



# Research assistance and publication of class action research results for junior high school teachers

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ARTICLE INFO	ABSTRACT
<p><b>Article history</b></p> <p>Received: 2023-01-12 Revised: 2023-01-16 Accepted: 2023-01-23 Published: 2023-01-24</p> <p><b>Keywords</b></p> <p>Classroom Action Research (CAR) Research articles Research assistance Science teacher Scientific publications</p>	<p><i>Teacher competence in carrying out Classroom Action Research (CAR) and presenting CAR results in the form of scientific work is a demand as well as a need in improving the quality of learning and teacher professionalism. The Chairperson of the MGMP IPA Malang city said that teachers' abilities and skills in conducting research still needed to be improved, especially for CAR research. The purpose of community service activities is to assist, direct, and collaborate with teachers in classroom action research activities and publish the results. The activities were carried out from June to December 2022. The mentoring activities were carried out in 3 Junior High Schools in Malang represented by one science teacher. Assistance is carried out online and offline. Assistance methods by means of lectures, brainstorming, discussions. The results of the mentoring activities resulted in 3 proposals and a CAR final report with different topics and CAR articles. Teachers have shown an increase in the ability to compile, apply and report CAR and scientific publications in the form of articles after the pre and post tests were carried out.</i></p>
<p><b>Kata kunci</b></p> <p>Artikel penelitian Guru sains Pendampingan penelitian Penelitian Tindakan Kelas (PTK) Publikasi ilmiah</p>	<p><b>Pendampingan penelitian dan publikasi hasil penelitian tindakan kelas bagi guru SMP.</b> Kompetensi guru dalam melaksanakan Penelitian Tindakan Kelas (PTK) dan menyajikan hasil PTK dalam bentuk karya ilmiah merupakan tuntutan sekaligus kebutuhan dalam peningkatan kualitas pembelajaran dan profesionalisme guru. Ketua MGMP IPA kota Malang menyampaikan bahwa kemampuan dan keterampilan guru dalam melakukan penelitian masih perlu ditingkatkan terutama untuk penelitian PTK. Tujuan kegiatan pengabdian kepada masyarakat adalah membantu, mengarahkan, dan berkolaborasi dengan guru dalam kegiatan penelitian tindakan kelas dan mempublikasikan hasilnya. Kegiatan dilaksanakan pada bulan Juni hingga Desember 2022. Kegiatan pendampingan dilakukan di 3 SMP di Malang yang diwakili oleh satu orang guru IPA. Pendampingan dilakukan secara online dan offline. Metode pendampingan dengan cara ceramah, brainstorming, diskusi. Hasil kegiatan pendampingan menghasilkan 3 proposal dan laporan akhir PTK dengan topik dan artikel PTK yang berbeda. Guru telah menunjukkan peningkatan kemampuan menyusun, menerapkan dan melaporkan PTK dan publikasi ilmiah berupa artikel setelah dilakukan pre dan post test.</p> <p>Copyright © 2023, Pantiwati et al This is an open access article under the CC-BY-SA license</p> 

**How to cite:** Pantiwati, Y., Hadi, S., Nurrohman, E., & Sari, T. N. I. (2023). Research assistance and publication of class action research results for junior high school teachers. *Journal of Community Service and Empowerment*, 4(1), 25-37. <https://doi.org/10.22219/jcse.v4i1.24374>

## INTRODUCTION

Education is one of the main components in development and improving the quality of human resources. Education is the foundation on which quality growth is built. Quality education is a compilation of the 17 Sustainable Development Goals (Rulandari, 2021). One of the objectives of the Sustainable Development Goal (SDGs) program is included in

Indonesia as an effort to improve quality in the education sector (Safitri, Yuniarti, & Rostika, 2022). According to Valiandes & Neophytou (2018) that one of the determinants of the success of the quality of education in schools is the professionalism of a teacher. Research result Teemant, Wink, & Tyra (2011) teacher professional development can improve teaching quality and student achievement.

Professional teachers are teachers who besides being able to teach well also have the ability to solve learning problems of students in class. The teacher is one of the dominant elements of the educational process, so that the quality of education is largely determined by the quality of educators in carrying out their roles and duties (Putri & Imaniyati, 2017). Teachers are required not only to master the material but also to lead to skills in using active learning strategies. Educators are highly demanded to have social competence, pedagogic competence, personal competence and professional competence (Humaida, Aula Sa'adah, Huriyah, & Hasanatun Nida, 2020).

The teacher has a fairly large role in the action in the classroom, is it interesting and effective or not a learning process, the teacher is not only required to be able to liven up the classroom atmosphere but also be able to make learning a process in improving the personality of students (Fitria, Kristiawan, & Rahmat, 2022). Improving the quality of learning that is most appropriate is an improvement made in a real context by the perpetrators themselves in their daily practice, namely by the teacher. This effort can be done through systematic and documented activities on an ongoing basis, namely through action research (Wardani, Karsiwan, Purwasih, Lisdiana, & Hammer, 2019). In line with this Haryati et al. (2022) said that action research is research that is directly related to the main tasks and functions that have a direct impact on improving the quality of learning.

Teacher competence in carrying out Classroom Action Research (CAR) is a demand as well as a need in improving the quality of learning and professionalism (Kaleka, Doa, Ilyas, Astro, & Ika, 2022). The ability to prepare CAR is one of the skills that must be possessed by professional teachers because this ability is needed by teachers to improve the quality of learning (Handoyo, 2020). CAR is one of the studies that raises actual problems that are carried out by teachers as an effort to improve and enhance learning practices in the classroom. CAR really supports programs to improve the quality of learning in schools, to improve the quality of education (Pambudi, 2018).

Through CAR teachers can innovate based on problems that arise in learning (Azizah, 2021). According to Afandi (2014) that teachers can develop innovations in learning such as using methods, media strategies to improve teacher professional competence. In line with this Fitria et al. (2022) said that before carrying out CAR the teacher needs to do an analysis of class conditions, to find out the problems in the class in order to get solutions that are appropriate to these problems. Teachers are expected to be able to obtain valuable findings that can be used to improve the quality of learning in class and help students achieve optimal learning outcomes, so that it can lead to quality improvement (Karinov, 2022).

Apart from academic research activities, the development of teacher professionalism is closely related to the activities of writing research results and publishing research results. Through this activity, teachers can obtain credit points that can be used to arrange promotions or for certification matters (Mawardi, Kristin, Anugraheni, & Rahayu, 2019; Pambudi, 2018). Teacher scientific publications can be published in the form of research reports (Rusdarti, Slamet, & Prajanti, 2019). Publication of research results is oriented towards developing teacher professionalism because published works are those that lead to the profession and improve the learning process (Haerazi, Irawan, Rahman, Jupri, & Warta, 2020; Lestari, Faozanudin, & Puspita, 2018). This is in line with Mawardi et al. (2019) that one of the efforts to develop teacher professionalism in a sustainable profession is publication activities. Apart from being a requirement for career development, writing is also a means for self-development of a teacher. Publication of research results is written based on experience and in accordance with the main tasks and functions of the teacher and can be published in the form of a scientific research report (Marwa & Dinata, 2020). Writing scientific papers to publishing results is a very important activity for a professional teacher (Yulhendri et al., 2018).

The results of field observations carried out by the community service team in December 2021 show that not a few Junior High School teachers in Malang City consciously find it difficult to solve classical problems in the form of CAR and publish research results. Teachers have limited time in carrying out CAR in class to limited time in preparing proposals to reports on CAR results. Teachers in the field feel that proposals, reports and CAR articles have a quite confusing format. Teachers are also not familiar with the instruments for collecting CAR data. Research result Setiawan et al. (2017) shows that the teacher's obstacle in implementing CAR lies in the teacher's lack of experience in writing CAR reports and the results of CAR reports. Limited knowledge or understanding of teachers regarding CAR is related to practical activities in the field (Fitria et al., 2022).

An activity is needed that is able to assist and accommodate teachers which includes facilities for finding CAR problems, writing proposals, implementing CAR, writing CAR reports, to writing CAR results articles (Burhanuddin et al., 2021). Through activities like this, teachers can feel the immediate benefits of being guided from drafting proposals to reporting classroom action research (Mahayanti & Utami, 2017). In general, teacher empowerment related to CAR is carried out when teachers receive special training. The form of mentoring collaboration is proposed as an effort of full and consistent involvement between the two parties (Zulfiani et al., 2016). Research result Kaleka, Nasar, Daud, Ika, & Harso (2020) CAR mentoring and training activities for teachers have had quite a positive impact. Implementation of education and training programs, as an effort to support the SDGs program (Amalia & Wilis, 2021).

The orientation of the mentoring program in this research is assisting teachers to prepare CAR proposals, implementing CAR proposals, processing CAR results in the form of reports to publication of results. In addition to mentoring, the mentoring program is also provided with comprehensive material for teachers regarding CAR and CAR publications. This aims to equip and review the theory and practice of CAR implementation up to the preparation of CAR results. Assistance activities are carried out online and offline. The methods used in mentoring are lectures and discussions. Offline activities are carried out with visits to partner schools, joint discussions in online groups to private discussions about the obstacles experienced by teachers in implementation. Service lecturers fully accompany and provide direction in every step of implementing CAR as well as motivating teachers to carry out CAR and produce scientific work. Service teachers and lecturers have the opportunity to discuss, reflect, and determine the steps for future activities.

Research activities and publication of research results is one of the developments in teacher professionalism. This relates to the teacher solving problems in class with appropriate solutions. It is important for teachers to carry out CAR and make scientific CAR reports. The fact is that teachers experience difficulties in carrying out CAR and writing CAR results due to limited knowledge about the steps for implementing CAR. A CAR mentoring activity is needed that fits the needs of teachers, actively involves teachers in planning, reporting the results of CAR implementation to publication of CAR results. Based on the description given, the purpose of this service activity is to assist, direct, and collaborate with teachers in classroom action research activities and publish research results.

## METHOD

The approach method that will be used in solving problems with partners or schools is training and assistance in the preparation of CAR proposals, CAR research and publication of CAR articles and dissemination of best practices with school principals and teachers. Activity assistance starts from planning to the end of the activity allocated within one year. Partners for mentoring activities are schools that are part of the MGMP IPA SMP Malang City group. Assistance was carried out in 3 schools namely Junior High School 2 Muhammadiyah, Bani Hasyim Islamic Junior High School, and Sabilillah Islamic Junior High School in Malang City. These three schools are Islamic-based private schools. The teachers participating in the mentoring are science teachers who are actively teaching in the 2021/2022 Odd Semester and carrying out learning completely offline. The teacher teaches in class VII, VIII or IX. In addition, teachers who participate are teachers who have the desire and are willing to do CAR and are willing to write their research which is prepared to be submitted in a journal. The determination of one school and one teacher is for the effectiveness and efficiency of achieving the goal of mentoring, namely the realization of writing articles on CAR results so that it is expected that teachers can do CAR well. In addition, even though it is hoped that one teacher from one school can have a minimal positive impact on the school where the teacher teaches, because there are 3 teachers and 3 schools it will have a minimal impact on the teachers in the three schools. The activities of this problem solving approach and partner participation in program implementation are described as follows (Table 1).

1. Socialization of the Nature of CAR and Scientific Work  
Activity 1 conveys the activities of the future activities regarding the implementation of the service some time in the future. Servants and teachers also conduct outreach about CAR and scientific work. Activities are carried out online using the lecture method, question and answer, brainstorming about CAR and scientific writing. Teachers can make direct observations in each school to find out the problems faced by students in learning and continue to formulate solutions to these problems. In this activity the accompanying lecturer assists the teacher in determining solutions to problems faced by students online and offline.
2. Assistance in the preparation of CAR proposals  
Activity 2 continued with mentoring activities for teachers in preparing proposals and implementing CAR. The servant provides a simple template for preparing CAR proposals, followed by the teacher by compiling CAR proposals. Mentoring activities are carried out online and offline to assist teachers in preparing CAR proposals.
3. Implementation of CAR in each partner school  
Activity 3 teachers carry out CAR activities in each school in accordance with the proposals that have been prepared by the teacher. In this activity the servant also monitors the implementation of CAR by monitoring teachers carried out both online and offline.
4. Assistance in preparing reports and articles on CAR results  
Activity 4 after the CAR implementation activities are finished the teacher prepares a report on the results of the CAR accompanied by a servant. Activities are carried out both online and offline. The teacher prepares a report based on the template provided by the servant and then continues with discussion activities both online and offline. In addition to CAR reports, teachers also compile CAR reports into scientific articles. The servant provides article templates according to the intended OJS.
5. Publication of scientific papers resulting from CAR research  
Activity 5 after completing the preparation of CAR reports and articles, teachers and volunteers submit articles to OJS aimed at activity 4.

**Table 1.** Service and Assistance Schedule

No	Date	Schedule
1	27 August- 1 September 2022	Dissemination of the nature of CAR and scientific work
2	10 September – 10 October 2022	Assistance in the preparation of CAR proposals
3	15 October- 10 November 2022	Implementation of CAR in each school
4	20 November- 20 December 2022	Assistance in the preparation of CAR reports and scientific articles
5	21-31 December 2022	Publication process

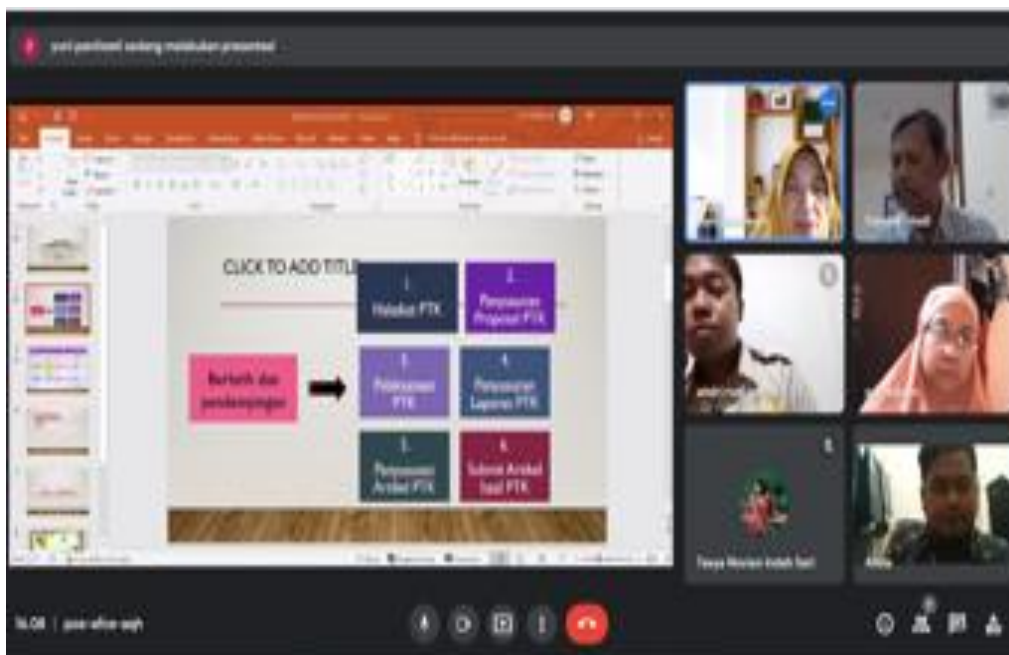
## RESULTS AND DISCUSSION

Classroom action research assistance and publication activities are carried out in several stages. The first stage was the socialization of the nature of CAR and scientific work, the second was assisting in the preparation of CAR proposals, the third was the implementation of CAR in each school, the fourth was assisting in the preparation of CAR reports and articles, the fifth was assisting in the publication process. At every stage the lecturer fully accompanies teachers from partner schools, mentoring is carried out offline and online. Prior to the training and mentoring activities, the lecturer gave a questionnaire to find out how far the teacher's knowledge was about CAR and the publication of CAR results. After the implementation of the training and mentoring the lecturer gives a questionnaire to monitor teacher progress regarding CAR and the publication of CAR results.

### Implementation of Training and Publication of Classroom Action Research

#### Results Socialization of the Nature of CAR and Scientific Work

Coordination and outreach activities were carried out on Saturday, 27 August 2022 at 13.00-18.00 online via the Google Meet platform. The activity involved science teachers from three different schools as partners and mentoring subjects and a team of lecturers from Biology Education, FKIP, University of Muhammadiyah Malang. In its implementation, the moderator was Endrik Nurrohman, S.Pd., M.Pd. The speaker is Dr. Yuni Pantiwati, MM, M.Pd and Samsun Hadi, MS. The theme and goal is socialization and the nature of CAR and scientific work to partner teachers. The participants involved were Andri Rudiyanto, S.Pd as a science teacher from Bani Hasyim Islamic Junior High School, Singosari sub-district, Malang city, Sari Wijayanti, S.Pd as a science teacher from Sabilillah Islamic Junior High School in Malang, Saiful Rachman, S.Pd as a teacher from Junior High School 2 Muhammadiyah Malang. In this activity, brainstorming was also carried out about the nature of research, especially CAR with lecture methods, questions and answers, brainstorming about CAR (Figure 1.).



**Figure 1.** CAR socialization, coordination and brainstorming with teachers

The activity was continued with a survey to identify the prior knowledge and experience of teachers regarding classroom action research and scientific publications of partner teachers, the activities were carried out asynchronously using the Google form with the survey results showing that 70% of science teachers in Malang City at 3 schools indicated

that the teacher had not have conducted CAR research and teachers have never published CAR research results. These results are in line with research Nasirun, Indrawati, & Suprapti (2021) that some teachers still experience problems in implementing CAR. In addition, the lack of insight, technical ability to submit, and teacher motivation in producing publications of scientific research results is an obstacle for teachers in publishing activities (Ghozi et al., 2021).

The survey results show that there are several teacher obstacles in carrying out CAR research. Most of the teachers said that the main obstacles to carrying out CAR were limited time, school infrastructure to support research and discussion partners to carry out research. Apart from the limitations in carrying out CAR research, the science teacher also said that there were difficulties in writing research results in the form of papers or articles. The teacher said that the difficulty in writing research articles lies in research results, time to write articles is limited by the teaching load at school, research instruments, research results are not appropriate and lack of practice in writing research articles. This is in line with research Ginting et al. (2019) that one of the causes of teachers' difficulties in carrying out CAR research is the low understanding of teachers in preparing CAR and teachers think that writing CAR is very difficult and takes a long time. Teachers have difficulty finding writing topics, writing and rules according to scientific journal formats, submission systems or publications in the open journal system (Wiryotinoyo, 2021).

Even though teachers experience difficulties in carrying out CAR, in fact most of the 70% Science Teachers are able to distinguish CAR research from Non-CAR research. The survey results showed that 70% of science teachers in 3 schools were able to describe the characteristics of CAR research and know the general components of scientific article writing. This includes the title, abstract, keywords, introduction, method, results and discussion to conclusion. These results are in line with research that theoretically teachers have knowledge of CAR, but are not yet familiar with the application of learning (Darsono et al., 2021).

The mentoring activity was continued with discussions with teachers as well as recording the results of direct observations at schools which were carried out on September 7, 2022. This activity was aimed at further coordination and observations made by teachers in schools and their respective classes. The results of the discussion each teacher conveyed were different, including (a) Saiful Rachman, S.Pd as a teacher from Junior High School Muhammadiyah 2 Malang City, the findings from observations in class were that the students' ability to analyze was lacking. (b) Sari Wijayanti, S.Pd as a science teacher from the Sabilillah Islamic Junior High School in Malang, classically the results of observations in class were the students' low literacy and 4C abilities. (c) Andri Rudiyanto, S.Pd as a science teacher from Bani Hasyim Islamic Junior High School, the findings during class observations were students' interest in reading and literacy. The class to be used is grade 9 students (Figure 2).



Figure 2. Observation activity to one school

Based on the results of discussions and observations with the three teachers, it shows that teachers need assistance in focusing on issues that will be raised as CAR topics. The problem to be studied is still general so it still needs to be reviewed both the source of the problem and how to solve the problem. According to Spradley in Tegor et al (2020) there are four alternatives for setting the focus in the form of research focus problem formulation, namely setting focus on problems suggested by informants, setting focus based on certain domains, setting focus that has finding value for science and technology development, setting focus based on problems related to existing theories and determine the focus based on problems related to existing theories.

### Practicing and Assisting in Preparing CAR Proposals

Assistance activities for teachers after each teacher finds problems from the results of observations in class are continued with the preparation of proposals. Some of the topics discussed related to the content of CAR proposals include identifying problems, formulating problems, writing objectives, writing benefits, writing systematic literature reviews, making research conceptual frameworks, determining research types, making research designs, analyzing research data, discussing findings. -findings.

The result of the assistance is the realization of proposals prepared by each teacher; each teacher has a research topic with different goals. Two of them, namely the teacher at the Bani Hasyim Islamic Junior High School made a CAR proposal with the title "implementation of meaningful learning (NGL and games) to increase conceptual understanding and scientific literacy skills on reproductive system material for class 9 Bani Hasyim Islamic Middle School", and a teacher from the Bani Hasyim Islamic Junior High School. Junior High School Muhammadiyah 2 Malang City made a CAR proposal with the title of implementing scaffolding in Project Based Learning (PBL) to improve analytical skills and Pancasila Student Profiles, while at Sabilillah Islamic Junior High School with the title Implementation of Learning Achievement-Based Assessment Strategies in Cooperative Learning to Improve Thinking Ability. The results of the teacher's proposal are presented in Figure 3.

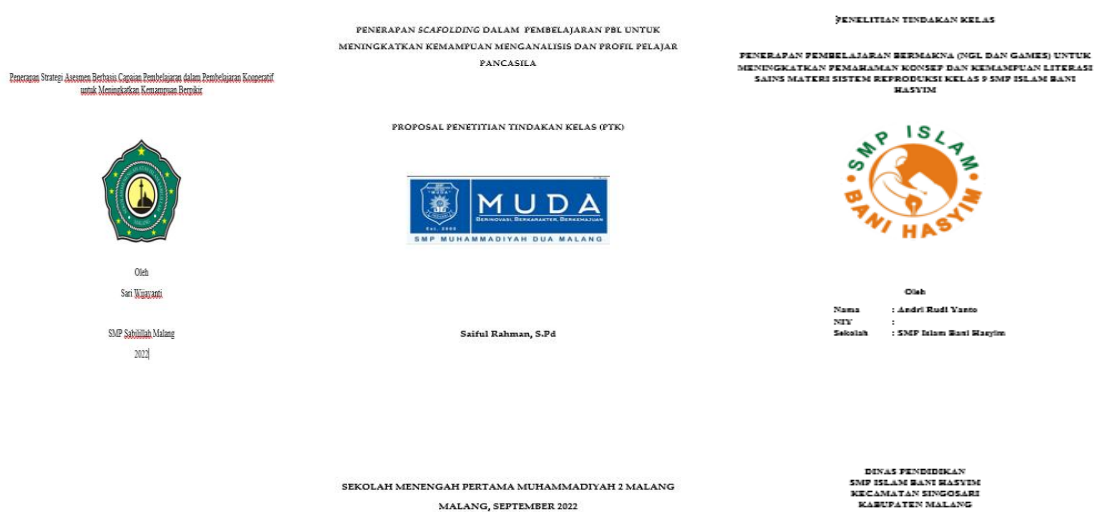


Figure 3. Sample CAR proposal made by teacher

Assistance in writing CAR proposals is also important because this can make teachers know where the weaknesses of their proposals lie. Through mentoring activities, it will provide opportunities for teachers to submit CAR research plans and the service team can provide input for improvement (Burhanuddin et al., 2021; Chandra et al., 2022). This is in line with the opinion that the strategic role of mentoring activities can explore more about teachers' difficulties in preparing CAR proposals or scientific research papers (Widana et al., 2019).

In writing proposals, teachers still have difficulty, especially making research backgrounds. Teachers need to be accompanied by how to describe what is the background for conducting research according to the topic of the problems found in each class at the respective teacher's school. The background of the problem is an explanation of why the problem is important to study, so that the background of the problem explains in full the research topic, research problem, and why the research was carried out (Zaluchu, 2020). After being given direction and assistance, the teacher can write down the background of the problem properly.

### Implementation of CAR in Each Partner School

After the mentoring activities for the preparation of CAR proposals, the teacher carried out research according to the CAR proposal in each teacher's school. The results of the assistance to Teacher 1 were that the teacher had compiled and implemented CAR with meaningful learning topics to increase conceptual understanding and scientific literacy skills in reproductive system materials, with the research subjects being 38 students in class 9 Bani Hasyim Islamic Middle School in the 2022/2023 Academic Year (Figure 4). Data collection methods: observation, interviews, questionnaires (student responses). The research instrument was a test for understanding concepts and a test for scientific literacy skills. The research data were analyzed descriptively.

The results of the assistance to Teacher 2 were that the teacher had carried out CAR activities with the topic "Implementation of Scaffolding in PBL Learning to improve analytical skills and Pancasila Student Profiles". CAR is carried out collaboratively between the researcher as the executor of the action and two observers as observers and

documentation. The first observer was a class VII science teacher and the second observer was a research colleague. Data collection methods: observation, interviews, questionnaires (student responses). The research instrument was a concept understanding test and a scientific literacy ability test. The data were analyzed descriptively.

Finally, the results of mentoring for teacher 3 entitled Application of Learning Outcomes-Based Assessment Strategies in Cooperative Learning to Improve Thinking Ability on Light and Optics material in class IX C. CAR was carried out until cycle 1 but the results were not optimal. Obstacles in the field outside of teacher teaching hours and related to institutional activities make CAR not run well.



Figure 4. Implementation of CAR by the teacher

#### Preparation of CAR Results Reports and Articles

The assistance was continued with the activity of making a CAR research report for each teacher, so that the CAR research results and research articles were realized (Figures 5 and Figure 6). According to Siswoyo and Hotimah (2021) training and mentoring activities can improve literacy culture and skills in writing a scientific paper for teachers. Writing skills can be developed by practicing analysis and synthesis of phenomena that occur in their field (Gunawan et al., 2018).



Figure 5. Teachers activity Compile CAR final report

This assistance aims to help direct teachers in compiling a CAR report which can then be used as a research article. Especially in the initial mentoring survey, most of the teachers said that one of the obstacles in writing research reports and articles apart from materials for writing teachers also experienced difficulties in compiling report contents which seemed difficult for teachers. The research article is an article that is produced from a research report in a short form, but describes the entire report. In general, articles in research journals consist of titles, author names, abstracts,

keywords, introduction, methods, research results, discussion, discussion, conclusions, suggestions and lists of references. Research reports need to be rearranged so that the style of the journal article is appropriate (Widana et al., 2019).



Figure 6. Assistance in writing scientific articles CAR results

In making reports on the results of CAR, the two teachers still need assistance, especially in how to organize data, considering that the data obtained is quite a lot, so it is necessary to direct the data needed in reporting CAR results. Teachers also still need to be reminded and directed regarding the ethics of writing scientific papers/reports. In writing scientific work or research there are several components that need to be considered, all of which relate to rights, obligations and responsibilities, and are rules that must be followed by writers. The number of these components may vary according to developments in the world of writing and copyright protection. Among the ethical components of writing scientific papers, there are three components that writers of scientific papers and research reports really need to know, namely honesty, objectivity, and citation (Elvandia, 2017).

#### Publication of Scientific Papers of CAR Research Results

Training and mentoring teachers in writing research articles according to the topic of proposals for each group of trainees, the output is that scientific articles produced by research for each group are ready to be submitted for National Seminar activities or submitted to OJS accredited journals. In this activity, mentoring activities were also carried out on how to submit articles to the Sinta 4 journal. Outwardly, the participant's skills in submitting research results in the form of articles to OJS, starting from registration to the stages of articles being accepted and obtaining an LoA and publication. Each teacher chooses a different OJS, namely the Lombok Journal of Science (LJS) and Jurnal Sains Riset (JSR).

The results of management and identification in the form of CAR data are very important to be communicated and shared with fellow teachers or colleagues with the aim of being able to add insight and experience to each other in the context of managing and solving problems in the classroom. Identification results can be shared through publication in scientific forums in the form of writing or scientific articles. The importance of scientific publications for middle-level teachers aside from for the interests and administrative needs of work as educators, can also be used as a means of sharing in an effort to increase professionalism as educators, improve pedagogical skills, and other things related to teachers are also very closely related to students and colleagues. fellow teachers. In line with this deliver Emaliana (2020) that conceptually, scientific articles are an essential part of the development of the teaching profession.

#### Teacher Responses to Training and Publication of Classroom Action Research Results

##### Teacher Responses about the Experience of Carrying Out Classroom Action Research

The survey results regarding teacher responses to experience in carrying out CAR showed that the majority of science teachers in junior high schools in Malang City had never conducted CAR research, namely 70% and 30% of teachers had carried out CAR research (Figure 7). CAR assistance with teachers begins with re-submitting material about CAR. Next, the teacher identifies problems in each class and continues the stage of solving these problems with CAR research. This is in line with opinion Dewi et al. (2019) that CAR is research that teachers can do in order to improve the learning process to achieve certain goals. A professional teacher is a teacher who besides being able to teach well also has the ability to solve problems or learning difficulties of students in class. Problem solving or student difficulties are carried out by carrying out CAR (Wiradimadja, Kurniawan, & Sukamto, 2019).



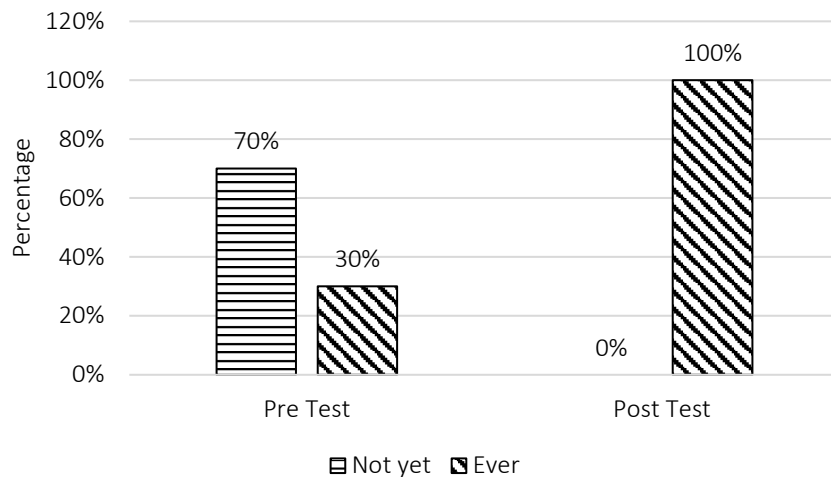


Figure 7. Teacher Pre-Test and Post-Test Results in Implementing CAR

### Teacher's Response About Publication of CAR Results

In addition to carrying out CAR research, teachers also have professional expertise in writing a scientific work, one of which is scientific work resulting from CAR research (Wiradimadja et al., 2019). The results showed that science teachers in 3 schools in Malang had never published research results prior to the research activity (Figure 8). One of the objectives of this assistance is that apart from carrying out CAR, teachers will be assisted to publish CAR. So that the results of the study show that after the training all teachers can carry out the publication of the results of their CAR research. Research result Handayani & Dewi (2019) shows that the publication of scientific papers by teachers is a continuous professional development activity. In addition, the publication of scientific work by teachers can be used to be able to rise to the next level.

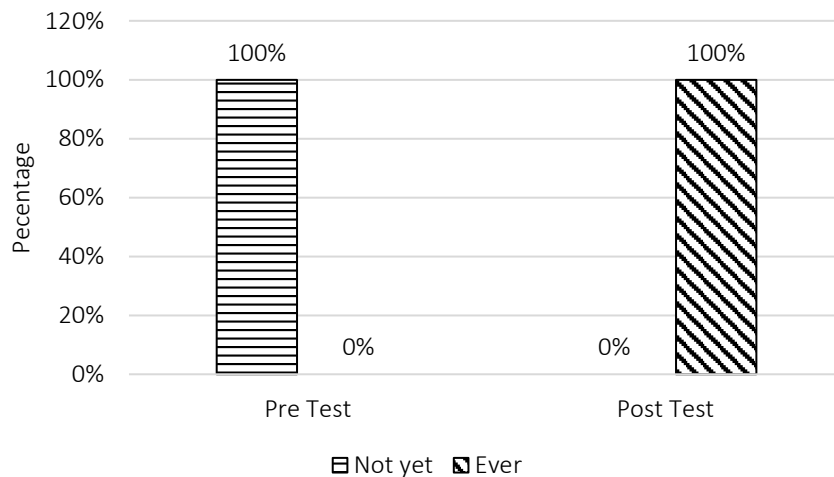


Figure 8. Teacher pre-test and post-test results in implementing CAR publications

### Teacher's Response About the Difficulty of Researching CAR

The results showed that science teachers in 3 schools in Malang City considered CAR research difficult. These difficulties include limited time, limitations in writing research results in the form of papers or articles to the preparation of CAR proposals. Research thing Setiawan et al. (2017) shows that the teacher's obstacle in implementing CAR lies in the lack of experience of teachers in writing CAR reports and the results of CAR reports. The output of this mentoring activity is the hope that teachers will no longer think that CAR is difficult, including preparing CAR reports and proposals. Proposals and results of CAR reports can be started from a simple form in mentoring, so that it doesn't become as difficult as stated at the beginning. The results of the research in Figure 9 after mentoring show that science teachers in 3 schools in Malang City do not think that CAR is difficult, after carrying out mentoring activities and getting involved in carrying out research including proposal preparation activities, research to CAR reports. Training activities can improve literacy culture and skills in writing a scientific paper for teachers (Siswoyo & Hotimah, 2021).

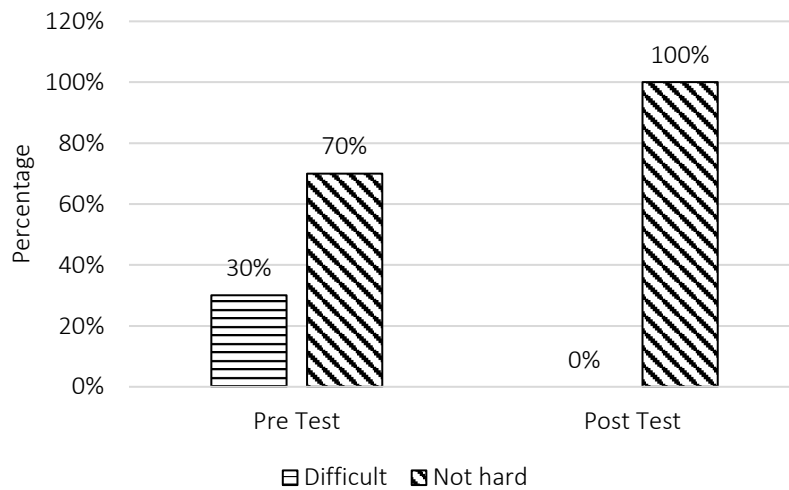


Figure 9. Results of Teacher's Pre-Test and Post-Test on Difficulties in Implementing CAR

### CAR Research Understanding Teachers' Responses with Non-CAR

The results showed that 30% of science teachers in 3 Malang city schools were able to differentiate CAR research and 70% of non-CAR research (Figure 10). An understanding of CAR research is one of the assets in carrying out CAR. This mentoring activity not only accompanies teachers in carrying out CAR activities but also provides delivery of basic concept material regarding CAR research before carrying out CAR. The results after mentoring showed that 100% of science teachers in 3 Malang City schools could differentiate CAR research from non-CAR research, as well as things that had to be prepared regarding CAR. This is in line with research Kaleka et al. (2020) that the implementation of CAR assistance is able to assist teachers in carrying out CAR including CAR implementation techniques, research proposals and presenting research results in the form of reports.

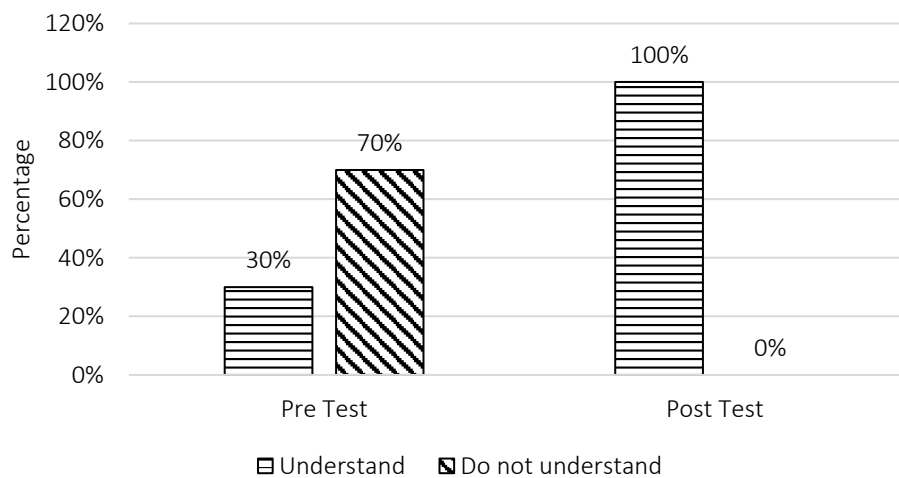


Figure 10. Pre-test and post-test results of teachers understanding of CAR

The results of the research which describe that CAR facilitation activities and publication of CAR results show positive results. Through mentoring activities teachers can prepare CAR proposals, implement proposals, compile CAR reports and publish CAR results in the form of scientific articles. This is in line with research Zainuddin et al. (2019) that mentoring activities have a positive influence on teachers in partner schools in the framework of CAR training. CAR training is important and necessary to train teachers in conducting research as one of the solutions to overcoming problems that exist in classrooms where they teach (Fitria et al., 2022). According to Afandi (2014) with CAR strongly supports programs to improve the quality of learning in schools, which leads to improving the quality of education. Efforts to improve the quality of education are one of the objectives of the SDGs program in Indonesia (Safitri et al., 2022).

## CONCLUSION

The implementation of community service activities in the context of training and mentoring research and publication of CAR was carried out for science teachers in 3 schools in Malang City with 5 stages, namely socialization of the nature

of CAR and scientific work, assistance in preparing CAR proposals, implementation of each school's CAR, assistance in preparing CAR reports and articles and assistance in the publication process. The output of this mentoring activity was that teachers at 3 schools produced CAR research proposals to implement CAR in each school. The results of the CAR research for each teacher in mentoring produced outputs in the form of CAR reports and publication of research results in Sinta 4 nationally accredited journals. The research results show that CAR mentoring and training along with publications provide quite satisfactory results with the preparation of CAR proposals to the final report. In the future, mentoring and training activities can be carried out for teachers in other schools who are still unfamiliar with CAR research until publication. Moreover, this is one of the demands of a teacher.

## ACKNOWLEDGMENT

We thank the Dean of the Faculty of Teaching and Education, Universitas Muhammadiyah Malang Malang for the Blockgrant Research and Community Service policies and programs, and the Leaders, Teachers, Students of partner schools where community service activities take place.

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