

**Professional Competence Enhancement of High School Teachers
through Scientific Paper Writing Training**

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Abstract

The study fulfils the gap in teachers' scientific paper writing skills, which benefits both the academic community and pupils. Teachers' competence can be improved so that they can engage in evidence-based practices, contribute to academics, and deliver engaging educational experiences that develop critical thinking in their pupils. Scientific paper writing training is critical for developing high school teachers' professional competency. The purpose of this study was to look into the efficiency of such training in improving teacher abilities and knowledge. A quantitative descriptive method was employed in the study to evaluate the efficiency of a scientific paper writing training programme for high school teachers. Data was gathered by assessing the quality of the teachers' papers using a quality assessment form. The data was analysed using statistical procedures such as the t-test and N-Gain analysis. The t-test compared pre- and post-treatment scores, while the N-Gain analysis assessed the training's effectiveness. These methodologies aided in determining the program's impact on teachers' writing skills and quantifying the level of development in their scientific paper writing competence. These data indicate the training program's effectiveness in improving teachers' understanding and skills in scientific paper writing. Training in scientific paper writing improves high school teachers' professional competency by increasing their understanding of article components, scholarly practices, and writing abilities. It emphasizes the importance of continuing professional growth and filling gaps in critical thinking and interdisciplinary writing.

Keywords: professional competence, high school teachers, scientific paper writing

INTRODUCTION

Writing scientific papers in an academic environment, especially for teachers, is very diverse and important for several reasons (Carlson et al., 2019; Hyland, 2021). First, writing scientific papers enables teachers to contribute to the academic community by sharing their research findings, innovative teaching practices, and insights gleaned from their classroom experiences. By being actively involved in writing scientific papers, teachers can showcase their expertise, establish themselves as knowledgeable practitioners, and contribute to ongoing dialogue in their fields. Second, scientific writing promotes professional growth among teachers by encouraging them to critically respond to their teaching strategies, explore evidence-based practices, and continuously improve their teaching methodologies. Through the process of writing scientific papers, teachers delve deeper into their subject matter, engage with current research, and refine their instructional approach, leading to increased teaching effectiveness. Finally, writing scientific papers equips teachers with the skills necessary to integrate research and evidence into their teaching practice, promoting a culture of inquiry and evidence-based decision-making in education. By developing the ability to write scientifically rigorous papers, teachers can support their students in developing critical thinking, problem solving, and research skills, thereby nurturing generations of informed and empowered learners.

The improvement of professional competence among high school teachers is crucial for ensuring the delivery of quality education (Locke, 2015). Training in scientific paper writing is one efficient way to accomplish this (PermenPANRB, 2009; Rahim et al., 2019). However, more research is needed to determine the influence of such training on the competency of high school teachers. Therefore, the purpose of this research is to find out the usefulness of scientific paper writing training in increasing the professional competence of secondary school teachers, with the ultimate goal being to answer common challenges in the field of education, particularly regarding teacher professional competence. By equipping teachers with the necessary skills and knowledge in writing scientific papers, it is hoped that they will be better equipped to address existing problems and improve their overall professionalism in the education sector.

There is a widespread problem in the sphere of education in which teachers lack the requisite abilities and knowledge to succeed in their professional lives (An, 2021; Csíkos & Sztányi, 2020; Gvozdic & Sander, 2018; Wijekumar et al., 2019). High school teachers, in particular, confront many challenges in keeping up with topic improvements and using creative teaching methods (Tawafak et al., 2020). These challenges hinder their ability to provide students with a high-quality education and impede their professional growth (Flores, 2019). In Indonesia, the results of teacher competency tests conducted in the last two periods show that teacher competence, especially pedagogical and professional competence, is generally still low. This indicates that teacher professional development is still far from the target for improving teacher performance and competency (Yusuf & Mukhadis, 2018). The widespread problem of inadequate skills and knowledge among teachers hinders their professional growth and jeopardizes the quality of education provided to students. Addressing these challenges through a comprehensive training program is essential for increasing teacher competency, promoting their professional development, and improving the education system as a whole.

This research investigates the limitations of high school teachers' exposure to scientific writing and its impact on their professional competence. Many teachers lack knowledge and direction in conducting research and writing scientific papers (Daud et al., 2020; Marwan, 2017; Nemati et al., 2017), limiting their ability to engage in evidence-based practice and contribute to the academic community. These limitations affect the integration of the latest research findings into teaching, the ability to produce quality scientific work, and participation in academic discussions. Appropriate training is essential to enhance teachers' knowledge and skills in research and scientific writing so that they can contribute effectively to the development of evidence-based educational knowledge and practice.

The findings of this study emphasize the importance of overcoming the limitations of high school teachers' exposure to scientific writing in order to enhance their professional competence. By providing comprehensive training and guidance in research and writing skills, teachers can contribute to evidence-based practice and participate actively in the academic community. This research highlights the need for educational institutions to prioritize the development of teachers' scientific writing skills to foster a research culture and knowledge dissemination in the field of education.

Several strategies have been offered in the last five years to address the challenge of improving high school teachers' professional competency through scientific paper writing training. Journal-published research studies have emphasised the necessity of complete training programmes that cover research methodologies, data analysis techniques, academic writing conventions, and ethical considerations. These studies have emphasised the importance of on-the-job training and ongoing support to guarantee successful implementation (Hutajulu et al., 2020; Widana et al., 2019; Yulhendri et al., 2018). These studies have underlined the importance of providing on-the-job training to teachers as it ensures the practical application of the skills and knowledge acquired. In addition, research emphasizes the need for ongoing support to maintain and strengthen the effectiveness of the training, which ultimately leads to the successful implementation of scientific paper writing practices among secondary school teachers.

Despite earlier study efforts, there are still gaps in the solutions presented to improve high school teachers' professional competency through scientific paper writing training. Some studies have only concentrated on theoretical frameworks, ignoring the practical components of research and writing. Furthermore, there is a lack of research on the long-term impact of such training on teachers' professional development and its subsequent impact on student learning outcomes. The originality of this work resides in the examination of what type of training will have long-term consequences on teacher writing abilities.

The goal of this study is to fill the gaps described above and to look into the usefulness of scientific paper writing training in improving the professional competence of high school teachers. This study's research questions include: How can scientific paper writing instruction contribute to the professional development of high school teachers? What long-term effects will such training have on teacher competence and student outcomes? This research seeks to provide significant insights and recommendations for educational institutions in establishing successful training programmes to improve the professional competence of high school teachers by answering these issues.

METHOD

The research employed a quantitative descriptive research method to investigate the effectiveness of a scientific paper writing training program for high school teachers. The study took place in SMAN 1 Lubuk Sikaping, and the community engagement programme ran from August to September 2022. The study's population included all 42 teachers at SMAN 1 Lubuk Sikaping, and the sample included the full population. The measurements were taken with a scientific article quality assessment sheet. The data collection process was carried out by collecting papers that had been written by the teacher and assessing them based on the criteria outlined in the quality assessment sheet.

To analyse the data, the assessment sheet scores were calculated by calculating the differences in instructors' writing abilities before and after training, as well as the improvement in their abilities before and after training. To analyze the data statistical techniques such as t-test and N-Gain analysis were used. The t-test was used to compare differences between pre-treatment and post-treatment scores, while the N-Gain analysis provided insight into the effectiveness of the training program. This analytical approach allowed researchers to examine the impact of the training on teachers' writing skills and determine to what extent the intervention was successful in increasing their competence in scientific writing.

The treatment given to teachers is conducted in four stages. There are preparation, implementation, monitoring and evaluation, and analysis and report writing. In-depth discussions with teachers were held during the preparation stage to analyse their challenges and potential solutions. The team also created the administrative documents, programme support materials, engagement materials, and instruments that would be utilised during the programme. The first stage included both in-person conversations at school and online communication via a WhatsApp group. To supplement the training sessions, each participant received a guidebook, soft and hard copies of the engagement materials, and a seminar kit.

The second stage, the implementation, consisted of three activities: initial orientation, guided practice, and independent practice. The complete activities can be seen in Figure 1. The third stage, monitoring and evaluation, included a post-test to measure the success of the engagement activities. If the teachers did not attain the intended results, the team gave interventions. Once the targets were completed, an online session was held to give teachers with enrichment for one month. The programme was evaluated based on the outcomes of each activity. The outputs included the pre-tests, the teachers' understand of the contents, the practise sessions, and the presentations. The third part, analysis and report writing, entailed analysing the data obtained during the evaluation to measure the development in writing skills. The research team then wrote a report summarising the program's implementation and outcomes

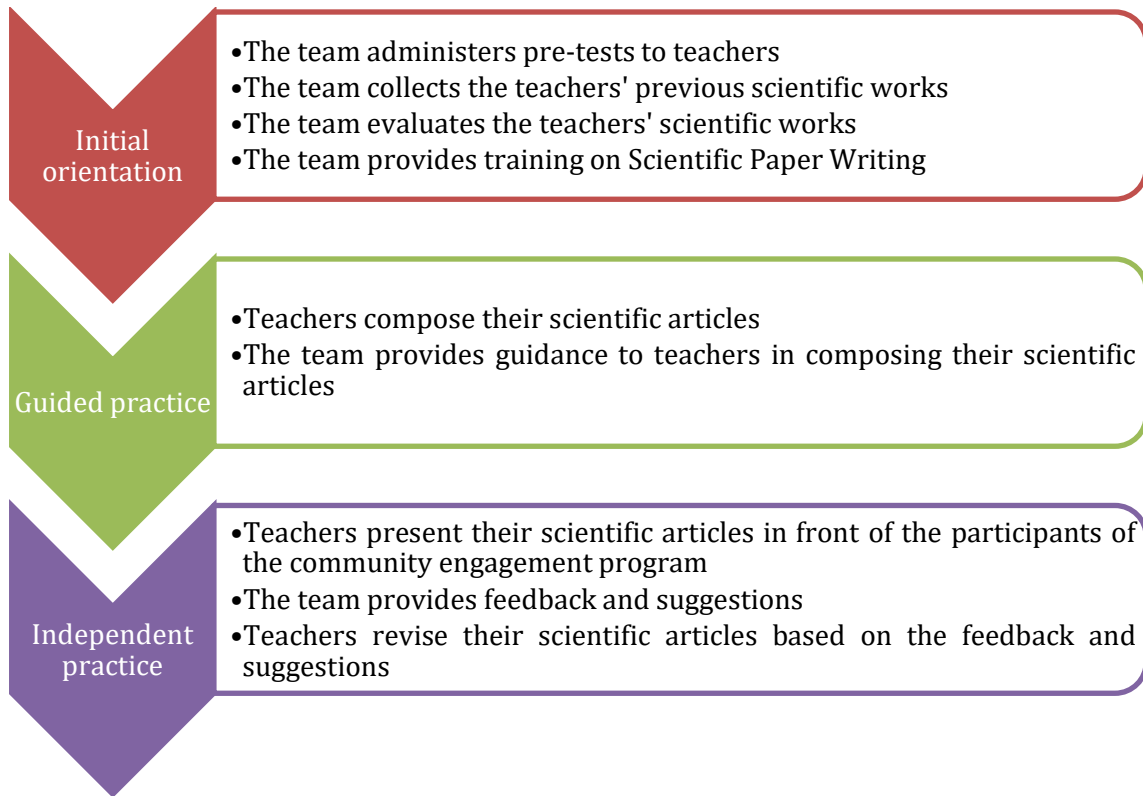


Figure 1. Activities during the Implementation Phase.

FINDINGS AND DISCUSSION

1. Results

The significance value of $0.188 > 0.05$ indicates that the residual values are normally distributed, according to the results of the normality test. The significance value of $0.951 > 0.05$ shows that the data is homogeneous based on the findings of the homogeneity test. A t-test was performed on the pre-test and post-test data to establish the impact of the training on the teachers' scientific article writing skills, as shown in Table 1. An N-Gain test was also done to measure the effectiveness of the training. The results are shown in Table 2.

Table 1. Results of the Paired Samples Test

	Mean	Std. Dev	Std. Error Mean	85% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pre-Test								
Post-Test	-14.6	0.91	0.141	-14.9	-14.3	-103.688	41	0.000

The significance value (2-tailed) of $0.000 < 0.005$ indicates a significant difference between the pre-test and post-test. It indicates that the scientific article training had a considerable impact on the teachers' ability to write scientific articles. The mean

score of 0.5086 in Table 2 indicates a moderate improvement in teachers' ability to produce scientific articles.

Table 2. Results of N-Gain Test

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	42	0.33	0.88	0.5086	0.13088
Valid N (listwise)	42				

2. Discussion

Before the training, the teachers had only an unclear understanding of the process of writing scientific articles. They had no idea about the exact principles and requirements for constructing and formatting such publications. As a result, teachers had difficulty organizing their thoughts and expressing them in a coherent and logical way. Their inability to construct a standardized format for their writing was caused by their lack of familiarity with the article templates. This lack of understanding of the required components and format of scientific papers created a substantial barrier to effectively conveying their research findings and insights. Because the organization and structure of the teacher's writings were not well-established, their ideas lacked a methodical flow. The themes chosen were out of date and had not been thoroughly researched. Furthermore, the teachers did not devote enough time to discussing the findings of their investigation.

There are some teachers who continue to write in everyday language, demonstrating a lack of skill in formal academic language. In addition, the teachers have not been able to string together concepts properly so they have not succeeded in coming up with interesting and new ideas. Additionally, when the articles were checked using Turnitin, their article similarity remained high, indicating a lot of copied content.

The teachers looked for references from unreliable websites, indicating a lack of discretion in selecting credible sources. In addition, the teachers were not familiar with using the reference manager, which made managing and organizing their reference materials difficult. In addition, they still have difficulty incorporating material from their sources into their own writing, and they lack the ability to provide insight and creative ideas.

After attending the training, teachers have a fairly thorough understanding of the components of scientific work. They are now aware of the basic aspects and structures necessary to develop well-organized and professional scientific articles. This includes understanding the importance of the introduction, review of the literature, methodology, results, discussion, and conclusions. With this understanding, they can properly format scientific articles and convey their ideas in a clear and unified way.

Throughout the training, teachers are instructed to complete targeted journal research and acquire appropriate article templates. They learn how to find academic journal references which are later used to identify articles that match their research interests and download templates that comply with the formatting rules relevant to their field of study.

This allows them to link their writing to recognized scholarly practice, ensuring that their publications conform to the structure and style required in their particular field. As the training progressed, teachers began to realize that some of the vocabulary they used previously in their jobs was informal and not suitable for an academic environment.

They become more aware of the importance of using formal and appropriate language in their articles to increase the professionalism and credibility of their work. They learn to avoid everyday idioms, slang, and overly informal language in their work and instead adopt a more scholarly tone.

Although the teacher's ideas are taking shape, the work certainly requires originality. To foster more innovative thinking, the service team takes a collaborative approach which is applied by forming groups of teachers with various areas of expertise. This allows for a wider range of ideas and facilitates the integration of different perspectives into their writing. Teachers can enhance the creativity and originality of their articles through teamwork and sharing of ideas, making their research contributions even more unique and important.

Despite the progress, the similarity of teacher articles remains high, indicating teachers still have a continuing dependence on content copied from the internet. To overcome this, teachers are taught the importance of paraphrasing in their own words. They learn how to rewrite content while retaining the core meaning, helping them avoid plagiarism and develop their own distinct voice in their work. They are able to communicate material in a more real and innovative way after honing their paraphrasing skills.

The organization of concepts in the teachers' writings began to show signs of greater cohesion and structure. They learnt ways for carefully organizing their thoughts and arguments, allowing readers to more readily follow the logical course of their work. The teachers developed a better understanding of how to write a concise and effective introduction, give well-supported evidence in the body of their papers, and finish their research with important insights and implications as a result of the training.

By the end of the program, the teachers had mastered the ability to do successful literature searches utilizing platforms such as Google Scholar. They were able to gain access to scholarly resources, download relevant publications, and incorporate the findings into their own writing to back up their claims and strengthen the validity of their research. They learnt how to analyze and choose credible sources, ensuring that their papers were well-informed and anchored in current knowledge.

While some teachers were still learning how to use reference management systems, it was discovered that the majority of them used software such as WPS instead. Reference managers are software programs that help scholars organize their references, generate citations, and manage bibliographic data. Zotero, Mendeley, and EndNote are other popular reference managers. Despite their varying levels of expertise, the teachers were taught the advantages of using reference managers to speed their citation process and preserve uniformity in their referring style. This enabled them to handle their references more effectively, appropriately cite sources, and develop properly structured bibliographies.

Teachers grew more competent at integrating material from numerous sources and synthesizing it into their own writing as their skills in literature synthesis developed. They demonstrated a higher degree of critical thinking and analysis by effectively adding appropriate sources to support their points and improve the overall quality of their works. They were able to give a well-rounded and informed perspective on their study topics by properly referencing and synthesizing information, boosting the credibility and impact of their writings.

Teachers must be able to write scientific articles in order to contribute to the growth of knowledge in their particular professions and create meaningful educational experiences for their pupils (Hyland, 2021). This study investigates the increase in teachers' capacity to write scientific papers, emphasizing the significance of improving their writing skills both academically and in terms of the benefits it offers to their pupils. The debate also addresses the contributions of training programs, the shortcomings identified in these programs, efforts to remedy such shortcomings, and other approaches to further improving teachers' scientific writing skills.

Training programs designed to improve teachers' abilities to write scientific articles have shown considerable beneficial results. Teachers' comprehension of scientific writing principles, such as good article organization, acceptable language usage, and the capacity to provide clear and logical arguments, has improved dramatically. Teachers have demonstrated greater proficiency in organizing their ideas, synthesizing information from relevant sources, and successfully expressing their study findings through well-written articles when comparing their beginning capabilities to their end achievements.

Improving teachers' scientific writing skills has had a significant academic impact. They can contribute to the scientific debate in their field of study, imparting their expertise and discoveries through research publications (Strobl et al., 2019). This advances knowledge in their field, enhances professional standing, and develops collaboration within the academic community (Miyakawa & Winsløw, 2019). Through enhancing scientific writing skills, teachers provide valuable insights and reinforce understanding within existing bodies of knowledge. Publishing research articles allows them to present their work in a rigorous and scientific standard. Ultimately, engaging in scientific writing and publishing works strengthens the professional position of teachers and promotes cooperation and collaboration within the academic community.

Teachers with good scientific writing skills can provide more interesting and useful educational experiences for their students (Cremin & Oliver, 2017). They can create and disseminate research-based learning materials, organize inquiry-based activities, and guide students in conducting scientific research. Teachers can encourage curiosity, critical thinking, and a deeper understanding of subject matter in their students by successfully explaining scientific concepts and research findings (Suriyanti & Yaacob, 2016).

By having strong scientific writing skills, teachers can produce high-quality, research-based learning materials. They can incorporate the latest research findings into lesson plans, create activities that engage students in scientific inquiry, and provide informative and relevant reading material. Research-based learning materials not only improve teaching quality, but also help students develop a deeper understanding of scientific concepts.

In addition, teachers with good scientific writing skills can also act as mentors for students in conducting scientific research. They can guide students in planning, carrying out, and evaluating their own research. Through this experience, students can develop investigative, problem-solving, and data analysis skills, which are essential in understanding the scientific method and deepening their understanding of the subject studied.

Furthermore, teachers who are proficient in explaining scientific concepts and research findings can build students' interest and enthusiasm for science. By using clear and engaging language, they can explain complex concepts in a way that is easy for students to understand. This ability not only helps students understand the material, but

also builds their confidence and motivates them to be actively involved in scientific learning.

Strong scientific writing skills in teachers have a significant impact in enhancing the educational experience of students. Teachers can create and disseminate research-based learning materials, organize inquiry activities, and provide guidance to students. By explaining scientific concepts and research findings well, teachers can encourage interest, critical thinking, and deeper understanding in their students. Good scientific writing skills enable teachers to provide meaningful and effective educational experiences for their students.

Through diverse activities such as initial orientation, guided practice, and individual practice, the training program made major contributions to strengthening teacher writing skills (Rahim et al., 2017). Teachers were taught the basic components of a scientific paper, academic writing conventions, and the need of adhering to ethical standards in research during the initial orientation period. This set the groundwork for their eventual advancement in scientific article writing.

Teachers received hands-on training and individualized guidance from experienced mentors throughout the guided practice phase. They were walked through the steps of doing literature reviews, developing research questions, developing procedures, analyzing data, and effectively presenting their findings. This interactive technique gave teachers hands-on experience and personalized feedback to help them improve their writing skills (Rahim et al., 2017).

Teachers were given the opportunity to apply what they had learnt and produce their own scientific articles during the independent practice phase. They were encouraged to pursue their study interests, collect relevant literature, analyze data, and present their findings coherently and scholarly. This phase encouraged self-directed learning and provided an opportunity for teachers to display their knowledge of scientific writing. Despite the favorable achievements, numerous flaws in the training programs have been identified. One prevalent flaw is a lack of emphasis on critical examination and interpretation of study findings. Teachers may develop technical skills in scientific writing, but they may struggle to critically analyze study findings and derive significant conclusions. Furthermore, the training program may fail to appropriately address the issues of writing in interdisciplinary situations, in which teachers must combine knowledge from multiple fields into their articles (Rahim et al., 2017).

To remedy these shortcomings, training program should include activities that encourage instructors to analyze and comprehend research findings as well as exercises that improve critical thinking abilities (Kayaalp et al., 2020). Facilitators should guide participants in synthesizing knowledge from many sources and generating sound judgements. Interdisciplinary approaches can also be used, allowing teachers to investigate links between their subject area and other disciplines, stimulating interdisciplinary collaboration, and producing more thorough and effective research publications (Annan-Diab & Molinari, 2017; You, 2017).

Other ways, in addition to the existing training program, it can be used to improve teacher scientific writing skills. Workshops or seminars on specific components of scientific writing, such as literature review, data analysis, or scientific argumentation, may be included. Collaborative writing projects, in which teachers collaborate with colleagues or researchers to co-author papers, it can also be introduced, giving chances for knowledge sharing and professional networking (Supiani, 2017; Abbas & Fathira, 2022). Creating writing communities or peer review groups can also provide a supportive

environment for teachers to receive criticism, participate in conversations, and continuously develop their writing skills.

Improving teachers' capacity to produce scientific papers is critical for their professional development and improving their students' learning experiences (Strobl et al., 2019). Training programs are important in enhancing instructors' scientific writing skills, but they must address flaws such as inadequate critical thinking and transdisciplinary writing issues (Rahim et al., 2017). Activities that promote critical thinking, multidisciplinary viewpoints, and continuing professional growth should be included. Educators may build a community of teachers with good scientific writing skills by offering ongoing support and diverse training methodologies, so contributing to the advancement of teaching and research in their particular professions.

CONCLUSION

In conclusion, the scientific paper writing training program significantly improves the writing skills of secondary school teachers, enabling them to create scientific papers with better organization and clear presentation of research results. This improvement in teachers' writing skills benefits both the academic community and students by enabling teachers to engage in scholarly discussions, disseminate knowledge, and collaborate with other researchers. However, there are still areas for improvement, such as the need to focus on critical analysis and interdisciplinary writing. Combining activities that promote critical thinking, research exploration, and a multidisciplinary perspective can further enhance teachers' scientific writing skills. Overall, this study highlights the importance of strengthening teachers' scientific writing skills through effective training programmes, contributing to their professional development and enhancing the quality of education. It also emphasizes the importance of research-based teaching practices, continuous professional development, and the improvement of overall educational standards in society.

Based on the conclusions of the study, some suggestions for future researchers include conducting a longitudinal study to see the long-term effect of scientific paper writing training on writing skills and teacher professional development. Further research should also focus on targeted interventions to address specific areas for improvement, such as critical analysis and interdisciplinary writing. Exploring technology integration, investigating the impact of collaborative writing projects and peer review groups, and conducting comparative studies on different training methods are also recommended. These suggestions aim to advance the field of scientific paper writing training for high school teachers and increase the effectiveness of future programs.

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