

# SAWT (Scientific Article Writing Training): Effectiveness in increasing Physics Teachers Competence as an Effort for Sustainable Professional Development of Teachers

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## ABSTRAK

Menulis dan mempublikasikan sebuah artikel ilmiah merupakan hal yang penting bagi guru. Kegiatan tersebut merupakan bagian dari indikator keberhasilan pengembangan profesional guru dan termasuk dalam prasyarat kenaikan pangkat. Penelitian ini bertujuan untuk mengetahui pengaruh model pelatihan penulisan artikel ilmiah 4-fase terhadap peningkatan keterampilan menulis artikel ilmiah guru fisika di Sumatera Selatan. Jenis penelitian ini adalah eksperimen semu dengan menggunakan metode pretest-posttest. Populasi penelitian ini adalah 35 Guru fisika. Teknik analisis data menggunakan teknik analisis data kuantitatif untuk menganalisis data yang terkumpul dari skor capaian keterampilan menulis artikel ilmiah guru fisika. Hasil penelitian menunjukkan bahwa penerapan model pelatihan artikel ilmiah 4-fase secara efektif dapat meningkatkan keterampilan guru dalam penulisan artikel ilmiah hingga berhasil melakukan submission pada jurnal nasional terakreditasi sinta 2 sampai sinta 5. Pelaksanaan kegiatan pelatihan menggunakan model pelatihan yang tepat dapat memberikan dampak positif bagi guru sehingga dapat secara komperhensif mampu meningkatkan keterampilan guru dan menukung pengembangan keprofesian berkelanjutan guru fisika.

## ABSTRACT

Writing and publishing a scientific article is essential for teachers. These activities are part of the success indicators of teacher professional development and are included in the prerequisites for promotion. This research aims to determine the effect of the 4-phase scientific article writing training model on improving physics teachers' scientific article writing skills in South Sumatra. This type of research is a quasi-experiment using the pretest-posttest method. The population of this study was 35 physics teachers. The data analysis technique uses quantitative data collected from physics teachers' scientific article writing skill achievement scores. The research results show that applying the 4-phase scientific article training model can effectively improve teachers' skills in writing scientific articles to the point of successfully submitting them to accredited national journals Sinta 2 to Sinta 5. Implementing training activities using the suitable training model can have a positive impact on teachers so that it can comprehensively improve teacher skills and support the continuous professional development of physics teachers.

## 1. INTRODUCTION

Education is one of the foundations and main components in building and improving the quality of human resources (Bahri, 2022; Pantiwati et al., 2023). In the process of implementing teacher education, it has a strategic and dominant position (Hasanah & Haryadi, 2022; Putri & Imaniyati, 2017). Therefore, the success of education is largely determined by the quality of educators in carrying out their roles and duties. Without its active participation, the educational process lacks essence and substance (Hasanah & Haryadi, 2022; Putri & Imaniyati, 2017; Suwardi et al., 2017). No matter how complex the curriculum and learning management as long as the teacher is passive, there will be no significant improvement in the quality of learning. So that the quality and professionalism of teachers in the educational process becomes very important. The professionalism of a teacher is one of the determinants of the success of improving the quality of education in schools (Darmansah, 2023; Valiandes & Neophytou,

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2018). In the Law of the Republic of Indonesia number 14 of 2005 concerning Teachers and Lecturers, it is stated that a professional teacher at least has pedagogical competence, personality competence, social competence, and professional competence. In addition, Professional educators as someone who has a professional attitude, skills that are able and loyal to develop their profession, participate in communicating professional development efforts and cooperate with other professions. Teacher professionalism is related to the ability of teachers to carry out their roles and functions and how they behave in schools and communities with positive values (Rahyasih et al., 2020; Sakti, 2020). The professional development of teachers can be done through self-development activities, scientific publications and innovative works (Rahyasih et al., 2020; Wijiutami et al., 2020).

These activities are essential for a professional teacher. Despite the fact that many teachers have received educator certificates, they have not fully developed sustainable professionalism, especially in scientific publication activities. Even though the activity of writing scientific papers and publications is one of the teacher processes in sustainable professional development in the long term (Rahyasih et al., 2020; Sunandar et al., 2016). Data in the field shows that out of 323 physics teachers of civil servants in South Sumatra, only 75 teachers have conducted class action research. Then only 45 physics teachers have ever written the results of class action research into scientific articles published in accredited journals. This data is also supported by research results which state that among teachers, publication of research results in journals is very low, namely only 59%. In addition, several previous research results show that teachers' skills in writing scientific articles are still low (Nani et al., 2017; Rahyasih et al., 2020; Septafi, 2021; Sulaeman, 2020; Yulhendri et al., 2018).

The level of teacher productivity in writing scientific papers is part of the success indicators of professional development and is referred to in the prerequisites for promotion. The more scientific works, the more productive the teacher, the easier it will be to get promoted (Rahyasih et al., 2020; Supriyanto, 2020). As many as 60% of teachers in Central Java are constrained from promotion due to obstacles in writing scientific articles. Then as many as 50.88% of teachers who have been ranked IVa, but only 0.5% can be promoted to IVb (Mawardi et al., 2019; Rohmah et al., 2023; Supriyanto, 2020). Then these results are supported by field data which shows that teachers, especially physics teachers in South Sumatra, are only 5.2% of teachers in group IV b, the majority are still in group III d of 19.5% and the rest are spread in groups III a, III b, III c, and IV a. It turns out that there are several dominant causes that result in teachers being less able to develop sustainable professionalism, namely because teachers are less optimal in carrying out class action research and are less able to write scientific papers (Fitria et al., 2019; Rohmah et al., 2023). This is supported by the results of interviews that have been conducted with physics teachers in South Sumatra. The teacher mentioned that the low intensity of teachers in writing scientific articles and publishing in scientific journals because teachers have limited time in carrying out research to limited time in carrying out research, preparing research proposals and reports. In addition, there are limited knowledge in writing scientific articles and are not accustomed to processing research results into data that are worthy of publication. Then the teacher felt that the scientific article had a confusing format. And it is not supported by the availability of training activities for teacher learning professional development, especially in terms of writing scientific articles in South Sumatra. This finding is in line with the results of previous research which shows that the obstacles for teachers in writing articles and scientific publications lie in teachers' lack of experience in writing. As well as the limited knowledge or understanding of teachers about the publication of scientific articles (Haryati et al., 2022; Setiawan et al., 2017).

Continuous professional development of teachers through scientific publications is important and needs to be improved and received serious attention both individually (teachers) and related institutions (Ardiansyah et al., 2022; Permana et al., 2021). Many efforts have been made, one of which is by carrying out training activities on writing scientific articles for teachers (CITATION). However, the majority of the training was not carried out using a special training model for writing scientific articles (Arono & Arsyad, 2020a; Emaliana et al., 2020; Emaliana, 2020; Harahap & Yunita, 2021). Therefore, it is less effective to improve teacher skills in writing scientific articles, especially in producing outputs in the form of article submissions in SINTA-accredited national journals. Therefore, special attention is needed to improve the skills of teachers in writing scientific articles, especially the implementation of writing training as an effort to develop sustainable professionalism of teachers in South Sumatra. Researchers developed a 4-Phase scientific article writing training model with the aim of training teachers in South Sumatra in the development of sustainable professionalism, especially in the publication of scientific articles. This training model is process-oriented so that through a good process, it will certainly produce good outcomes. The previous 4-phase training model has been tested for feasibility and practicality, but its effectiveness has not been seen to improve teachers' scientific article writing skills. Therefore, this study

aims to determine the effect of the application of the 4-Phase scientific article training model in improving the skills of physics teachers in South Sumatra as an effort to develop teacher professionalism.

## 2. METHOD

The research was conducted in July-August 2023. The subjects in this study were high school and vocational school physics teachers in South Sumatra. This study used a pseudo-experimental method with One Group Pretest Posttest Design (Muthi'ik et al., 2018; Nisah et al., 2021). The research design of one group pretest-posttest was conducted in one group. Through the One-Group-Pretest-Posttest design, it will be seen how the effect of the 4-phase training model of writing scientific articles in improving the competence of physics teachers as an effort to develop sustainable professionalism of teachers in South Sumatra. The previous 4-phase selection model has been developed by researchers and tested for feasibility and practicality from the point of view of experts and teachers as users. The process of developing a 4-phase model has referred to adult education (Andragogy) and the activities carried out in each phase refer to improving the writing skills of teacher scientific articles (Hiryanto et al., 2015; Wiyono, 2015). The 4-phase training model used in the research process showed in Table 1.

**Tabel 1.** 4-Phase Training Model

Phase	Description
Phase 1: Purpose and Motivation	<ol style="list-style-type: none"> <li>1. The interviewees motivated the participants by explaining the urgency and benefits for teachers if they were able and had outputs in the form of articles in accredited or internationally reputable nasiaonal journals.</li> <li>2. The interviewee explains the learning objectives and conveys the scope of the material</li> </ol>
Phase 2: Information	<ol style="list-style-type: none"> <li>1. Interviewees presented information on tips and tricks related to writing AI-assisted scientific articles (Artificial Intelligence).</li> </ol>
Phase 3: Division and mentoring of Learning Groups	<ol style="list-style-type: none"> <li>1. Participants form independent study groups</li> <li>2. Interviewees assign tasks to participants</li> <li>3. The interviewee guides the trainees related to the task that has been given</li> </ol>
Phase 4: Peer Review	<ol style="list-style-type: none"> <li>1. The interviewee directs participants to collect the tasks that have been given and invites one of them to present the tasks that have been created.</li> <li>2. Interviewees provide comments and guided discussions on the tasks that have been made by participants</li> </ol>

The implementation of the training was carried out as many as 5 meetings each meeting discussing one topic in the module of writing scientific papers. Figure 1 shows themetings given in this training to participants. Scientific article writing training model for teachers showed in Figure 1. The data collection instruments used were tests and non-tests in the form of observation sheets for the results of writing scientific articles for physics teachers. The test questions used include pretest and posttest that have been validated in advance by the lecturer of physics education at Universitas Sriwijaya. Pretest in the form of questions is given to students before conducting training. In addition, before the training was carried out, participants were required to collect works in the form of scientific articles based on class action research that had been carried out. Meanwhile, the post-test was given to participants after conducting the training process and the teacher was again required to compile scientific articles. Then the observation sheet used is in the form of a scientific article assessment rubric. Rubric filling was carried out by three observers to assess the ability to write scientific articles for physics teachers in South Sumatra during the training process. The analysis technique used is quantitative data analysis technique to analyze the data collected from achievement scores. The data were then analyzed using Normalized Gain (N-Gain) analysis techniques to determine whether the training carried out proved effective in improving the writing competence of physics teachers in South Sumatra. Many previous studies have used normalized gain analysis (Doyan et al., 2020; Khaira et al., 2021; Muthi'ik et al., 2018; Pratama, 2020). After obtaining the results of the calculation, then interpret the value in the category of training effectiveness. The N-Gain criteria can be seen in Table 2.

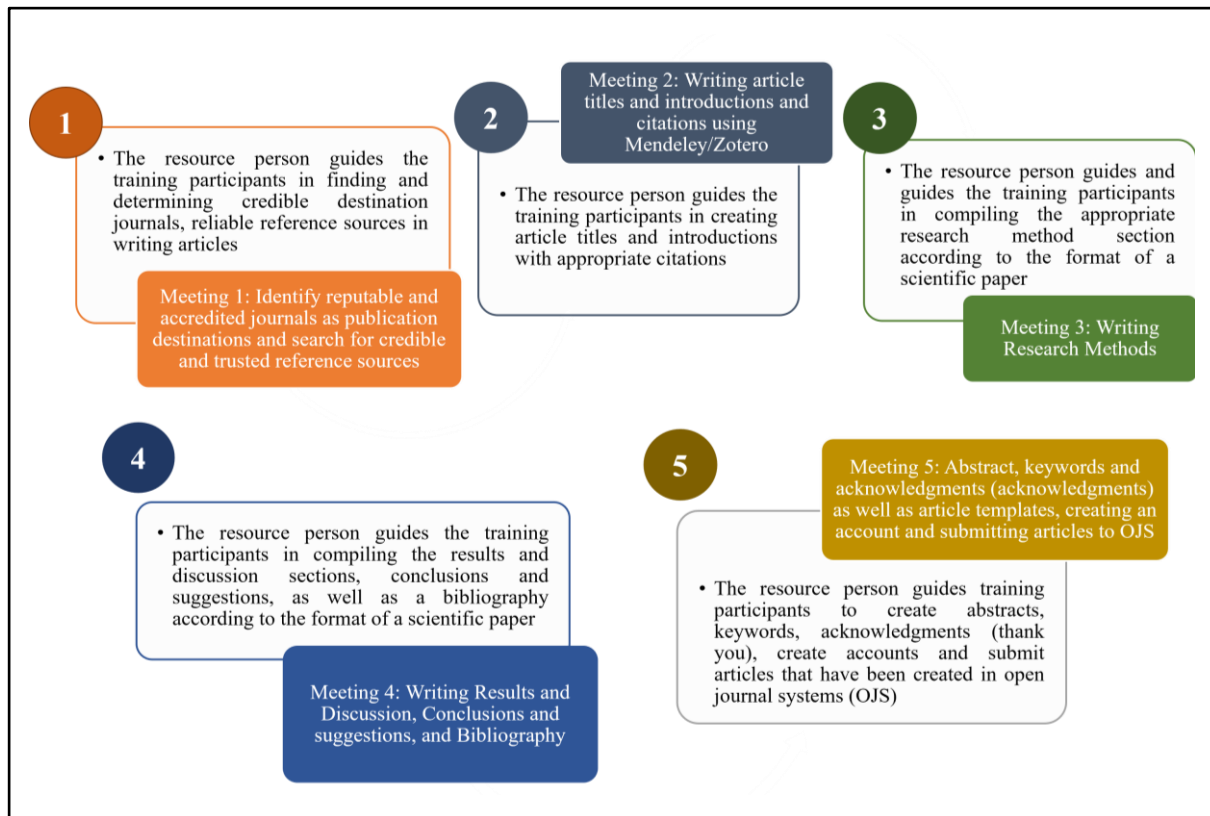


Figure 1. Scientific Article Writing Training Model for Teachers

Tabel 2. Category of Effectiveness Based on N-gain

N-gain Value Criteria	Category
Ngain ≥ 0.7	High
0.7 > Ngain ≥ 0.3	Moderate
Ngain < 0.3	Low

### 3. RESULT AND DISCUSSION

#### Result

Competence in writing scientific articles for physics teachers is expected to increase after training in writing scientific articles as an effort to develop professionalism for teachers in South Sumatra. The competency improvement can be seen from the pretest and posttest that have been done by participants before and after the training activity. The average pretest and posttest results of trainees are shown in Table 3.

Tabel 3. Average Data on Pretest and Posttest Results of Learners

Parameter	Pre	Post
Number of trainees	35	35
Top Rated	80	100
Lowest value	30	70
Average	63.24	83.82

Table 3 shows the results of the pretest and posttest of the trainees. Based on these data, it can be seen that there is an increase in the value of trainees in this case are physics teachers in South Sumatra. Physics teacher's understanding of scientific article writing increased by 20.58% after scientific article writing training. Furthermore, the n-gain test was carried out to determine the improvement of understanding and writing skills of scientific articles of physics teachers as seen from the difference between pretest and posttest values given before and after treatment. The average-gain for pretest and posttest results of writing scientific articles for physics teachers can be seen in Table 4.

**Tabel 4.** N-Gain pretest and posttest results of writing scientific articles for physics teachers in South Sumatra

Parameter	Competence in Writing Scientific Articles for Physics Teachers
Number of trainees	35
Highest gain	1.00
Lowest gain	0.33
Average	0.51

The data presented in Table 5 shows the results of the N-Gain pretest and post-test for writing scientific articles for physics teachers in South Sumatra. It is known that the lowest N-Gain value is 0.33 and the highest is 1.00 with an average N-Gain of 0.51, which is referred to in the medium category. Then review the N-gain score of the physics teacher's scientific article writing skills seen with observation activities before and after the treatment was carried out. The results of N-gian can be seen in Table 6.

**Tabel 6.** N-Gain Per-Indicator of Scientific Article Writing Skills

No	Indicators	Pre	Post	N-Gain
1	Identify reputable and accredited journals (A1);	54.71	72.94	0.40
2	Choosing credible and reliable reference sources in the article writing process (A2);	50.59	66.47	0.32
3	Create article titles and introductions with appropriate citations;	46.47	66.47	0.37
4	Create an appropriate research method section (A3);	54.71	70.00	0.34
5	Make appropriate results and discussions (A4);	56.47	70.00	0.31
6	Make a conclusion and suggestion section and write a bibliography in the manual style of the destination journal (A5);	60.00	80.59	0.51
7	Create abstracts, keywords, and acknowledgments on articles (A6);	50.59	81.18	0.62
8	Preparing scientific articles based on the selected journal articles (A7);	36.47	81.18	0.70
9	Create an account on Open Journal Systems (OJS) and submit articles that have been created (A8).	37.06	100.00	1.00
<b>Average</b>		<b>49.67</b>	<b>76.54</b>	<b>0.51</b>

Based on the data in Table 6, it is known that the average score of N-gain of scientific article writing skills of physics teachers in South Sumatra is 0.51 which means that it has a medium category and shows that there is an average increase in scientific article writing skills of physics teachers for each indicator. The first indicator, namely identifying reputable and accredited journals, increased by 18.24% with N-gain of 0.40 entering the medium effectiveness category. The second indicator, namely choosing credible and reliable reference sources in the article writing process, increased by 15.88% with an N-gain value of 0.32 in the medium category. The third indicator, namely creating an article title and introduction with the right citation, increased by 20.00% with an N-gain of 0.37 medium category. The fourth indicator, namely making the right research method section, increased by 15.29% with an n-gainof 0.34 in the medium category. The fifth indicator, namely making the right results and discussion, experienced an average increase of 13.53% with an N-gain value of 0.31 medium category. The sixth indicator, namely making conclusions and suggestions and writing a bibliography in accordance with the manual style of the destination journal, increased by 20.59% with an N-gain value of 0.51. The seventh indicator, namely making abstracts, keywords and acknowledgments in articles, increased by 30.59% with an N-gain score of 0.62. Then the eighth indicator compiling scientific articles based on the selected journal article template increased by 44.71% with an N-gain score of 0.70. Finally, the ninth indicator making an account at Open Journal Systems (OJS) and submitting articles that have been made experienced the highest increase of 62.94% with an N-gain score of 1.00. Overall, the average skill of physics teachers in writing scientific articles increased by 26.86% with an N-gain of 0.51 in the medium category, or in other words, the training for writing scientific articles for physics teachers in South Sumatra was quite effective in improving teacher skills in writing scientific articles. Figure 2 shows a graph of the increase in n-gain in teacher skills in writing scientific articles.



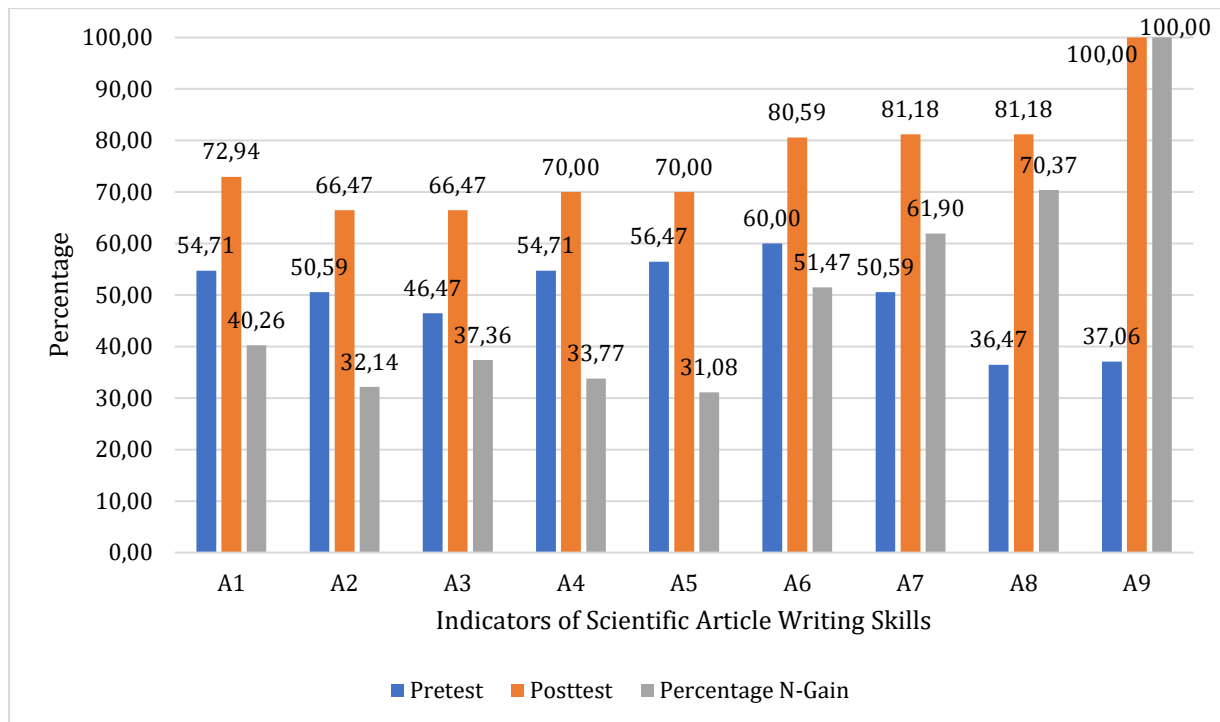


Figure 2. N-Gain Chart of Each Indicator of Scientific Article Writing Skills

Then at the end of the training activity all participants are required to submit the articles they have compiled in SINTA-accredited national journals 2-5. This was done to provide concrete evidence that training activities using the 4-phase model had a positive impact on the scientific writing skills of physics teachers in South Sumatra. Figure 3 shows the percentage of accredited national journal levels that are the goals of the trainees.

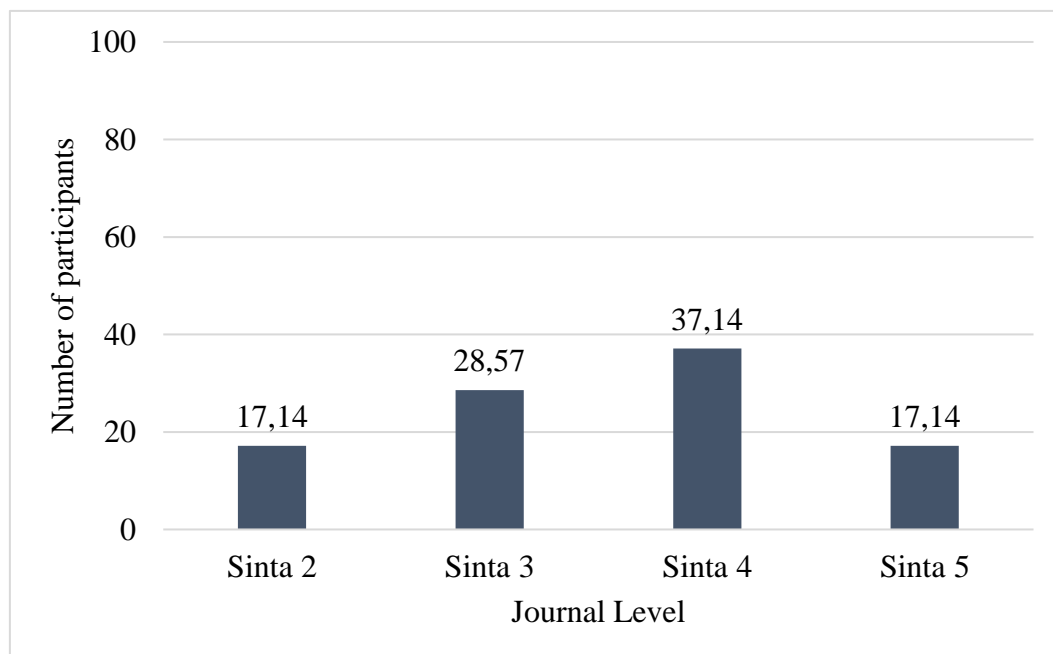


Figure 3. Percentage of Training Participants' Preferred Journal Levels

**Discussion**

Training on writing scientific papers for physics teachers in South Sumatra has been carried out to improve the competence of physics teachers in writing articles as an effort to increase the sustainable professionalism of teachers in South Sumatra. The implementation of training began in July 2023 which began with the development of a 4-phase training model which was then tested for feasibility and

practicality to experts and teachers as users. Then continued with the socialization of scientific article writing training activities for teachers in 4 cities and 12 regencies in South Sumatra. Then the registration of scientific paper training participants was opened by members of the implementing team from the South Sumatra Education Office in collaboration with the Department of Physics Education, Universitas Sriwijaya. As a prerequisite, all prospective participants are required to have conducted and had a class action research report, this aims to facilitate teachers in preparing scientific articles as the final demands of training activities. In addition, teachers are also given prerequisites to compile scientific articles as an initial reference for resource persons and teams in looking at the skills of physics teachers in compiling scientific articles. From 267 high school and vocational school physics teachers in South Sumatra, 35 teachers were selected to participate in scientific writing training activities.

The activity was carried out by inviting three professional speakers, namely lecturers from Sriwijaya University and the South Sumatra Education Office. The training was divided into three main materials, including the importance of scientific articles for teachers, scientific publications and promotions for teachers and writing scientific articles. The material for writing scientific articles is divided into five meetings which can be seen in Figure 1. The implementation of training at each meeting refers to the scientific article writing training model that has been developed. The training model consisted of four phases, namely: Phase 1 (Objectives and motivation), Phase 2 (Information), Phase 3 (Division and guidance of study groups), Phase 4 (Peer review) which had been previously developed by the researcher. In phase 1, the speaker conveyed the objectives and motivation to participants to be more enthusiastic in participating in training activities. Phase 2 of the interviewees delivered material in accordance with the topic of the meeting being discussed. Then phase 3 was carried out independent work by trainees who were divided into study groups. In this phase, trainees are assigned tasks in accordance with the material being discussed which will then be reviewed by the interviewees at the peer review stage. Furthermore, at the end of the training all participants (physics teachers) are required to submit articles that have been compiled in accredited national journals SINTA 2 to SINTA 5. This activity is carried out to hone skilled teachers in writing scientific articles and provide opportunities for trainees to work in the time period that has been approached in producing products and submitting articles that have been made (Fitriani, 2020; Waluyo & Wahyuni, 2021). Photos of training activities are shown in Figure 4.



**Figure 4.** a) Phase 1: Purpose and motivation; b) Phase 2: Information; c) Phase 3: Division and guidance of study groups; d) Phase 4: Peer review

This activity is also equipped with a scientific article writing training module for teachers to facilitate participants in understanding the concept of writing scientific articles. The modules used have been adjusted to the 4 phases of the training model that has been developed. The training module is also equipped with examples that are relevant to the teacher's research background so that it can make it easier for teachers to understand the material (Awalludin & Lestari, 2017b; Herminayu & Sulasmono, 2020). Then the module is also equipped with a barcode that can be used to view images, links and videos that are available and can be accessed using the smartphone of each trainee. The use of this barcode scan was able to increase the motivation and curiosity of participants in carrying out the training (Nafisah & Ghofur, 2020; Pratiwi & Indana, 2022). In addition, there are also tips and tricks in writing scientific articles that can facilitate teachers in writing scientific articles. The results of the analysis showed that training in writing scientific articles for teachers by applying the 4-phase training model was declared effective to improve the skills of physics teachers in compiling scientific papers in the medium category according to the N-gain category level. The average overall N-gain for pretest and posttest results of teacher scientific writing skills was 0.51 (medium category). This improvement is due to the training

carried out by applying the 4-phase training model and equipped with a scientific article writing training module for teachers to make it easier for participants to understand the concept of writing scientific articles. This is in line with previous research which states that scientific writing training can improve teachers' understanding of writing scientific articles (Emaliana, 2020; Utomo & Brata, 2022). Previous research also shows improvements after training by implementing certain training models as an effort to improve physics teachers' skills in writing scientific articles (Arono & Arsyad, 2020b; Ginting et al., 2021; Harahap & Yunita, 2021).

Based on the results of the study, it also shows the teacher's skills in writing scientific articles on each indicator. Figure 2 shows that the highest increase was 62.94% in the ninth indicator, namely creating an account at Open Journal Systems (OJS) and submitting articles that have been created while the lowest increase was 13.53% in the fifth indicator, namely making the right results and discussion. This is because the results and discussion are more complex compared to other indicators (Nani et al., 2017; Sulaeman, 2020). In this section, participants are required to present the results in an interesting and easy to understand way by readers such as presenting it by using tables, graphs or images. In addition, they were also required to compare the results of the research obtained with the results of previous studies, as well as discuss the findings of the research results. However, due to the lack of experience of trainees in presenting research results and discussing these results, when required to compile results and discussions within a limited period of time, they tend to panic and be confused in doing so. Even though their abilities already exist, they just need a lot of practice in writing the results and discussion. However, overall, it can be seen in Figure 2 that there is an increase in the N-gain score in each indicator. This means that the application of the 4-phase training model is able to improve teacher skills in writing scientific articles. The application of the training model is in accordance with the level of development of teachers whose age is already referred to in adulthood. This is because the training model that has been developed refers to the andragogy (Adult education) approach, which is the process of human maturation (for an individual) to move from a sense of dependence to independence with different moving speeds according to people and their life dimensions. In andragogy, each individual is directed to make decisions, have experience, readiness to learn and have a learning time perspective (Arono & Arsyad, 2020b; Ginting et al., 2021). The 4-phase training model with 5 meetings has covered these.

In phase 1, the speaker conveyed the objectives and motivation to participants to be more enthusiastic in participating in training activities. Phase 2 of the interviewees delivered material in accordance with the topic of the meeting being discussed. Then phase 3 was carried out independent work by trainees who were divided into study groups according to the time given. In this phase, trainees are assigned tasks in accordance with the material being discussed which will then be reviewed by the interviewees in the last phase, namely peer review. The 4-phase training model with 5 meetings of scientific paper material creates a learning climate in accordance with the learning desires of teachers, both space, furniture, equipment, learning media, cooperation, mutual respect, and the learning environment, resulting in comfort, including participants in diagnosing the training needs for teachers so that they feel involved and motivated to learn because it suits their needs (Ardiansyah et al., 2022; Wulandari & Iriani, 2018). The training process also provides flexibility to participants in planning and making scientific papers, so that the speakers act as facilitators, giving responsibility during the learning process and emphasizing self-evaluation, emphasizing the practical application process on the basis of participants' experiences so that participants are enthusiastic and active during the training process. In addition, the application of the training model of scientific articles is interesting, so that participants are enthusiastic and active during the training process. This is in line with previous research that using the right model in training activities can arouse motivation and trainees (Awalludin & Lestari, 2017a; Sabon, 2019), and improve the skills and understanding of participants in the author of scientific articles (Darmuki et al., 2021; Mawardi et al., 2019).

Then there are tips and tricks, exercises and assignments, as well as peer review given by speakers during training that requires students to be active during training, especially in the preparation of scientific articles so that submissions can be made to accredited national journals. Communication between participants and resource persons is one of the keys to successful improvement of scientific article writing skills for fisika teachers in South Sumatra (Perera & John, 2020; Shellawati et al., 2018). Scientific article writing training activities as a first step in one of the elements of sustainable professional development, namely scientific publications from research results. The implementation of training provides a positive experience for physics teachers. Then the integration between the training model and the modules used for scientific article writing training activities is believed to improve the understanding and skills of trainees (Hsu & Lin, 2020; Martini et al., 2021; Rahyasih et al., 2020). In addition, the training process has been carried out in a correct, interesting and interactive pattern, namely through 4-phases that help participants directly and actively in completing scientific articles (Hartanto et al., 2021;



Sunandar et al., 2016). The successful implementation of the training using the 4-phase training model was supported with as many as 100% of trainees having successfully submitted articles as a result of training activities. A total of 17.14% of participants submitted to national journals distributed by SINTA 2, 28.57% to SINTA 3 journals, and SINTA 4 and 5 accredited national journals respectively by 37.14% and 17.14%. Training activities by applying the 4-phase training model are certainly the answer to the need for continuous teacher professional development and support teacher productivity in writing scientific articles. So that in the future activities like this must be more massive to be carried out, as an effort to develop sustainable professionalism of teachers in South Sumatra. But not only in physics teachers but in all teachers in the field of study. Considering that the need for professional teachers in the world of education is very large (Lee & Perret, 2022; Rahyasih et al., 2020; Sugumlu, 2020).

#### 4. CONCLUSION

Based on the research that has been conducted, it can be concluded that the application of the 4-phase scientific article training model can effectively improve the skills of teachers in writing scientific articles to successfully submit to accredited national journals SINTA 2 to SINTA 5. Implementation of training activities using the right training model can have a positive impact on teachers so that they can comprehensively improve teacher skills and support the sustainable professional development of physics teachers in South Sumatra.

#### 5. ACKNOWLEDGE

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