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# Analysis of High School Students' Difficulties in Writing Scientific Papers

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**Abstract:** This study discusses students' difficulties in learning science related to writing simple scientific papers. So far, teachers in the classroom have focused more on providing knowledge without involving a good understanding of concepts related to writing scientific papers. Therefore, the purpose of this research is to analyze the causes of students' difficulties in writing scientific papers. This research is a servei study in the form of 24 questions in the form of questionnaires for 148 people consisting of 57 male students and 91 female students in the Science class at SMA Negeri 14 Central Maluku. The findings prove that the dominance of language in research has become an obstacle in publication. This has made writing scientific papers difficult. Another aspect is the interference of different cultural views, linking the text with the views of the scientific community, arguments, grammar rules, and so on. All of this must be supported by a good understanding of scientific concepts by utilizing the original surrounding environment as a strength value that is different from other regions. This study then proposes suggestions for further research when students write for publication in a way to make claims to their knowledge. Future research is to focus on deeper investigation of ways to make knowledge claims and how students deal with that aspect so that the publication of scientific papers can be achieved.

**Keywords:** Concept understanding; Student difficulties; Science learning; Scientific work

## Introduction

Qualified students are determined by qualified teachers. This is because science teachers determine the quality of student learning outcomes (Graham et al., 2020). Research shows that the quality of science teachers has an impact on student learning outcomes (Wang & Calvano, 2022). Efforts to improve the quality of science teachers are carried out with various policies, namely teacher qualification standards that have at least completed undergraduate studies (Fenanlampir et al., 2019). In addition to fulfilling educational requirements, quality teachers are also expected to be fulfilled after going through the teacher certification stage (Sholihah et al., 2020).

The teacher certification stage aims to develop four competencies that must be attached to the teacher, namely professional, pedagogical, social and personality. The goal of teacher certification in general is to produce qualified professional teachers in designing, implementing, and evaluating learning (Nurhattati et al., 2020). Another goal of teacher certification is to improve the welfare of teachers through additional income equal to one time the basic salary received after graduation. Another goal of this program is to improve teacher performance in designing, implementing, and evaluating learning so that student learning outcomes increase (Suryani, 2020).

These certified teachers should have better work performance, because the government has already paid a kind of professional allowance. However, this condition is not as expected, because the teacher's attention to problems and improving processes and learning outcomes is not maximized. The results of Ballou & Springer's research (2015) found that there is no strong evidence of the effectiveness of certified teachers on student learning outcomes and teacher performance, as measured by student test scores, teacher test scores,

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teacher attendance, and teacher involvement in other non-teaching activities. at school. This condition is very concerning, because the state pays great attention to improving the welfare of Indonesian teachers through the teacher certification program which has been known since 2007-2017 as Teacher Professional Education and Training (PLPG), and is now called Teacher Professional Education (PPG). As mentioned earlier that professional teachers are required to act professionally in solving learning problems that occur in their class. Teachers can collaborate with other teachers and competent lecturers to take action to improve learning through research that is considered relevant.

The quality of teachers is required to get better from time to time, to anticipate the times, knowledge, and technology. Teachers are agents of reforming people's lives who must be qualified to provide the best quality services for students and related parties (Keiler, 2018). This can be seen from the mechanism for increasing the functional positions of teachers and their credit scores which have changed with the enactment of PERMENPAN and Bureaucratic Reform no. 16 of 2009. Where every teacher who wants to propose a functional or rank promotion, needs to implement continuous professional development, one of which is by practicing classroom action research (Helmayunita et al., 2022). So, teachers must always innovate and sharpen their knowledge by improving learning through research and scientific publications.

Scientific publications are considered important in supporting teacher activities, especially in order to broaden scientific insights that are relevant to the development of science and technology (Fakherji, 2019). Scientific publications encourage teachers to be aware of learning performance, by always confirming the truth of the facts of student learning outcomes through scientific research, so that teachers are also increasingly aware of uncovering learning problems through research (Lamanauskas & Augiene, 2009). In addition, scientific publications can be a means of encouraging teachers to innovate in developing models, strategies, approaches, media, or learning evaluation instruments that have the potential to improve academic performance and student learning achievement (Jimenez-Liso et al., 2021). So, scientific publications are the next product of scientific research activities carried out by professional teachers (Hennessy et al., 2022).

Facts on the ground show that teachers in Maluku Province are still in the lower range of the professional teacher category. In fact, the decline in education in Maluku can be studied through the results of the National Teacher Competency Test. In 2015 Maluku is the key in a series of rankings of education in the country. This condition is not easily repaired in a short time. It is proven through the results of the 2018 Teacher Competency Test, Maluku has increased by one point from before, so that it is in 33rd place out of 34 provinces or ranks 2nd last (Rahabav et al., 2021).

The empirical facts above encourage this research to be carried out to take a real role in improving the quality of education in Maluku. One of them is by doing research and doing a deeper analysis of why this could happen. In addition, looking for the root cause of this downturn. One of the causes of this downturn is the teacher's performance which has greatly decreased in carrying out tasks related to learning, namely lesson preparation, implementation, and learning evaluation (Briones et al., 2022). Even though many are already certified or have received professional degrees, in practice there are still many who do not have professional responsibilities. This happens because teachers currently only focus on earning wages, not focusing on professional performance. As a result, the awareness to develop professional competence is getting worse, and it has an impact on low teacher competency test results.

In terms of quantity, there are more high school teachers compared to teachers at other levels of education. Therefore, high school teachers should contribute more to improving teacher competency test results in Maluku. Another fact is related to the competence of teachers in Maluku in general. So far, Maluku has never been left behind in taking part in national-level outstanding teacher competitions. In 2019, Maluku sent 17 people to take part in a national level outstanding and dedicated teacher competition. They come from various levels of education, namely early childhood education to high school/vocational school. Unfortunately, no one has returned home with proud achievements (Pelita Maluku, 2019). That means teachers in Maluku need assistance in many aspects related to increasing professional competence so that they have the best qualifications to become winners in competitions at the national level.

Through efforts to increase teacher professionalism, efforts are made to make positive improvements in learning. As a result, it can facilitate students to learn in a fun, easy, and effective way so that the learning process and results can be achieved with higher quality. The fact that so far, students still have difficulty in writing scientific papers that can be used as evidence to take part in various regional and national and even international competitions. Therefore, teachers must be professional and competent in writing scientific papers so that they can train and educate students in writing scientific papers.

One of the most prestigious competitions in Indonesia is the Youth Scientific Work Competition. This competition is an annual activity held by the National Research and Innovation Agency since 1969. This activity aims to motivate the younger generation, especially students throughout Indonesia, to carry out

independent research activities (Asmara & Kusumaningrum, 2020). Therefore, the teacher must increase students' conceptual understanding of how they learn to write, analyze and get a deeper sense of increasing scientific literacy in meeting students' needs in writing scientific papers.

Understanding the concept is the key to success in learning. If someone has a misunderstanding of a concept it greatly disrupts science learning outcomes (Nussbaum et al., 2017). Many studies have reported that alternative conceptions of natural phenomena tend to hinder the acquisition of scientific concepts (Braasch et al., 2013). However, reading texts in the form of books or other sources and the teacher himself can produce cognitive conflicts that will interfere with students' conceptual changes (Danielson et al., 2016). Therefore, teachers who are professional and have strong conceptual skills will produce works and formulate scientific concepts well. Science is a unique science especially exploring the world around. the study of the biological sciences for example, not only explores how the different organs and systems of the human body function, and how organisms adapt and evolve, but also facilitates a better understanding of the world and its natural processes. It should be noted that science is very different from any other because of the breadth and complexity of knowledge, content, and interconnections at many different levels. Previous research has revealed that students tend to have inadequate understanding and misconceptions about scientific knowledge (Hung & Fung, 2017). Students tend to carry their misconceptions about science from primary, secondary, to when they continue to study in college (Shen et al., 2018). Therefore, teachers need to design learning that is oriented towards understanding student concepts and teachers are able to understand how students learn science (Moore & Cotner, 2009).

Previous research stated that students' conceptions of learning were influenced by the learning process (Otting et al., 2010). For example, students believe that studying is to prepare for exams primarily focusing on passing exams or achieving high scores on tests. So that students' conceptions of learning can influence their approach to learning, and their learning outcomes (Virtanen & Lindblom-Ylänne, 2010). The results of the study prove that students who learn rote have poor quality when compared to conceptually oriented learning. This was proven by science students in an interview study showing results that were more skilled at solving science problems when compared to rote students (Sung et al., 2020).

Students in Germany are more directed towards students' understanding and conceptual changes (Pinarbaşi et al., 2006). They believe that if students' understanding of science is good, it will have a significant impact on the students' own creativity. In addition, good creativity really supports conceptual change. If a person's conceptual is weak, it will affect one's appearance and creativity (Gobert et al., 2011). Therefore, the important role of culture for students and daily life in their learning experience is well established. Culture can encourage knowledge skills and competencies through a continuous learning process (Lin et al., 2018). Culture also influences students' way of thinking and learning outcomes, therefore teachers must understand and take into account the culture of each individual student, the teacher must study the cultural and environmental history of individual students as well as patterns, perceptions, and ideologies related to education and learning (Lam et al. al., 2019). Meanwhile, the purpose of the research is to analyze students' difficulties in writing quality scientific papers.

## Method

*Types of research*

The type of research used in this study is the survey method. This study collected information from students through answers to questions in the form of a questionnaire with items assessed numerically. Questionnaires were made in two forms, namely online filling and filling on paper that had been prepared. This is done because not all students have Android phones. Questions that are made can range from several targeted questions from individuals to obtain information related to behavior and preferences (Ponto, 2015). Before filling out the questionnaire, an approach was made and gave an explanation to the students so that when filling out the questionnaire students did not find it difficult.

*Participant*

Sources of research data from students majoring in Science Grades 10 to 12, at SMA Negeri 14 Central Maluku. The students studied were aged 15-17 years. The sample studied was 148 students, with 57 male students and 91 female students. The research was conducted from July-November 2022.

*Research Instruments*

Closed questionnaires are designed to find out students' difficulties in writing for publication. This allows the respondent to select an answer from a number of options, and is therefore easy to use, score, and code for analysis by Fraenkel & Wallen (2009). So, there are 24 items on the questionnaire and they are rated on a four-point Likert scale ranging from Strongly Agree (SS), Agree (S), Disagree (TS) and Strongly Disagree (STS). Questionnaires were distributed using the Google form or filling directly on printed paper. Finally, it is considered as an effective and efficient way for researchers and participants. After the data is collected, it is then analyzed using percentages.

Questionnaire questionnaire adapted from (Azizah & Budiman, 2017).

*Data analysis technique*

After the items are scored, the points for each are totaled and then, all the filled points are totaled. The next step is analyzed using the Microsoft Excel software program and broken down as a percentage. Excel also helps determine means, standard deviation, percentages and ratings for each variable being measured.

## Result and Discussion

It's so complex to write a scientific work that it's only taught to students after stepping on high school. The purpose of writing scientific papers is for students to practice and solve problems using scientific methods or approaches. There is an assumption from students that writing scientific papers is very difficult. Students imagine how complicated it is to find a problem, the process of collecting data, managing it, writing techniques so as to produce quality writing. As well as the huge cost and location in collecting research data. Students also think about the length of time it takes to complete the scientific paper, because they have to read many references, both books and journals, as supporting theories. This resulted in students not daring to write simple scientific work.

Based on the findings that 85% of students think that the language aspects up to the most training in writing quality scientific papers is very difficult because it requires good skills. An essential part of scientific work is the scientific process of communicating original results to others so that one's findings can be forwarded to the scientific community and the public for input and scrutiny. Before the work is accepted by the publisher, a scientist must submit their article for review by other scientists with the same research field. So that it can decide whether the work was done correctly and whether the results add to the knowledge base and are conveyed well enough to warrant publication (Hesselbach et al., 2012).

**Table 1.** Students' Difficulties in Writing for National Publication

| Item | Question | Alternatif % | | | |
|---|---|---|---|---|---|
| | | SS | S | TS | STS |
| 1 | I find it difficult to use good Indonesian grammar | 10 | 20 | 70 | - |
| 2 | I still make mistakes in using grammar. | 5 | 45 | 50 | - |
| 3 | It is difficult to get related sources to quote | 35 | 25 | 10 | 30 |
| 4 | I found difficulty in making citations with Software namely Mendeley, Zotero and End Note | 50 | 25 | 10 | 15 |
| 5 | I found it difficult to get hold of guidebooks for reference | 20 | 75 | 5 | - |
| 6 | I'm having trouble making references | 50 | 20 | 30 | - |
| 7 | It's hard to organize my ideas/opinions in a sentence | 15 | 75 | 10 | - |
| 8 | I find it difficult to connect ideas from one paragraph to another | - | 50 | 50 | - |
| 9 | I find it difficult to write clearly and regularly | 20 | 70 | 10 | - |
| 10 | It is difficult to write analytically, such as involving causation, comparisons and pros and cons. | - | 25 | 65 | 10 |
| 11 | I find it difficult to choose words to convey ideas to readers. | - | 35 | 65 | - |
| 12 | I find it difficult to convey ideas specifically to people related to my research topic. | - | 45 | 55 | - |
| 13 | It is difficult to claim that the results of my new research are different from other related studies. | - | 25 | 25 | 50 |
| 14 | I find it difficult to convince readers of a new perspective on the problem that is different from other related research. | - | 10 | 25 | 65 |
| 15 | I encountered an issue in getting the author's message in the associated journal/manual. | 5 | 75 | 20 | - |
| 16 | It is difficult to identify and reveal the author, look at the journal/guidebook. | 5 | 75 | 20 | - |
| 17 | I found it difficult to frame my research | - | 80 | 20 | - |
| 18 | I find it difficult to focus my research | 10 | 60 | 25 | 5 |
| 19 | It is difficult to involve culture in my research | 25 | 10 | 60 | 5 |
| 20 | I find it difficult to write research in order that the message can be received by people of different cultures. | - | 35 | 50 | 15 |
| 21 | I believe that writing and publishing for journals is very important for my academics | 5 | - | 30 | 65 |
| 22 | I will continue to write scientific papers even though I have been rejected or have not passed the selection | 5 | 10 | 50 | 35 |
| 23 | The Office of Education or Schools should provide students with workshops/training on writing scientific papers for publication | 10 | 5 | 10 | 75 |
| 24 | I will take a writing course/training for publication in order to enrich my knowledge | 10 | 5 | 50 | 35 |

Adapted from (Azizah & Budiman, 2017)

So, learning is phenomenological in nature which means that students learn concepts, principles, and scientific materials that depart from various contextual phenomena that are often encountered in their surroundings (Graffigna et al., 2011). So far, students have a negative stigma towards science lessons which are considered difficult, boring, and scary subjects to understand. Therefore, teachers must have the courage to invite students to shift the positive stigma towards science learning, namely that lessons are fun, useful, and really exist in the student's environment (Fasasi, 2017).

As Karimnia (2013) states that students have problems describing their results accurately and effectively to support a claim. This problem has also been described by non-English speaking graduate students in the United States (Dong, 1998) and Chinese researchers in Hong Kong (Flowerdew, 1999). This is also in line with the findings of research conducted by Backlund (2003) in New Zealand where English is the first language which finds that students cannot generate or produce knowledge. It is stated that the classroom management applied by the teacher influences students' ability to produce knowledge in the form of good science concepts. Some examples of scientific concepts and principles contained in Maluku local wisdom which can be used as learning resources by students and teachers in classroom learning that can have strong research power can be shown in Table 2.

**Tabel 2.** The Concepts and Principles of Science Contained in It Local Wisdom of Maluku

| Local Culture | Concepts and Principles of Science | Country or Region of Origin |
|---|---|---|
| *Bakar Batu* (Stone Burn) | Heat Transfer | Tanimbar Islands Regency |
| *Kain Tenun* (Woven fabric) | Viscosity | Tanimbar Islands Regency |
| *Ina Sua* | Microbiology | Waipia, Central Maluku Regency |
| *Burung Maleo* (Maleo bird) | Animal Ecology | Pelau, Central Maluku Regency |
| *Sageru* | Microbiology | Tuni Hamlet, Ambon City |
| *Gula Merah* (Brown sugar) | Biotechnology | Ulath Village, Ihamahu Village - Central Maluku Regency |
| *Ukulele* | Sounds, vibrations and waves | Amahusu Village, Soya Village-Ambon City |
| *Pembuatan Sempe* (Sempe Production) | Heat Transfer | Ou, Central Maluku Regency |
| *Meti Kei* | Environment | Southeast Maluku Regency |
| *Timba Laor* | Animal Ecology | The coasts of Ambon Island, Kei, Lease, and Seram Island |
| *Sasi Ikan Lompa* | Animal Ecology | Haruku, Central Maluku Regency |
| *Buah Atong* | BioPharma Plants | Seram Island, Lease and Ambon City |
| *Morea* | Animal Ecology | Waai and Morela, Central Maluku District |
| *Kus-Kus* | Mammals | Seram Island, Ambon City and Central Maluku Regency |
| *Bunga Anggrek Lelemuku* (Lelemuku Orchid Flowers) | Botany | Tanimbar Islands Regency |
| *Galoba dan Gandaria* | Biodiversity | Seram Island, Ambon Island and Central Maluku Regency |
| *Kayu Torem* (Torem wood) | Botany | Tanimbar Islands Regency |
| *Pukul Sapu* | Human Physiology Bot | Mamala and Morela, Central Maluku District |
| *Totobuang* (Totowaste) | Sounds, vibrations and waves | Amahusu, Soya, Kusu-kusu, Refinery, Naku, Hukurila – Ambon City |
| *Panen Ikan dengan Daun Kelapa* (Harvest Fish with Coconut Leaves) | Animal Ecology | District of Tanimbar Islands and Kei Islands |

Maluku is an area that is still rich in living and non-living things with a variety of cultures. Therefore, students will not lack references in learning science. This diversity will make students have a lot of knowledge. So far, local wisdom in a scientific approach, namely ethnoscience as a cultural potential, has not been empowered to build the foundation of civilization to build modernization. Ethnoscience learning will make students more familiar with the culture and local wisdom of their nation. Thus, students can later become cultured individuals and become agents who can transfer culture to the next generation.

Learning in the small islands of Maluku requires strategies that are relevant to the ethnoscience approach. Learning strategies can help equalize learning opportunities for all students, because they reach students in small islands, thus encouraging students to interact, collaborate, and provide feedback (Bere & Rambe, 2016).

## Conclusion

The dominance of language in research has been a recent issue in publications. This has made writing

scientific papers even more necessary. However, students tend to have writing problems in several aspects such as knowledge claims, textual organization, interference of different cultural views, associating texts with the views of scientific communities, arguments, grammar rules, and so on. All of this must be supported by a good understanding of scientific concepts by utilizing the surrounding environment which is still original as a strength value that is different from other regions. In addition, this study found that the most common difficulties faced by students in how to acquire knowledge about writing scientific papers.

This study then proposes suggestions for further research. In this study, it was revealed that the most difficult aspect of students when they write for publication is in a way to make knowledge claims. Future research is to focus on deeper investigation of ways to make knowledge claims and how students deal with that aspect so that the publication of scientific papers can be achieved.

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