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How Are Research Trends on Reading Activity in Science Learning? Tracking from 2000 to 2019 on Selected Journal

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Abstract: The number of studies and researchers in the science education field is constantly increasing from year to year. It makes research about article review very important because it helps researchers determine the research orientation. In this study, a research review was conducted on reading activities in science learning. There have been several studies on tracking research trends in science education in recent years, but there has not been any detailed discussion about reading activities in science learning. Therefore, it is necessary to know the development trends of research on reading activities in science learning. In this study, we analyze 74 articles published from 2000-2019 using the open-coding system. By using a search engine, it is done by entering one keyword or a combination of several keywords, include reading, a variety of "reading and text," "reading and science text," "reading and textbook," "reading, text, and science." The results showed that there were still many empty things that the researchers had not studied. The United States dominates the average researcher with a primary focus on reading comprehension. In terms of participants, research is dominated by involving students in schools (although the numbers are still small), with the variables studied are dominated by reading comprehension. This research can help researchers find gaps in research that have not been carried out related to reading activities in science learning.

INTRODUCTION

The research will be meaningful if it is published. Through publication, research results can be read by other people/other researchers. Publication of research results can be done through journals. In this case, journals have a critical role in disseminating and validating research results (Milne et al., 2015).

In making publications, researchers must have a big motivation because publications must be done consistently. This is because scientific publications conducted by researchers can advance academic careers for themselves (Tsai & Wen, 2005). However, scientific publicity activities are not easy for researchers (McGrail et al., 2006). Some researchers sometimes have difficulty carrying out ongoing research activities and have novelty compared with other researchers.

A research work published in a research journal will be reviewed by experts who have the same field of expertise. Therefore, research results published in scientific journals have been directly accepted by the scientific

community in their area (Henson, 2001). The research results in scientific journals will be beneficial in providing an overview for similar research to be carried out in the future (Gilbert et al., 2002).

In recent years, there have been several studies on tracking research trends in science education (Lee et al., 2006; Lin et al., 2014; Lin et al., 2019; Teo et al., 2014; Tsai & Wen, 2005). Based on the analysis results, there has not been any detailed discussion on developing research trends regarding reading activities in science learning. Reading activities are critical in science learning, so it is necessary to carry out many research studies about it (Alexander et al., 2012; Tenopir et al., 2009). In addition, research on reviewing articles in specific fields will be vital in developing research in related fields in the future (Chang et al., 2010; Lee et al., 2009; Tsai, 2005).

Therefore, based on the explanation above, this research focuses on tracking research articles on reading activities in natural science learning. Tracking is carried out on articles published between 2000 and 2019. Specifically, this research was conducted to investigate the focus of research that became the center of attention by researchers about reading activities in science learning. Research is focused on science learning because the science learning process has only been related to laboratory activities and mathematical calculations. Besides, an analysis was also carried out on the number of study distribution in several areas and the analysis of materials used as tools in the research process. The purpose of this study was set to know the description of the research that researchers have not done. There are six research questions: (1) How is the number of research publications development in reading activities on science learning from the year 2000 – 2019?; (2) Which countries have contributed to researching reading activities on science teaching from 2000 – 2019?; (3) Who was anyone participates in research activities of reading activities on science learning from 2000 - 2019?; (4) What variables in the main focus of reading activities on science teaching from 2000 - 2019?; (5) How is the distribution of research about reading activities on science learning from 2000 - 2019 if viewed from scientific subjects?; (6) What materials are taught in research activities of reading activities on science teaching from 2000 - 2019?

METHOD

Search Strategy

In this study, an article review was conducted. The researchers analyzed 74 articles published from 2000 - 2019 and indexed by the web of science. The keywords or a combination of several keywords were entered into the search engine. In this research, article tracking is carried out in the web of science indexing with the following categories: (1) Journal is included in the Social Science Citation Index (SSCI) indexation category; (2) Journal entry in the category of Education & Educational Research; (3) Journals are written in English; (4) Journals have a high impact factor. However, tracking is also carried out in the direct science database by limiting the search for keywords.

The researchers are entering a keyword or a combination of several keywords on the search engine, such as reading, a combination of reading and text, a combination of reading and science text, a combination of reading and textbook, a combination of reading, text, and science. The combination was carried out to aim that the articles obtained were more specific following the field of study. The results of searching journals and articles can be seen in Table 1.

Table 1. Article Tracking Results.

Journals	Tracking Results	Matched Tracking Results
International Journal of Science Education (IJSE)	36	31
International Journal on Science and Mathematics Education (IJMSE)	13	13
Science Education (SE)	12	6
Journal of Research on Science Teaching (JRST)	5	4
Others (On Science Direct Data Base)	8	7
Numbers	74	61

Data collection

The article selection process can be seen in Figure 1. After entering keywords or keyword combinations, 74 articles were selected. Then, from the 74 articles, the researcher reviewed the title and abstract of the article. The activity was carried out to choose the selected papers based on the scope of the research conducted, i.e., reading activities on science learning. Based on the results of the studies, the process produced 61 articles that were completed. In this study, the research stages were divided into four phases. The settings carried out in these 4 phases can be seen in Figure 1.

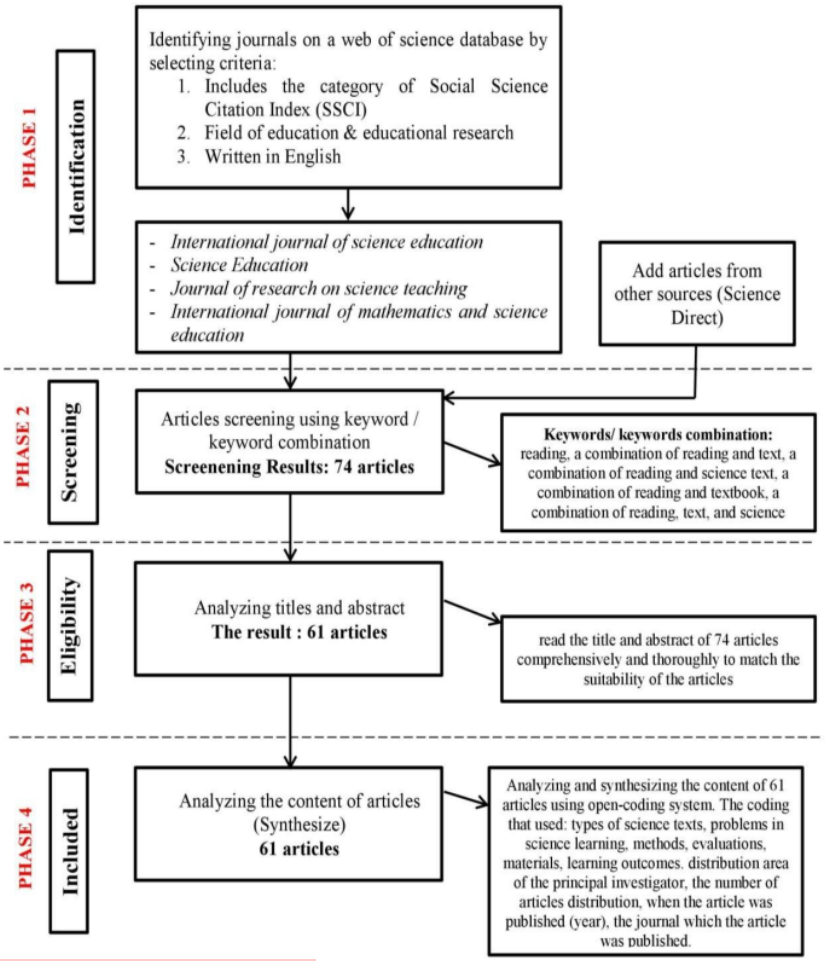

Figure 1. Article Selection Flow Chart for the Review Process.

Data analysis

Articles are analyzed using the open-coding system. The articles collected are then coded according to the appropriate category. This coding is carried out with the aim that the articles can be quantified according to specific criteria. Coding used includes several topics related to research science learning reading activities: types of science texts, problems in science learning, methods, evaluations, materials, learning outcomes (cognitive, affective, skill), and participants (students in the school/ students in the University). Other categories used are the distribution area of the principal investigator, the number of articles distribution, when the article was published (year), the journal in which the article was published. Specific sub-categories for some of the topics mentioned are shown in the results.

RESULT AND DISCUSSION

This research focuses on the articles that examine natural science learning reading activities, published in the year 2000 - 2019 and indexed by the web of science. The article search results can be seen in Table 1. Based on the results of research articles analysis that focus on reading activities on science learning, the amount of research at reading activities on science learning has increased. It can be seen in Figure 2. From the year 2001 to 2019, there was a change in the number of publications. For several years, the number of publications has increased and decreased. Only in 2004, 2005, and 2015 were no published articles about reading activities on science learning.

The publication details in each journal can be seen in Table 1. Most articles are found in the International Journal of Science Education (IJSE). Every year, IJSE publishes the most papers on reading activities on science learning, followed by the International Journal of Mathematics and Science Education (IJMSE), Science Education (SE), and the Journal of Research on Science Teaching (JRST). This journal was chosen because it has good reputation. These journals are the most popular journals in science education, which have a high impact on other journals. In addition, the journal is indexed by the web of science database in the SSCI category.

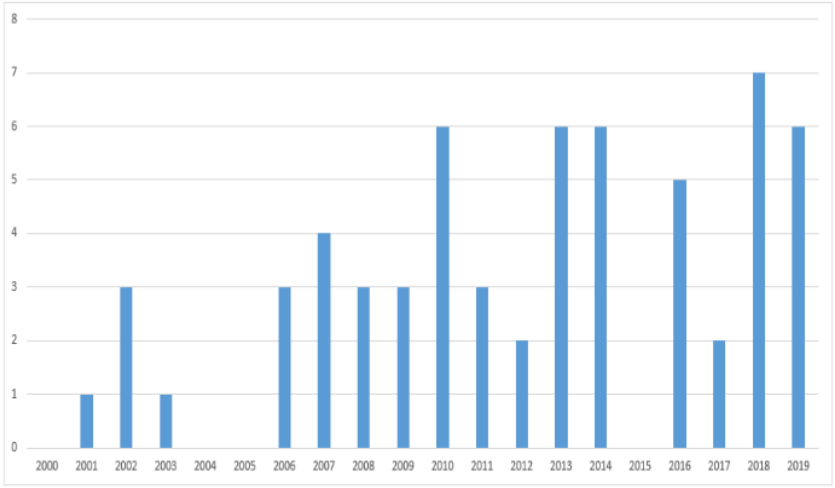

Figure 2. Distribution of the Number Published Articles Focusing on Reading Activities on Science Learning Research.

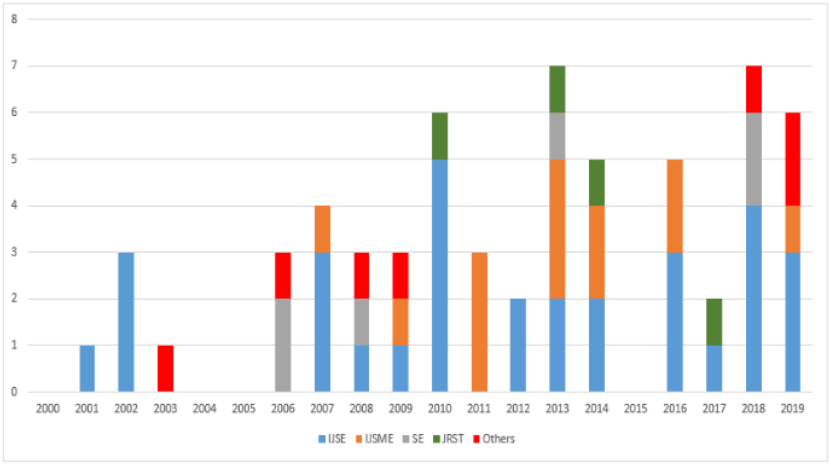

Figure 3. Distribution of the Published Articles Numbers in Each Journal Focusing Reading Activities on Science Learning Research.

However, based on the number of article publications data in each journal and increased research publications at reading activities on science learning, it does not mean that the research is becoming a widely conducted trend by researchers. Research on reading activities in science learning is still scarce. The researchers conducted the most in 2018, as many as seven studies, and this number is still small compared to other topics such as laboratory activities in science learning. This is because researchers and practitioners in science education think that the science learning process is always related to laboratory activities. Reading activities are critical in learning science, so it needs more research studies (Alexander et al., 2012; Tenopir et al., 2009).

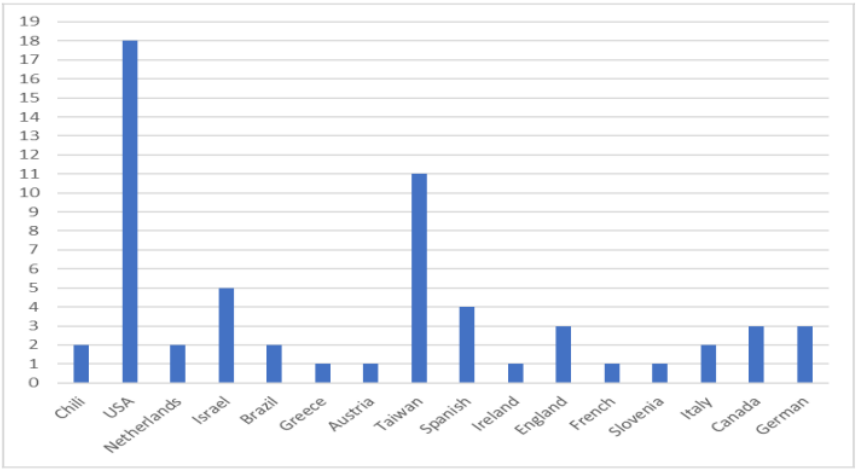

Figure 4. Distribution of Origin Countries at Main Researchers which Focuses Reading Activities on Science Learning Research.

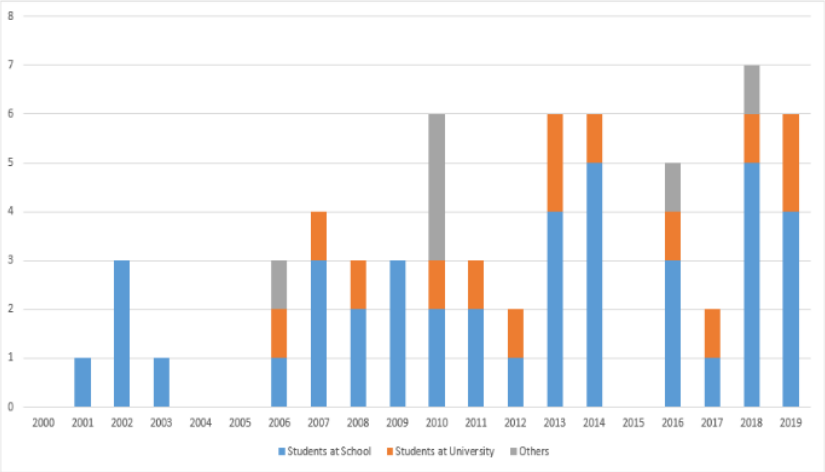

Figure 5. Description of Participants Types at Reading Activities on Science Learning Research.

In Figure 4, research in reading activities on science learning is primarily done in America. From the year 2000 - 2019, there were 18 articles published by researchers from the United States. The second-largest country in research related to reading activities in science learning in Taiwan is 11 articles. In general, the distribution of the researcher number by country of origin, which focuses on the field of study at reading activities on science learning, is still minimal. A few researchers in countries around the world focus on researching reading activities in learning science. Many things can be explored in this research study, such as practicing higher-order thinking skills through reading activities.

The distribution of participant types can be seen in Figure 5. Based on the distribution, the research of reading activities on science learning is primarily done in schools. In fact, from the year 2000 to 2005, the researchers conducted such research in schools focusing on students at the school as research subjects. In the year 2006, the research of science learning reading activities began at the university level. But the distribution is still small. In the years 2009 and 2015, there were no studies conducted on students at the University. In general, based on the results analysis, research on reading activities carried out at universities was still very little. Research range from the year 2000 - 2019 (for the college level began 2006) conducted at the tertiary level between 1-2 studies. Research on the reading activity at the university level must be widely carried out. Supposedly, through reading activities, students got be practice learning independence.

Based on Figure 6, the main focus of researchers in reading activities on science learning research is more to measure reading comprehension. Based on the analysis results, we found 40 articles that focus on measuring reading comprehension due to reading activities carried out in learning. In general, reading activity is very closely related to reading comprehension (Cromley et al., 2010). For example, some researchers who focus on reading comprehension include: (Cano et al., 2014; Kloser, 2016; Lammers et al., 2019; Meneses et al., 2018; Yang et al., 2016). In addition to reading comprehension, researchers also focus on several variables, including motivation (Adler et al., 2018; Jarman et al., 2012; Kloser, 2016; Simon et al., 2016; Yang et al., 2016), conceptual achievement (Ametller & Pintó, 2002; Ariasi & Mason,

2014; McCrudden et al., 2011; Oliveira et al., 2014), Scientific Achievement (Cano et al., 2014; Rojas Rojas et al., 2019; Romance & Vitale, 2017; Vitale & Romance, 2012), Scientific writing (Deng et al., 2019; Southerland & Sellange, 2018), Scientific literation (Fang et al., 2008; Ford et al., 2006; Kachan et al., 2006; Wright et al., 2016).

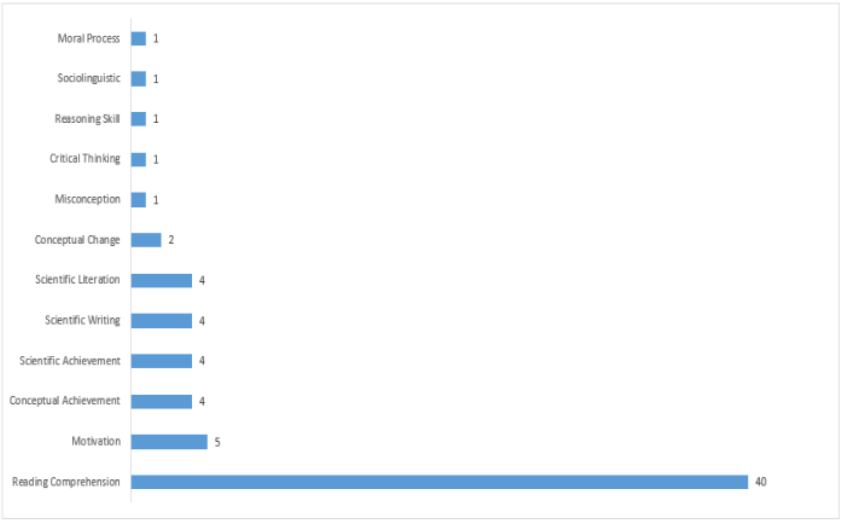

Figure 6. Distribution of Main Focus of Research (Independent Variable).

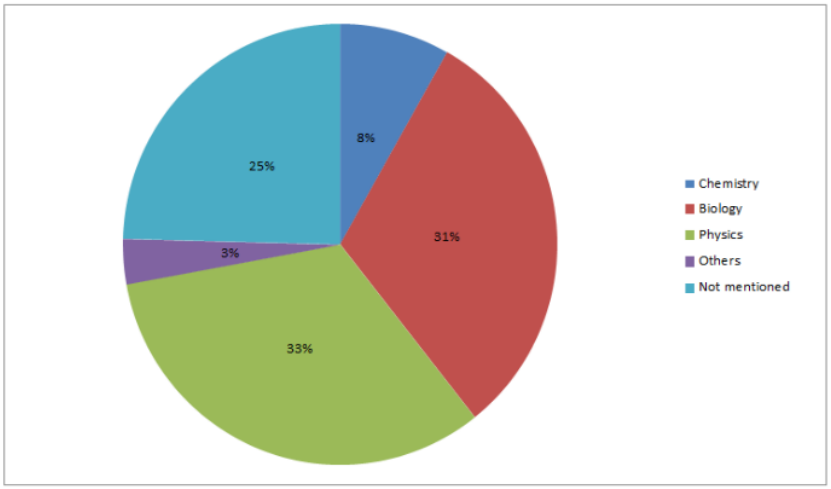

Figure 7. The Proportion of Study Subjects on Reading

Some variables that still very little researched are conceptual change (Diakidoy et al., 2003; Wang et al., 2010), misconceptions (Vosniadou & Skopeliti, 2017), critical thinking (Oliveras et al., 2013), reasoning skills (Yang, 2017), and others variables as shown in Figure 6. Based on this, it is clear that there is still little research study as a result of science learning reading activities, especially on aspects of higher-order thinking skills. Further, the focus has only been on reading comprehension.

Research on reading activity was primarily carried out on Physics studies as much as 33 % (Figure 7). Besides that, research was also mostly done on biology studies, which was as much as 31 %. On the subject of Chemistry, studies were only at 5 %. Based on the material, there is still a lot of material that has not been explored in research related to reading activity in natural science learning (Table 2).

Table 2. The Description of Material Used.

Subject	The Topic
Chemistry	Organic chemistry, chemical changes, chemical reactions, electrolytes, water molecules
Physics	Energy transfer, day and night cycles, astronomy, optics, vectors, kinematics, dynamics, energy, global warming, tides, climate change, air and matter, moon phases, wind power, heat, light
Biology	Biomolecular, microorganisms, genetic diseases, anemia, cells, physiology, pharmacology, cardiovascular system, ecology, genetic, wild animals, human digestion, respiration, bees, blood circulation, species, diabetes
Others	Technology

CONCLUSION

Based on the research findings, there are still many things that have not been studied by researchers about reading activities in science learning. Although the number of its studies is increasing, in terms of quantity is still very small, the most tracking in the year 2018 is seven papers. Researchers from developed countries still dominate most researchers about reading activities in natural science learning. In terms of participants, research is dominated by involving students in schools (although the numbers are still small), with the variables studied are dominated by reading comprehension. Based on the searching, there are still many higher-order thinking skills that have not been explored. Most researchers focus on the reading comprehension aspect. Thus, there is still much material studied in research activities.

Many things have not been done related to reading on science learning research based on the research results. There are so many things that can still be researched and developed on this topic. Research that can be done includes practicing higher-order thinking skills using reading activities and integrating reading activities with laboratory activities. As we all know, reading activities are essential things to do in the science learning process.

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