ABDIMAS: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang
Vol.9(4) November 2024, 1102-1116
p-ISSN: 2721-138X e-ISSN: 2548-7159
http://jurnal.unmer.ac.id/index.php/jpkm

LPPM
UNMER
MALANG

Empowerment program through project-based learning and assessment to enhance teachers' scientific writing

Hilarius Jago Duda[1], Imanuel Sairo Awang[2], Beni Setiawan[3], Hendrikus Julung[1]

[1]Department of Biology Education, [2]Department of Elementary School Teacher Education, [3]Department of Mathematics Education
High School of Teacher and Education (STKIP) Persada Khatulistiwa
JL. Pertamina-Sengkuang, Sintang, West Kalimantan, Indonesia

ARTICLE INFO:

Received: 2024-09-29
Revised: 2024-10-17
Accepted: 2024-11-10
Published: 2024-11-30

Keywords:

Empowerment, PTK methodology, Project-based learning, Scientific papers, Teacher training

ABSTRACT

The traditional lecture-based learning followed by questions or assignments from the teacher, as observed in partner schools, often fails to fully empower students' abilities. Research conducted by the PKM team has shown that practicum-based and project-based learning can effectively enhance various student skills, including cognitive abilities, critical thinking, creativity, process skills, and attitudes. The Community Empowement Program (PMP) aims to empower and enhance the knowledge and skills of teachers in developing project-based learning tools and assessments, creating learning products, as well as writing and publishing scientific papers. This activity involves socialization, training, mentoring, and review of project-based learning and assessments, as well as article writing and publication using PTK methodology for science teachers. Participants in the program are science teachers from schools in the Sepauk sub-district, Sintang, West Kalimantan. The program was implemented from June to September 2024. The results of the activities indicate that teachers actively and enthusiastically participated in the socialization, training, mentoring, and guidance sessions. The products generated from the PKM activities were 90 percent successful, and there was an 80 percent increase in teacher empowerment through these activities.

How to cite: Duda, H. J., Awang, I. S., Setiawan, B., & Julung, H. (2024). Empowerment program through project-based learning and assessment to enhance teachers' scientific writing. Abdimas: *Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, 9(4), 1102-1116. https://doi.org/10.26905/abdimas.v9i4.14359

1. INTRODUCTION

The learning process in schools, particularly in certain regions, tends to involve direct lectures by teachers, followed by questions or assignments given by them. This was observed in partner schools based on initial survey data. Such a learning model cannot empower all students' abilities and fails to prepare them for current and future life challenges. Various studies conducted by the community empowerment team on practical-based learning and project-based learning demonstrate the ability to enhance students' cognitive skills, critical thinking, creativity, process skills, and attitudes (Duda, 2022; Duda, 2019; Duda, 2010). Additionally, research data shows that the use of authentic assessments, such as performance/product evaluations, effectively supports learning by enhancing students' cognitive abilities, skills, and attitudes (ElSayary, 2021; Fadzil & Saat, 2019; Frey et al., 2019; Istyadji, 2023; Mansyur, 2011; Sabtiawan et al., 2019; Zahrok, 2009).

✉ Corresponding Author: **Hilarius Jago Duda:** Tel. +62 821-5596-4080 | E-mail: hilariusjagod@yahoo.com

Another issue in the field is the orientation toward acquiring as much theoretical knowledge as possible without balancing it with developing various skills, such as creating useful products. Various studies reveal that project-based learning can empower students' abilities because they are involved in producing tangible products (Safaruddin et al., 2020; Sutrisno et al., 2019; Widarti et al., 2020; Yustina et al., 2020). Furthermore, research conducted by the community empowerment team on product creation highlights its potential benefits for the environment and society (Duda, 2018; Ege & Julung, 2019; Ege et al., 2018).

In addition to gaining knowledge through the learning process, teachers are also supported in producing scientific papers based on the learning activities they conduct. This approach not only empowers all student abilities but also provides teachers with experiences to develop scientific papers, thereby enhancing their performance and career progression as science educators. Teachers are required to fulfill conditions such as writing scientific papers, including classroom action research or articles published in seminars or journals (Mawardi et al., 2018). Generally, the professional development of high school teachers in writing scientific papers remains lacking and requires serious attention and guidance (Noorjannah, 2014). Teachers should continuously learn and write both non-academic and academic works to present at seminars or publish in the mass media as part of their professional development (Samuel, 2002).

This case occurred among several science teachers in Sepauk District, based on situational analysis at SDN 01 Sepauk, SMPN 01 Sepauk, and SMAN 01 Sepauk. It was revealed that science learning in these schools still predominantly relies on direct lectures, followed by discussions and question-and-answer sessions, with limited implementation of practical activities and project-based learning. Furthermore, the teachers struggle with writing effectively, which is attributed to several factors, including their busy schedules teaching and mentoring in classrooms, the lack of training related to scientific writing, and limited familiarity with journals where their work could be published.

Additionally, the teachers' creative ideas for research, such as the use of varied strategies, models, or teaching methods, are lacking, often leading to monotonous approaches. Being located in remote areas further hinders their access to information about innovative ideas (Awang, 2018; Erwin et al., 2018; Holbrook, 2005). These challenges in writing scientific papers, combined with the limited use of appropriate models/methods for science learning and the lack of teacher publications on educational themes, have resulted in many science teachers experiencing stagnation in rank or level. Some remain stuck at levels III/b and III/c for extended periods without promotion.

The community empowerment team chose these three schools for several reasons. Beyond the issues outlined above, the training participants consist of science teachers (biology, physics, chemistry) from these schools, which are located close to one another. The group of teachers represents elementary, middle, and high school levels to ensure that they can serve as role models for both public and private schools in Sepauk District.

The Sepauk District is located quite far from Sintang city, with access roads to the district center being difficult to navigate. The roads are riddled with potholes, covered with rocks and dirt, and often experience flooding at wooden bridge crossings, as observed in the initial survey data. Such road conditions make it rare for training activities to be conducted at these schools, and the routines and activities of teachers traveling to the regency or provincial capital are also limited.

This geographical situation further reduces the creativity required to enhance teacher competency. Moreover, the internet network in these schools is not very stable, which further demotivates teachers from engaging in writing activities. The following is a depiction of the road conditions leading to the schools where the community empowerment program will be implemented.

Figure 1. Current condition of the SDN 01 Sepauk, SMPN 01 Sepauk, and SMAN 01 Sepauk

In this community empowerment program, in addition to the socialization and training on designing project-based learning models and their assessments, there is also a focus on writing articles using the action research method. The community empowerment team chose the action research methodology because it is more suitable for teachers who interact with students daily, allowing them to understand students better in various aspects, including cognitive, psychomotor, affective, as well as values and behaviors. It is hoped that this research methodology can enhance and improve the learning process and student achievement through project-based learning models and authentic assessments.

The various issues mentioned can be explained as follows: (1) The current learning approach is monotonous, relying solely on lectures, which fail to empower all the abilities of science students. This is due to a lack of innovation and creativity among teachers in developing skills for using/designing appropriate learning models or strategies for teaching science. Research and theories suggest that science learning should engage all five senses to deeply understand and internalize scientific concepts; (2) The assessments used in learning are not aligned with the teaching methods, as teachers tend to rely on tests that do not explore all students' abilities or uncover other skills. This is because teachers have not received adequate training to develop skills in designing authentic assessments; (3) Initial survey data show a lack of innovation and creativity among teachers in creating products to implement in learning. To address this issue, the community empowerment team will provide guidance on what types of products can be generated through project-based learning and tips on how to create those products; (4) Many teachers lack the motivation to write scientific papers, as there has been little training on developing the necessary skills to write using innovative strategies or learning models. Moreover, teachers in remote areas have limited access to information and resources for training in scientific writing; (5) Many teachers do not have scientific publications, as they focus solely on daily teaching activities without developing skills in publishing their work. Additionally, teachers have limited access to information about journals suitable for submitting educational articles; (6) Many teachers face delays in career progression or even stagnation in their rank. One of the main reasons for this is the lack of scientific articles or papers, which are a requirement for rank advancement; (7) The Sepauk District is located far from Sintang and Pontianak, with poor road conditions. As a result, many teachers have not participated in training related to the use of appropriate models, strategies, or methods for science teaching, the application of authentic assessments, or the writing and publishing of scientific papers. To address these issues, the following solutions are proposed: (1) Conducting outreach and training on the development and design of project-based learning; (2) Providing outreach and training on the development and design of authentic assessments; (3) Socializing the creation of products within project-based learning (e.g., subjects like biotechnology and environment); (4) Conducting outreach, socialization, and training on scientific writing and its publication using the action research methodology; (5) Providing guidance and

mentoring in teaching practice with project-based learning and its assessments; (6) Offering guidance, mentoring, and review sessions for scientific article writing using the action research methodology.

This community empowerment program aims to empower and enhance teachers' knowledge and skills in developing project-based learning models and their assessments, creating products, and writing and publishing scientific papers. Specifically, the main objectives of the activities are: (1) To develop and enhance teachers' skills in using project-based learning models designed and developed in lesson plans (RPP) and student worksheets (LKS); (2) To develop and enhance teachers' skills in designing and using authentic assessments, including performance and product evaluations, during project-based learning; (3) To develop and enhance teachers' skills in creating products within project-based learning; (4) To empower and enhance teachers' knowledge and skills in writing and designing scientific papers using the action research methodology; (5) To improve and support teachers in publishing their scientific papers; (6) To motivate teachers to apply for rank or grade promotions; (7) To assess the extent of improvement in teachers' skills and knowledge gained from the community empowerment activities.

Based on the situational analysis identified and the results of discussions with partners, the priorities for the implementation of community empowerment are agreed upon as four key areas: (1) Training in the development and design of project-based learning, which is incorporated into lesson plans (RPP) and project-based student worksheets (LKS). This is expected to improve the learning process and enhance students' academic achievement; (2) Training in the development of authentic assessments designed as performance evaluations during project-based learning and product evaluations from the outcomes of project-based learning; (3) Training and development in creating products within project-based learning; (4) Training in writing scientific papers using project-based learning models and authentic assessments through the action research method, as well as their publication.

2. METHODS

The activities in this program involve socialization, training, mentoring, and assessment in project-based learning and its assessments, as well as in writing articles and publications using the action research methodology for science teachers. After socialization and training, the teachers are guided and observed in applying the training results to improve their skills in designing and implementing project-based learning and assessments, as well as enhancing their skills in writing and publishing scientific papers. The implementation stages of these activities use several methods, including: (1) Lecture/socialization method; (2) Discussion and Q&A method; (3) Simulation method; (4) Training and mentoring method; (5) Guidance and observation method; (6) Evaluation method.

The lecture method is chosen to provide explanations and motivate teachers about project-based learning and its assessments, learning products, the importance of writing scientific articles and their publication, and action research methodology, as well as how to write scientific articles using the action research methodology. The Q&A method is essential for the training participants, both when receiving explanations about project-based learning and its assessments, learning products, action research, and how to write scientific articles, as well as during practice. This method allows participants to gain as much knowledge as possible about the community empowerment material. The simulation method is critical for training participants, providing them the opportunity to practice the training material they received. The goal is for participants to truly master the material, understand their ability to apply project-based learning and its assessments, create learning products, and write scientific articles technically, and then identify any difficulties (if any) to be solved.

The training and mentoring method is important for science teachers, where the community empowerment team will train, accompany, and guide science teachers in designing project-based

learning and its assessments, creating products, and writing scientific papers using the action research methodology, until the article is written and ready for publication. At this stage, participants are expected to design project-based learning and its assessments in accordance with the material taught in school, and write scientific articles which include: (1) Creating an article outline; (2) Citing references from books and journals; (3) Designing scientific articles based on journal templates. The observation method involves the community empowerment team reviewing the application of project-based learning and its assessments, learning products, and scientific paper writing at any time during the community empowerment process, until the article is finished and ready for publication.

The evaluation method is used to assess the community empowerment activities that have been carried out to determine the percentage of achievement of these activities and gather feedback from the teachers regarding the training, as well as their expectations for the future, so that the collaboration can continue. The evaluation is carried out during the process and at the end of the training, focusing on the achievement of the training goals and the training's organization. Process and outcome evaluations (training goal achievements) are documented. The evaluation of the training organization is done through questionnaires. The success indicators in the training implementation are based on two methods, evaluation during the training process and post-training evaluation. The evaluation during the training process includes the involvement and capabilities of the participants at each stage of training. At the final stage, post-training evaluation is done through the distribution of questionnaires related to the benefits of the training for the science teachers who participated and measuring the percentage of the products produced.

The community empowerment activities method is appropriate and highly effective in empowering the participants from the beginning to the end. This is because the method used for community empowerment is carried out systematically and purposefully, starting with surveys, socialization, training, Q&A, guidance and mentoring, observation, and evaluation. It has been proven that the participants actively engaged in the community empowerment activities from start to finish. Additionally, it can be seen from each stage that the results achieved were optimal, and the time allocated was sufficient. The target for each stage was completed successfully or worked on effectively.

Implementation of Activities

The community service activity, which consists of training on project-based learning and its assessment, product creation, and writing scientific articles using the PTK methodology, is conducted in Sepauk District, Sintang Regency. The training participants are IPA teachers from SDN 01 Sepauk, SMPN 01 Sepauk, and SMAN 01 Sepauk in Sepauk District, Sintang Regency. This community service activity is planned to run for approximately 6 months, from June 2024 to November 2024.

The preparation of training materials includes: papers and PowerPoint presentations on project-based learning, project-based learning designs (RPP and LKS), examples of products from project-based learning, authentic assessments (performance assessments, product assessments), PowerPoint presentations on article writing and publication, PowerPoint presentations on the PTK methodology, and others.

Partner Participation in Program Implementation

The implementation method for this program is through a participatory approach. Intensive coordination between the IPA teachers at the partner schools and the faculty team responsible for the community empowerment activity is carried out in planning and implementing all activities, including socialization, training, and mentoring. The training is provided by a team of expert IPA Education lecturers in collaboration with educational practitioners.

The teachers, as partners in the implementation of this community empowerment program, play an active role throughout the entire process, from the initial preparation phase to the completion of the program. In this program, the partners assist by providing initial information about the current state of teachers, their teaching and assessment practices, their research activities, the training/seminars/ workshops they have attended, and any other information related to the school environment that supports the program's needs.

The partners are directly involved with the implementation team in justifying the priority issues and finding the best solutions that are most feasible for the IPA teachers in Sepauk District. The partners serve as the main agents of implementation, applying the agreed-upon solutions. They actively participate in the training and mentoring activities as participants who will apply the methods. Additionally, the partners are always ready to help the proposers by providing information related to the next steps in the process.

Evaluation for Program Implementation and Program Sustainability

After the implementation of the community empowerment program, the proposers will report all activities, documenting everything that has been carried out. This includes preparing materials for monitoring and evaluation by internal evaluators, preparing the final report for the activity, uploading the community empowerment article documents resulting from the activity, uploading the video of the community empowerment activities on YouTube, and publishing it in the mass media.

Additionally, after the community empowerment activities are completed, the proposers, together with the partners (the IPA teachers in Sepauk District and the school principals), will conduct a joint evaluation of the program, addressing the following points: (1) How has the project-based learning design and assessment been developed? What are the strengths and weaknesses/difficulties in its implementation, and what solutions can be applied to overcome these weaknesses/difficulties? (2) What are the products generated during the project-based learning? Will there be follow-up actions? (3) How has the scientific paper been developed? What are the strengths and weaknesses/difficulties in developing writing skills, and what solutions can be implemented to address these weaknesses/difficulties? (4) How effective have the guidance and mentoring activities been? Have they been sufficient in assisting IPA teachers in applying project-based learning and assessments? (5) What difficulties have teachers encountered in applying project-based learning and authentic assessments used in the projects? (6) What challenges have teachers faced in writing scientific papers using the PTK methodology through project-based learning and authentic assessments, as well as publishing them?

Figure 2. Stages of community empowerment activities

Based on the evaluation of these activities, continuous improvements will be made to enhance the skills and knowledge of IPA teachers, empowering them to design project-based learning and assessment strategies, as well as to improve their writing and publication skills for scientific articles. Additionally, the results of this evaluation will help determine the next steps for future collaborations.

3. RESULTS AND DISCUSSION

Results

This community empowerment activity has been implemented by the team for approximately 4 months. The community empowerment activity is related to the empowerment of science teacher groups through project-based learning and its assessment in supporting the writing of scientific papers by science teachers with the PTK methodology. In this community empowerment, it is implemented with several stages of activities:

Survey activities

The survey activity was conducted by the community empowerment team, and the results revealed that teachers have not widely implemented project-based learning, assessments for project-based learning, or developed projects used in the learning process. Many teachers also lack scientific publications on education, are unfamiliar with how to publish articles, and are unaware of the many educational journals available. Additionally, many teachers do not manage their rank and group, resulting in many teachers having a rank that does not align with their age and years of service, with the highest rank being II and IIIb.

Socialization and counseling activities

The socialization activity was conducted by the community empowerment team on project-based learning models, assessments for project-based learning, PTK methodology (Classroom Action Research), article writing with action research methodology, how to publish articles, and types of educational journals suitable for publication. Before the main activities took place, the socialization and outreach activities started with singing the Indonesian national anthem, followed by a welcome speech representing the school principal, a speech representing the lecturers/community empowerment team leader, and concluded with an opening prayer.

Figure 3. Community empowerment team and other presenters are delivering extension materials

After the presentation, the next step was a discussion and Q&A session. The discussion took place between the community empowerment team and the participants about the material that had been

presented. Some of the questions raised included: Is the PJBL model the same in elementary, junior high, and senior high schools? Are the Merdeka Learning curriculum and the K-13 curriculum the same in implementing the PJBL model? Can all topics be applied using the PJBL model? Additionally, there were questions regarding writing scientific papers, such as: What about the PTK stage, specifically during the reflection stage? What should be done? What about publication—what kind of article can be submitted for publication? Where should we submit for publication with lower costs and simpler procedures?

The answers provided by the participants included the following points: In principle, the application of the PJBL model is the same across SD, SMP, and SMA in terms of its understanding, principles, and steps in implementation. The differences lie in the topics/themes and the projects involved. Additionally, not all teaching materials can apply the PJBL model, as it depends on the topic chosen, which should have a project that can be developed and worked on in the learning process. This should also be adjusted to the available time. Both the Merdeka Learning curriculum and the K-13 curriculum can accommodate the PJBL model. PTK can be conducted with a minimum of two cycles, each consisting of four stages. The reflection stage involves evaluating the activities that have been carried out, which can serve as feedback for future learning activities.

Figure 4. Community empowerment participants are listening to the delivery of material

Training and mentoring activities

In this stage, the community empowerment team conducted training on creating project-based learning lesson plans (RPP), assessments, student worksheets (LKS), project-based learning products, writing articles using the PTK methodology, and their publication. The activity began with an opening, followed by a presentation of examples of products that had already been developed. The steps for creating the products were explained, with both the community empowerment team and participants actively involved in the product creation process. Below are examples of the developed products.

Simulation method and implementation

In this stage, the community empowerment team conducted a simulation of project-based learning and its assessment. During the activity, the teachers simulated project-based learning in the classroom, complete with the corresponding assessments. After the simulation, the community empowerment team provided suggestions and feedback on the conducted simulation.

Following the simulation, the teachers were able to implement the project-based learning and its assessment in their teaching. Figure 9 are pictures of the teachers applying the project-based learning model and its assessment in their classrooms.

Figure 5. Process of making modified corn tempeh
Figure 6. Training on making Tempe products as a substitute for corn
Figure 7. Tools and materials for making liquid fertilizer
Figure 8. Training in making liquid organic fertilizer

Figure 9. Simulation of teaching activities with project-based learning

Guidance and publication methods

In this stage, the community empowerment team guided the teachers in writing articles using the PTK methodology based on project-based learning and its assessment. At this point, the teachers began drafting articles on project-based learning and assessment or other teaching models. The community empowerment team provided suggestions and feedback on the drafts.

Once the articles were polished, the team guided the teachers and introduced journals to submit their work for publication. If there were difficulties in writing the article or publishing it, the teachers kept in touch via WhatsApp and email. Communication was focused on the article's progress and the appropriate journal addresses for submission. The community empowerment team assisted in proofreading the articles and returned them to the teachers for revision. The journals' addresses were provided, with references to journals that could be targeted for submission. Table 1 is the journal references introduced by the community empowerment team from STKIP Persada Khatulistiwa.

Table 1. Names of journals that can be used as references for publication

Journal Name	Publishers	Accreditation Status
Vox Edukasi: Jurnal Ilmiah Ilmu Pendidikan	LPPM STKIP Persada Khatulistiwa	Sinta 3
Jurnal Pendidikan Dasar Perkhasa: Jurnal Penelitian Pendidikan Dasar	Department: PGSD	Sinta 4
Jurnal Kansasi: Jurnal Pendidikan Bahasa Indonesia dan Sastra Indonesia	Department: Pendidikan Bahasa Indonesia	Non-Sinta
Jurnal Pendidikan Ekonomi (JURKAMI)	Department: Pendidikan ekonomi	Sinta 4
JPBIO (Jurnal Pendidikan Biologi)	Department: Pendidikan Biologi	Sinta 3
JURNAL PEKAN : Jurnal Pendidikan Kewarganegaraan	Department: Pendidikan Kewarganegaraan	Sinta 5
DUNIA ANAK: Jurnal Pendidikan Anak Usia Dini	Department: Pendidikan Anak Usia Dini (PAUD)	Non-Sinta
Journal of English Educational Study (JEES)	Department: Pendidikan Bahasa Inggris	Sinta 3
J-PiMat : Jurnal Pendidikan Matematika	Department: Pendidikan Matematika	Sinta 4
JUTECH: Journal Education and Technology	Department: Pendidikan Komputer	Sinta 5
Jurnal Pengabdian Masyarakat Khatulistiwa	LPPM STKIP Persada Khatulistiwa	Sinta 5
JPPM: Jurnal Pelayanan dan Pemberdayaan Masyarakat	Department: PGSD	Non-Sinta

Evaluation for community empowerment activities

In this stage, the community empowerment team, along with the partners, conducted an evaluation of the activities that had been carried out. Participants in the community empowerment program were

given the opportunity to provide verbal and written comments, suggestions, and criticisms regarding the entire process, starting from the survey stage, socialization and outreach, training, mentoring and publication, and finally, the evaluation stage.

The community empowerment team also shared their impressions verbally, reflecting on the cooperation during the program, and provided motivation and encouragement to the participants for their teaching activities or any tasks they were focusing on. In addition to receiving feedback on the program, there was also a discussion on the next steps for implementation in the schools. This was aimed at improving the performance of both the community empowerment team and the teachers as participants, and ultimately enhancing the quality of teaching at the school. The goal was to produce high-quality students, which would have a positive impact on the students, the school, and the future of education in Indonesia. Based on the evaluation data, it is evident that there was a significant improvement in the empowerment of science teachers through the community empowerment activities, particularly in the skills and knowledge of project-based learning tools, authentic assessments, scientific writing with the PTK methodology, and publishing. Overall, more than 80 percent of the science teachers involved showed improvement. Moreover, the products developed during the activities, such as learning devices, authentic assessments, modified tempeh, and liquid fertilizers, achieved a success rate of 90 percent. Thus, the community empowerment team and the partners concluded that the community empowerment activity was successful and met its targets, even though it did not reach 100 percent.

Figure 10. Delivery of product results

Discussion

This community empowerment program, with the theme of project-based learning and its assessment to support science teachers' writing of scientific papers using the PTK (Classroom Action Research) methodology, has several key objectives. The overall aim is to empower science teachers' skills in project-based learning and designing assessments for such learning, as well as to enhance their ability to write scientific papers using the PTK methodology and publish them. This community empowerment activity has a positive impact on improving the teachers' performance and careers, as well as on the quality of the learning process and educational outcomes.

As Amelia & Aisya (2021) stated, project-based learning is a model that directly engages students in the learning process through research activities to work on and complete a specific learning project. This model enhances creativity in students as it involves interesting activities that motivate students to engage with the learning process joyfully, leading to the achievement of successful outcomes in increasing creativity. It also allows students ample space and time to actualize their skills in the learning process (Dewi et al., 2015).

Mueller (2005) argued that authentic assessment is "a form of assessment in which students are asked to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills." Authentic tasks are those that are directly given to learners to measure their competency achievements, whether during the learning process or after its completion, such as writing scientific papers or work reports. Rodriguez and Gallardo (2017) noted that authentic tasks might involve students being asked to write plans according to a predefined structure and record a video presentation using the plan as a script. Meanwhile, Nurgiyantoro (2008) emphasized that authentic assessment focuses on students' ability to demonstrate their knowledge in a meaningful and tangible way. The assessment activities are not merely about recalling or testing existing knowledge but are about real-world applications of the knowledge and skills acquired.

Based on the results of unstructured interviews between the implementation team and the participants, along with direct observations during the activities, the following results were observed: (1) the community empowerment program has improved and enhanced the science teachers' skills and knowledge in project-based learning; (2) The improvement in teachers' skills and knowledge in developing project-based assessments can be seen from the creation of project-based assessment designs. Additionally, participants' increasing knowledge can be observed through their active participation in the program from start to finish. In each session, the implementation team provided different information in both theory and practice that participants were required to follow; (3) There was an increase in the teachers' skills and knowledge in creating products to support project-based learning, evident from the products developed during the training activities. This is attributed to the involvement of the community empowerment participants in the product development process; (4) The improvement in teachers' skills and knowledge in writing scientific papers using the PTK methodology is evident because the participants not only listened to theoretical presentations but were also encouraged to create draft articles, which they then continued to develop into complete educational articles. Furthermore, the participants were guided in writing and publishing these articles.

In the implementation of this community service program, there were several supporting factors that contributed to the success of the activities: (1) The financial support from DIKTI for community empowerment, which facilitated the execution of the activities; (2) The assistance from the partner institution in providing the venue for the activities and the involvement of science teachers representing SDN 01 Sepauk, SMPN 01 Sepauk, and SMAN 01 Sepauk, who participated directly in and contributed to the success of the community empowerment program; (3) The interest and enthusiasm of the participants during the activities. This was evident from the number of participants, which did not decrease, and their engagement during the outreach, practical training, development, article writing, and other activities. The participants' enthusiasm was also reflected in their questions aimed at gaining more information from the implementation team during the practical sessions; and (4) The availability of necessary facilities, including refreshments and other support, provided by the community empowerment team during the activities.

However, there were also several challenges during the implementation of the program: (1) Since some of the training sessions were delivered through lectures or direct outreach, real-life examples were needed to make the content easier to understand. This was especially important since many participants were unfamiliar with project-based learning and authentic assessments; (2) Some participants did not have draft articles or had never written articles for publication in journals, which required more detailed explanations on how to write and publish scientific articles; (3) The teaching method emphasized hands-on practice, which at times left some participants needing additional guidance to understand the steps they had to follow; (4) The limited duration of the program meant that more time was needed to fully observe the impact, such as the application of the learning model and assessment in teaching, or to

assess the publication of articles by the teachers; and (5) The lack of facilities for creating more diverse learning products that could have a more direct impact on the community's daily life. Nevertheless, these challenges were still within reasonable limits as the facilities for the program, including the venue and materials used by the community empowerment team, were sufficient for the activities.

4. CONCLUSION AND RECOMMENDATIONS

This community service program aims to provide training in new skills and knowledge to science teachers, specifically in implementing project-based learning (PBL) and its assessment to support the writing of scientific papers using the Classroom Action Research (CAR) methodology. The objectives of this program are for participants to be able to create lesson plans (RPP) and worksheets (LKS) based on project-based learning and assessment, write scientific papers using the CAR methodology, and successfully publish their scientific papers. The program is divided into five stages: survey, socialization and outreach, implementation/pilot testing, guidance and mentoring, and evaluation of the community empowerment activities. The success of this program is mainly supported by the availability of equipment and facilities, the provision of a suitable venue, the involvement of the community empowerment team and partners, as well as the support from the community. The outcomes achieved include the teachers' ability to create RPP and assessments based on project-based learning, the ability to develop learning products, and the ability to write and publish scientific articles. It is hoped that through this initiative, both teachers and students will contribute to improving the quality of the learning process, including the model/strategy, methods, assessments, and the writing of scientific articles, thereby enhancing the quality of education in schools, and ultimately, in Indonesia.

There is a need for socialization and promotion of this program, so that participants include not only teachers from schools in the Sepauk District but also from other schools. As the community empowerment program involves various activities, additional time for implementation is necessary to provide sufficient knowledge about the products used in project-based learning, article writing with various methodologies, and other related topics. Continuous guidance and monitoring for the partners should be carried out to ensure that the program can be sustained periodically. It is advisable for the program to be continued through collaborations with other partners or organizations in other districts, to gain a broader response to the implementation of the community service program. Partners can provide valuable information regarding the alignment of needs, abilities, and knowledge that can be utilized to successfully carry out similar community service programs.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to the Ministry of Education, Culture, Research, and Technology, particularly the Directorate General of Higher Education, Research, and Technology, for supporting and sponsoring the research fund for the Beginner Community Service (Community Empowerment) program in 2024.

REFERENCES

Amelia, N., & Aisya, N. (2021). Model pembelajaran berbasis proyek (project based learning) dan penerapannya pada anak usia dini di TK IT Al-Farabi. *BUHUTS AL ATHFAL: Jurnal Pendidikan dan Anak Usia Dini*, *1*(2), 181-199. https://doi.org/10.24952/alathfal.v1i2.3912

Awang, I. S. (2018). Kesulitan belajar IPA peserta didik sekolah dasar. *Vox Edukasi: Jurnal Ilmiah Ilmu Pendidikan, 6*(2), 108-122. https://doi.org/10.31932/ve.v6i2.106

Dewi, I. A., Suarni, N. K., & Magta, M. (2015). Penerapan metode proyek melalui kegiatan 3M untuk meningkatkan kreativitas anak kelompok A TK Negeri Pembina. *E-Journal Pendidikan Anak Usia Dini Universitas Pendidikan Ganesha*, *3*(1). https://doi.org/10.23887/paud.v3i1.5920

Duda, H. J. (2010). *Pembelajaran berbasis praktikum dan asesmennya pada konsep sistem peredaran darah untuk meningkatkan kemampuan berpikir kritis dan sikap ilmiah siswa SMA* (Theses, Universitas pendidikan indonesia).

Duda, H. J., Awang, I. S., & Andri, A. (2018). PKM pelatihan pemanfaatan bahan bekas sebagai media pembelajaran IPA bagi kelompok guru IPA. *Jurnal Pengabdian Kepada Masyarakat*, *8*(1), 15-22. https://doi.org/10.30999/jpkm.v8i1.195

Duda, H. J., Susilo, H., Newcombe, P. (2019). Enhancing different ethnicity science process skills: Problem-based learning through practicum and authentic assessment. *International Journal of Instruction, 12*(1), 1207-1222. https://doi.org/10.29333/iji.2019.12177a

Duda, H. J., Wahyuni, F. R. E., Setyawan, A. E., Supiandi, M. I., & Bustami, Y. (2022). Development of project based biotechnology teaching books. *Biosfer: Jurnal Pendidikan Biologi*, *15*(2), 178-191. https://doi.org/10.21009/biosferjpb.18003

Ege, B., & Julung, H. (2019). Produktivitas tanaman cabai rawit (Capsicum frutescens L.) melalui pemberian pupuk organik berbahan dasar Hydrilla verticillata L. dan kotoran ayam. *Techno*, *8*(2), 278-286. https://doi.org/10.33387/tk.v8i2.1177

Ege, B., Julung, H., Andri, A., Leliavia, L., & Utami, Y. E. (2018). Pembuatan kompos tankos kelapa sawit dengan memanfaatkan stater organik menuju masyarakat unggul dan sejahtera. *Jurnal Pengabdian Masyarakat Khatulistiwa*, *1*(2), 60-70. https://doi.org/10.31932/jpmk.v1i2.318

ElSayary, A. (2021). Transdisciplinary STE AM curriculum design and authentic assessment in online learning: a model of cognitive, psychomotor, and affective domains. *Journal of Turkish Science Education,18*(3), 493-511. https://doi.org/10.36681/tused.2021.86

Erwin, H., Awang, I. S., & Anyan, A. (2018). Penerapan pendekatan kontekstual untuk meningkatkan minat dan prestasi belajar siswa pada pelajaran IPA. *Jurnal Pendidikan Dasar PerKhasa*, *4*(1), 169-178. https://doi.org/10.31932/jpdp.v4i1.9

Fadzil, H. M., & Saat, R. M. (2019). The development of a resource guıde in assessıng students' scıence manıpulatıve skılls at secondary schools. *Journal of Turkish Science Education*, *16*(2), 240-252.

Frey, B. B., Schmitt, V. L., & Allen, J. P. (2019). Defining authentic classroom assessment. *Practical Assessment, Research, and Evaluation*, *17*(2), 1-18. https://doi.org/10.7275/sxbs-0829

Holbrook, J. (2005). Making chemistry teaching relevant. *Chemical education international*, *6*(1), 1-12.

Istyadji, M. (2023). Conception of scientific literacy in the development of scientific literacy assessment tools: A systematic theoretical review. *Journal of Turkish Science Education*, *20*(2), 281-308. https://doi.org/10.36681/tused.2023.016

Mansyur, M. (2011). Pengembangan model assessment for learning pada pembelajaran matematika di SMP. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *15*(1), 71-91. http://dx.doi.org/10.21831/pep.v15i1.1088

Mawardi, M., Kristin, F., Anugraheni, I., & Rahayu, T. S. (2019). Penerapan pelatihan partisipatif pada kegiatan penulisan dan publikasi karya ilmiah bagi guru SD. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *9*(2), 132-137. https://doi.org/10.24246/j.js.2019.v9.i2.p132-137

Mueller, J. (2005). The authentic assessment toolbox: enhancing student learning through online faculty development. *Journal of Online Learning and Teaching*, *1*(1), 1-7.

Noorjannah, L. (2014). Pengembangan profesionalisme guru melalui penulisan karya tulis ilmiah bagi guru profesional di SMA Negeri 1 Kauman Kabupaten Tulungagung. *Jurnal humanity*, *10*(1), 97-114.

Nurgiyantoro, B. (2008). Penilaian otentik. *Cakrawala Pendidikan*, *27*(3), 250-261. https://doi.org/10.21831/cp.v3i3.320

Rodriguez, I. E., & Gallardo, K. (2017). Redesigning an educational technology course under a competency-based performance assessment model. *Pedagogika*, *127*(3), 186–204. https://doi.org/10.15823/p.2017.48

Sabtiawan, W. B., Yuanita, L., & Rahayu, Y. S. (2019). Effectiveness of authentic assessment: Performances, attitudes, and prohibitive factors. *Journal of Turkish Science Education*, *16*(2), 156-175.

Safaruddin, S., Degeng, I. N. S., Setyosari, P., Murtadho, N. (2020). The effect of PJBL with WBL media and cognitive style on students' understanding and science-integrated concept application. *Jurnal Pendidikan IPA Indonesia (JPII), 9*(3), 384-395. https://doi.org/10.15294/jpii.v9i3.24628

Samuel, M. (2002). Working in the rain: pressures and priorities for teacher education curriculum design in South Africa: a case study of the University of Durban-Westville. *International Journal of Educational Development*, *22*(3-4), 397-410. https://doi.org/10.1016/S0738-0593(01)00061-X

Sutrisno, A., Mila, H., & Santoso, S. (2019). Perbedaan kemampuan kognitif siswa dengan menggunakan model Problem Based Learning (PBL), Project Based Learning (PjBL) dan inkuiri di SMP Negeri 24 Bengkulu Utara. *In Seminar Nasional Sains & Entrepreneurship, 1*(1), 1-8.

Widarti, H. R., Rokhim, D. A., & Syafruddin, A. B. (2020). The development of electrolysis cell teaching material based on stem-pjbl approach assisted by learning video: A need analysis. *Jurnal Pendidikan IPA Indonesia*, *9*(3), 309-318.

Yustina, Y., Syafii, W., & Vebrianto, R. (2020). The effects of blended learning and project-based learning on pre-service biology teachers' creative thinking through online learning in the covid-19 pandemic. *Jurnal Pendidikan IPA Indonesia*, *9*(3), 408-420. https://doi.org/10.15294/jpii.v9i3.24706

Zahrok, S. (2009). Asesmen autentik dalam pembelajaran bahasa. *Jurnal Sosial Humaniora (JSH)*, *2*(2), 166-180. http://dx.doi.org/10.12962/j24433527.v2i2.660