

Critical Reading Skills in Writing Scientific Papers containing the 21st Century Skills

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Abstract. It is important to construct critical reading skills into the writing scientific papers process for students. It aims to strengthen the process and results of scientific writing so that the results are more profound. Therefore, this research was aims to reveal the basic concepts of critical reading in writing scientific papers for students and the relation between critical reading and the 21st Century skills in writing scientific papers for students. The method used in this study is a critical analysis method through the following stages: (1) formulating research questions and hypotheses, (2) sampling the selected data sources, (3) making categories used in the analysis, (4) collecting the data on a sample of documents that have been selected and coding, (5) making scales and items based on certain criteria to collect the data, (6) interpreting the data obtained, and (7) conclusions. The results of the analysis found about two main things. First, critical reading skills have a strong influence on article writing skills, especially in the process of finding ideas and ideas, paragraph development, description analysis, content analysis, research results development, and concluding. Secondly, critical reading skills cannot be separated from the 21st century skills, namely critical thinking and problem solving skills, creativity and innovation, collaboration, and communication.

Keywords: critical reading, students, scientific writing, the 21st century skills

1 Introduction

Reading is one of the skills that must be mastered by students as a provision in responding to the content of the reading text or developing ideas after reading. The type of reading studied in this research is critical reading, although there are reading comprehension and creative reading which can also be used as a study material. Studies related to critical reading provide an interesting description that to master, understand, or implement science that requires receptive language skills that are not just getting it but holding in depth about what is obtained. This is in line with the idea of Nasrollahi et al [1] which revealed that reading has often been done by students but in practice it has not been conducted systematically, so it does not get maximum results. The systematic concept is that what is read has not been matched by a response to the reading results.

Research on reading skills has been carried out in previous studies with different subjects and themes. Sawitri et al. [2] tested the effectiveness of learning to read in schools, Subekti et al. [3] developed a textbook containing the values of Pancasila, Praheto et al. [4] implemented Indonesian language learning by using interactive multimedia, and Rahmawati et al. [5] conducted an analysis of student reading in Indonesia. In addition, various research findings related to critical reading skills also show various problems namely findings from [6], [7], [8], [9]. In some of these studies, it was revealed that various things have been conducted in improving critical reading skills and how to maximize them to support the quality of interests or other competencies. These efforts have been implemented to students even to teachers.

Efforts to increase the strength of reading skills do not always in accordance with the plan with various causes. There are several studies that reveal several aspects or analyzes related to reading skills. [10] It revealed that the type of text presented will affect reading results because each individual has different characteristics in reading in general and critical reading in particular. This is strengthened by studies [11], [12], [13], [14], [15] regarding the relation between critical reading skills and literacy, reading attitudes or habits, knowledge perception, self-efficacy, scientific literacy, translation, and strengthening other languages skills. Many aspects that affect reading skills turn out to be complementary and related so that they need to be deepened and strengthened.

Based on observations and previous research studies that have been revealed, it can be known that the development of reading skills is also related to other skills. One of the skills that is closely related is writing skill. The amount of information obtained when reading will make it easier to develop words in writing. One of the writing skills needed by students is writing scientific papers.

Writing scientific papers is something that cannot be avoided in the academic life of students. However, based on several previous studies, there are some basic problems related to the writing of student scientific papers. [16], [17], [18] stated that there are limitations in written communication, difficulties in finding the right topic, and limitations in writing to solve problems. Meanwhile [19] revealed that there are limitations in language when writing, namely writing and foreign languages. In other words, writing problems include writing preparation, writing, developing writing, and editing writing based on good structure and grammar.

Thus, the main problem in this study is how educators can maximize critical reading skills to improve scientific writing skills. This is reflected in the lack of critical thinking skills of students in developing ideas in writing scientific papers. The problem is in line with the study that has been revealed about critical reading. When it is compared to several studies on critical reading, there are still no studies on strengthening critical reading for strengthening scientific writing.

Based on this background, critical reading skills become one of the keys in writing scientific papers. This does not mean putting aside reading comprehension and creative reading, but there are some interesting focus of critical reading in scientific writing that require critical expression of ideas. The aim is to reduce the level of plagiarism in scientific writing, which is allegedly due to a lack of critical thinking among students.

Based on this background, the research question of this article are. (1) What is the basic concept of critical reading in writing scientific papers for students? (2) How is critical reading related to 21st Century skills in writing scientific papers for students?

2 Research Method

This study uses an approach critical analysis [20] which consists of 5 main questions, namely: (1) who? (2) days what? (3) in which channel? (4) to whom? and (5) with what effect? The method used in this study is a critical analysis method Lasswel [20] with steps, (1) researchers formulated research questions and hypotheses, (2) sampled the data sources that had been selected, (3) made categories used in the analysis, (4) collected the data on a sample of documents that had been selected and coding, (5) made scales and items based on certain criteria to collect data, (6) interpreted the data obtained, and (7) made conclusions. The subjects of analysis in this study included the findings of previous studies, observations, research studies, and relevant theories. The analysis is also supported with the initial observational data so that there is a combination of analysis and disclosure of the initial data related to critical reading of students.

3 Result And Analysis

There are two results and a discussion that includes 5 questions based on [20]. Questions (1) who? (2) says what? discussed in the first analysis of students' critical reading skills in writing scientific papers and questions (4) to whom? and (5) with what effect? discussed in the second analysis of the relationship between critical reading and 21st century skills in writing scientific papers for students. Question (3) in which channel? Not analyzed because it has been included in the analysis carried out.

3.1 Students' Critical Reading Skills in Scientific Writing

Critical reading is part of general reading skills. If it is analyzed more deeply, reading is one of the four interrelated reading skills. If someone is able to read well, gets complete information, and able to criticize the contents of his reading, he will make other language skills better. This is in line with the results of studies [21], [22], Varaporn and [23] who stated that good writing skills are supported by good reading skills as well. Not only understanding the reading but critically examining the contents of the reading for the need of writing.

These findings related to critical reading provide a message and information that many people know why it is difficult to write but not everyone is willing to overcome the problem. In addition, students as prospective scientists have their own interests in developing writing skills. Student needs in the scientific receptive aspect are unavoidable. Students as prospective scientists need a lot of new knowledge to be applied into other forms, namely speaking and writing.

Several studies have shown the relationship between critical reading and students' academic ability, as revealed by [24], [25], [26], [27]. If it is analyzed, there are several close relations between students' critical reading skills and other academic lives which are listed in the following table. What is revealed in the table are some examples of academic aspects that are directly related to critical reading

Table 1. The Relation between Critical Reading Skills and Student Academic Aspects

Reading Aspect	Student Academic Aspects	Description of Relation
Critical reading skills	Remember material ability	Critical reading does not directly affect the ability to remember because the main goal is not memory but understanding the basic concepts of the material read.
	Asking ability	Asking ability is greatly influenced by critical reading because students who are able to read critically will have many questions to ask or develop.
	Critical thinking in learning	Students who are accustomed to critical reading will be able to find new understandings based on what they read and relate to the learning they follow.
	Creative/scientific learning	The basis for writing is an idea that is developed in a writing in the form of a work. Students who read critically will find it easier to find and develop ideas from the readings they have read.

More specifically, there are several indicators that show the relation between critical reading skills and scientific writing skills, which are presented in the following table. The sections of scientific papers presented are some examples of general sections that can be used as an understanding of the concepts presented.

Table 2. The Relation between Critical Reading Skills and Student Writing Skills

Reading Aspect	Scientific Writing Skills	Description of Relation
Critical reading skills	The discovery of ideas	Critical reading greatly influences students in finding ideas or ideas in research.
	Writing outline	The writing of framework is based on the ideas that have been found.
	Paragraph development	Paragraphs developed by students tend to be monotonous if students are not able to think critically, they can even get stuck with the habit of copy and paste
	Content and description analysis	The basis for analyzing is theory and reading that is read critically so that it can provide in-depth analysis
	Research result development	Assembling the results of the description into a unity that requires accuracy based on knowledge, which one of them is obtained by the critical reading process
	Citation	Currently cited should be conducted with the reference manager so that nothing is missed
	Conclusion	A good conclusion is based on the results of critical reading of research findings or writings that have been revealed
	Text editing	Editing is not just editing language but content and legibility so that it requires accuracy, thoroughness, and criticality in reading.

Based on the table above and the results of researchers' observations in lectures and research, it can be concluded that not everyone who reads does critical reading. There are still many students who only read to fulfill the task and understanding process. In this case, the researcher concludes that it takes several conditions for someone to be stated to be critical reading. (1) Reading activities are entirely critical thinking activities with different goals, for instance wanting to criticize reading for writing ideas.

(2) The reader does not fully agree with the reading before considering it with many aspects, so that new conclusions will emerge. (3) The reader seeks the ultimate truth when reading and criticizes the reading so that the understanding emerges. (4) The readers always involve themselves in the reading problems. (5) Critical readers do not remember what they read but process and formulate it into something they are looking for. (6) The reading results will be implemented and not just remembered.

3.2 The Relation of Critical Reading with 21st Century Skills in Scientific Writing for Students

The 21st century skills consist of critical thinking and problem solving skills, creativity and innovation, collaboration, and communication. This ability is a skill that can be used as a basis for strengthening other skills, namely reading and writing skills. Based on the analysis, there are several components that we can conclude in relation to how we can relate critical reading skills, scientific writing skills containing 21st century skills. These are briefly illustrated in the following table.

Table 3. Strengthening Critical Reading Skills and Writing Skills of Students based on 21st Century Skills

21st Century Skills	Scientific Writing Skills	Description of Related 21st Century Skills
Critical thinking and	Discovery of ideas	In the process of finding ideas, criticality, creativity, and innovation are needed, which can be done with good

problem solving skills, creativity and innovation, collaboration, and communication	Writing outline	communication and collaboration with friends or experts. Writing outlines can be designed creatively and innovatively after reading a lot of things critically
	Paragraph development	Paragraph development, content and description analysis, research results development can be done with a solid knowledge base. This is obtained from readings related to the writing content. It means that critical thinking skills are needed to determine which ones will be written which are not in accordance with the needs of the analysis.
	Content and description analysis	
	Research result development	
	Citation	Cited requires accuracy and creativity
	Conclusion	Concluding will be right through critical thinking skills
	Text editing	Editing writing requires accuracy and creativity

The description contained in the table is the result of observations of students' habits in writing scientific papers. Students are accustomed to construct ideas at almost every step of writing scientific papers, whether it is in the form of paper assignments, article writing, or thesis as a final project. However, there are still many students who do not realize that the process of writing scientific papers also requires other components to strengthen critical reading skills to write scientific papers. Those abilities are critical thinking and problem solving skills, creativity and innovation, collaboration, and communication.

Researchers found that the problem lies in the willingness to implement which is still not optimal. For instance, students have the provision to collaborate but they are reluctant to do so because it is considered impractical so that it obstructs the mindset of openness in science. If it is examined, collaborating is one of the best means to strengthen someone's criticality. In addition, this is where the role of institutional control is to oversee the delivery of the best concepts, one of which is the 21st century skills so that they can be implemented. One of them is in writing scientific papers so that the results of writing scientific papers can be in-depth and produce scientific findings that can be accounted for.

Based on this analysis, we can compare with the findings of previous studies. The result of this analysis is a strengthening of previous researchers, particularly in terms of critical reading outcomes which not only have an impact on receptive knowledge but also have a creative side. In addition, this analysis emphasizes that in improving writing skills, students must be equipped with directed critical reading qualities. Thus, what is done will have a direct impact on what is intended. For instance, in critical reading learning aimed at strengthening scientific writing skills, it will have an impact if everything that is designed leads to strengthen scientific writing skills.

4 Conclusion

Based on the results of the analysis and discussion, there are several conclusions that can be drawn. First, critical reading skills can be used as a basis for strengthening other skills, particularly in language skills. Critical reading skills have a strong influence on scientific writing skills, particularly in the process of finding ideas, paragraph development, description analysis, content analysis, research results development, and conclusions. Second, critical reading skills cannot be separated from the 21st century skills, namely critical thinking and problem solving skills, creativity and innovation, collaboration, and communication. It is illustrated that the process of writing scientific papers requires aspects of the 21st century skills that have been adapted to the needs.

There are three main recommendations based on the findings in this article. First, students should strengthen critical reading skills by doing exercises with the right pattern. Second, critical reading skills cannot be acquired in a short time, there needs to be practice and good patterns to develop them. Third, there is a need for in-depth development, evaluation, or analysis to find solutions to unfinished problems, namely strengthening scientific writing skills and their development so that students are able to implement them well with a good scientific attitude as well.

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