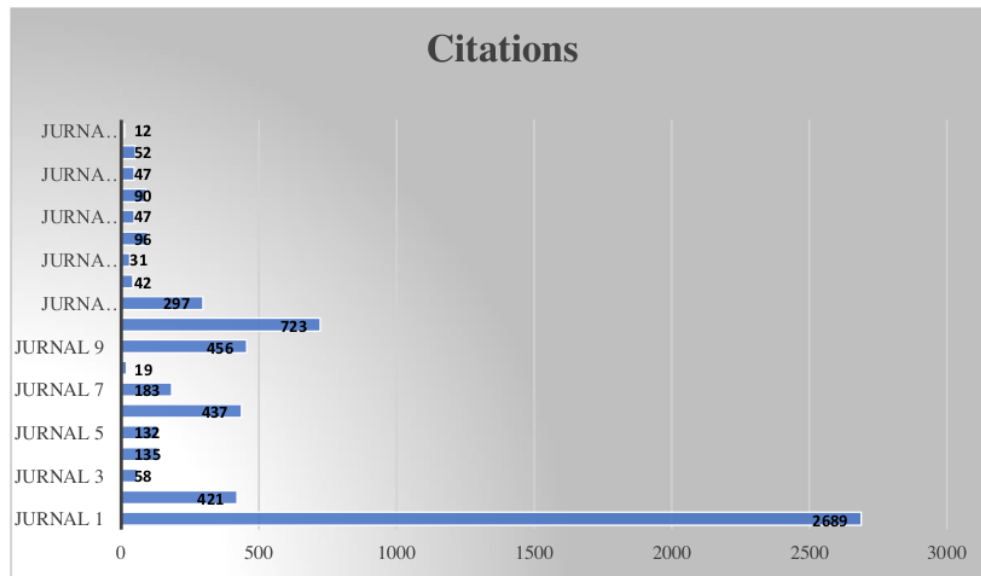
Figure 3. Citations of Science Education Journals Indexed by SINTA

The citation rate is varied. The SINTA 1 journal is preferably referred, which means that the higher the SINTA level, the greater the chance of articles to be cited. On the other hand, the SINTA 5 journal has the least article citation number, which also reflects the readers' higher level of trust in articles published in higher-level journals.

The number of issues and the average number of articles are closely related and direct proportional. However, these two aspects have nothing to do with the citation numbers. This is supported by Royle et al. [25], who stated that a large number of articles published in a journal has no relationship with the high average citation of articles published. There are several journals whose number of articles is low but has a high sensitivity. This phenomenon occurs as a result of 'natural' article citation done by researchers while arranging their scientific papers, or other forms of the research report. The citation should not be directed by anyone who becomes the authority of each person, depending on the needs of information. The rate of an article's citation number strongly relies on the quality of the contents.

Articles published in journals that rank in SINTA 1, SINTA 2, and SINTA 3 have relatively higher citation average than those published in journals having the lower SINTA level. However, the citation rates of the nineteen journals were categorized as low, keeping in mind that only two journals have a moderate citation level. Generally, a scientific article published has only been cited less than five times. Many factors may cause the low rate citation, and one of them, according to Rigby et al. [26], is the lack of novelty for the development of the field of study and the research finding specifications. This low citation reflects the overall quality of the journal. Therefore, journal managers and reviewers have to perform a rigorous review of the submitted article primarily based on the novelty as this is the central aspect seen from research.

Science education journals with a significant impact factor have a high citation rate. Given an example of *Jurnal Pendidikan IPA Indonesia*, which possesses 4.36 impact factor, 26 H5-Index, and achieves SINTA 1 level. This accomplishment indeed describes the quality of articles published in it primarily on the novelty, which attracts readers to cite. The best way to increase the citation rate of an article is by highlighting the critical finding of the article [27].

The analysis of nineteen science education journals has revealed that articles published in them have a relatively low rates of citation. Thus, journal managers must review the published articles' citation as a reference for publishing the next articles. It may take quite a long time to escalate the citation number, and it depends on the journal managers' strong desire and tenacity to maintain and improve the quality by performing a strict selection and review process. As the quality of the article improves, citation number would no longer be worried about as readers will naturally cite without any suggestion given from the journal managers, which has been a severe violation of publication ethics. This analysis has strengthened the importance of researchers' awareness to submit articles in journals that have not been indexed by SINTA, or those are in the low SINTA level.

4. Conclusion

Scientific articles published in science education journals were said to have a low rate citation as they generally scored less than 10. This low rate reflects the article's quality that has to be improved. The journals rank in SINTA 1 and SINTA 2 averagely have a better quality of article and citation number when compared to journals rank lower in SINTA. A strict review process has undoubtedly contributed to the article citation rate.

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