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Enhancing teacher competence through collaborative worksheet development: an empirical investigation

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ABSTRACT

This study examined the efficacy of collaborative teaching using a project-based learning (PjBL) worksheet on plastic waste and climate change. The research design followed a type-II development approach, with two distinct phases: exploration and development, and collaborative teaching. The study involved five science teachers, two lecturers, and 45 seventh-grade students in three limited field trials. The study found that collaborative teaching through worksheet development could increase science teachers' professionalism, particularly in the collegial phase. Furthermore, the study developed a valid PjBL-based worksheet on plastic waste and climate change, aligning with the 2013 curriculum for science instruction in junior high school, involving three core competencies. The research design employed a lesson study framework, which allowed for a thorough exploration of the research topic, leading to the development of effective instructional material. The findings of this study have significant implications for science education in junior high school, particularly in promoting active learning and fostering a deeper understanding of complex environmental issues. Overall, the study highlights the importance of collaborative teaching and the potential of PjBL-based worksheets in enhancing teacher competence and developing relevant instructional materials that align with the curriculum.

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1. INTRODUCTION

Student mastery of learning content still highly depends on the teacher's professional and pedagogical competence [1]. Unfortunately, science teachers' competence in several regencies in Indonesia in 2013-2015 was classified as low [2]. Similar things were found in science teachers in Yogyakarta [3], Madiun [4], and Aceh [5]. One of the causes of this low teacher competence is that teachers have not attended material content review training since finishing college or they tend only to master one field of science, such as biology, physics, or chemistry [6], [7].

Low science content mastery affects the teacher's ability to teach and create a "fully-integrated" science instruction [8]. However, teaching is not only about content mastery, it is about competence and developing professionalism [9]. The study by Putra *et al.* [10], found that out of six third-grade teachers at elementary school, only one was at level IV, and had the ability to create integrated learning fundamentally.

Several studies have been carried out to overcome this problem [11]–[16]. However, none developed an integrated science learning instrument by collaborating with lecturers and teachers.

Collaborative teaching is a form of informal training that can improve teachers' professional competence, in which they observe each other's instruction as a source of self-reflection [17]. Virtanen *et al*. study [18] showed active learning methods in regular use are important to developing teachers' professionalism. Teacher professional competency improvement training is divided into two forms, namely formal collaborative training and informal collaborative training [19]. Studies on collaborative teaching have been conducted by several researchers [20], [21].

Nevertheless, no research has yet combined the development of science learning worksheets employing collaborative teaching (CT). Besides, there are no specific studies that link it to improving the professional competence of teachers [22]. The selection of the topic "plastic waste and climate change" is essential in Indonesia for several reasons, including i) Indonesia is the second-largest producer of plastic waste in the world; and ii) the issue is the dominant environmental issue today [23], [24]. Meanwhile, there is no specific curriculum in science learning that discusses plastic waste and relates it to the context of climate change. The impacts of climate change are being recorded and documented all around the world [25]. Research on plastic waste teaching tools in Indonesia was recently conducted by Rahmawati *et al.* [26], but only measured student eco-literation in social studies learning without showing the worksheets or basic competencies (KD) used. Based on the three points above, the purpose of this research is to develop an integrated science worksheet on the topic of "plastic waste and climate change", which is with the prevailing curriculum in Indonesia by conducting collaborative teaching between science teachers and lecturers from the Teacher Training Institute.

2. RESEARCH METHOD

2.1. Research design

This descriptive study depicted what happened during learning, with modifications to two research types: developmental research and collaborative teaching. Developmental research used a type-II developmental research framework, which consisted of two stages: exploration and development phases. Meanwhile, collaborative teaching utilizes a lesson study framework, comprising the phases of curriculum study, formulating a goal (PLAN), conducting research (DO), and reflection (SEE). The modification of the two types of research frameworks was carried out to facilitate innovation in the development of learning tools and support the collegial learning process among the teachers participating in collaborative teaching. In the lesson study framework, namely the curriculum study and PLAN, discussion activities were conducted. The final results were realized in the form of an initial worksheet design.

2.2. Research sample

The initial worksheet design obtained from the exploration phase was tried out on a limited scale in DO activities, modified with the development phase, towards 15 junior high school students in grade VII for a cycle, and this research was conducted in three-cycle processes. Therefore, the total number of students involved was 45 people. One teacher acted as a model teacher, while two teachers and two other lecturers represented the observers. The use of a limited sample in this study (15-45 students) is very possible because qualitative research that develops educational research products as proposed by Borg and Gall can be tested using qualitative methods involving small participants [27].

2.3. Research instruments and procedures

Trials were carried out three times (cycle processes). The findings from each completed were employed as input for revising the worksheet being developed. The LKPD design would be revised based on the results of feedback from the observer in the DO phase. Feedback from observers was delivered in the SEE. The research design that modifies collaborative teaching with the exploration and development phases is presented in Figure 1.

This research activity was carried out during the COVID-19 pandemic from April to November 2020. Discussions were conducted online using WhatsApp and Zoom. The involvement of science teachers and model teachers in worksheet development in the form of collaborative teaching started from the initial validation process (exploration phase) up to three limited class trials (developing phase). The teachers involved in the initial discussion designing the worksheet until the limited trials totaled five teachers and lecturers, including the model teacher. Meanwhile, the seventh-grade students of junior high school (SMP) totaled 45 people, each of which amounted to 15 students in the trial. Besides, for expert validation, it involved other teachers who were not involved in the CT team, with a total of three teachers and lecturers.

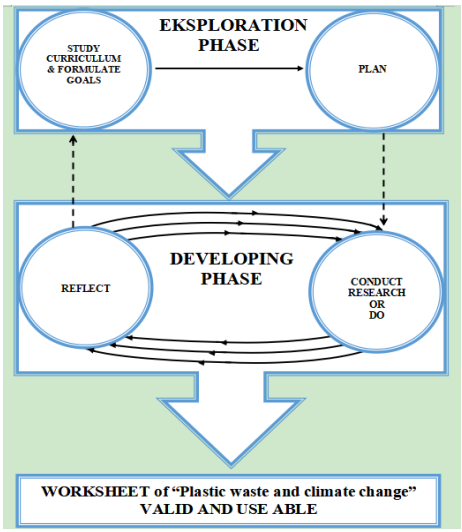


Figure 1. Modification of collaborative teaching and developmental research phase

The findings at each test (reflect) completion were used as input to revise the developed LKPD. The revised results were retried so this phase is called the cycle process because it is an accumulation of field trials with a limited number of participants. The LKPD design would be revised in each trial process based on the trial results' feedback results. The LKPD design from the exploration phase is referred to as the construction design, while the trials' final result is called the implementation LKPD design. Likert scale questionnaires and semi-structured interviews were used to measure teachers' professional competence. Meanwhile, to measure the level of teacher professional competence, Hargreaves [16] framework was employed. It was divided into four professional competence levels: pre-professional phase, autonomous phase, collegial phase, and post-professional phase.

2.4. Data analysis

The competence of a teacher is usually associated with the professional performance of a teacher in relation to student performance, and this professional competence is a crucial part of education. There are various frameworks used to measure the professional competence of teachers, and in this study, the Hargreaves framework [16] is used. This framework measures competence based on time and the consequences it brings, including the pre-professional phase, autonomous professionalism phase, collegial professional phase, and post-professional phase. Each indicator can be seen in Table 1.

Table 1. Distribution of teacher professional competency questionnaires

Competency	Indicator
Pre-professional phase	The teacher views that mass education is better than individual education.
	Books and learning resources are still limited.
	Teachers dominate the learning process.
	Students are motivated to be competitive.
	The monotonous teaching and learning strategies.
	The teaching materials used from year to year are always the same.
	Teaching is still considered the same as managing a class.
	The pedagogical aspect is only a concern when being a pre-service teacher.
Autonomous professionalism phase	Continued professional education after bachelors.
	Teachers get full autonomy to teach in class.
	Having commitment and investment in developing technology and innovation in formal education.
	The view that the length of time in the profession as a teacher makes someone lose their professionalism.
Collegial professional phase	Teachers start working collaboratively.
	The teaching materials are growing rapidly.
	The rapid development of science and teaching methods.
	Multicultural challenge.
	More discussion sessions on student learning difficulties and personal problems.
	The teacher community has grown.
Post professional phase	The professional concept becomes flexible and democratic.
	Professionals have become ingrained in motivation.
	Collaborative work is no longer limited to one institution.
	Teachers improve professionalism at the formal level.

3. RESULTS AND DISCUSSION

3.1. Collaboration teaching in the exploration phase

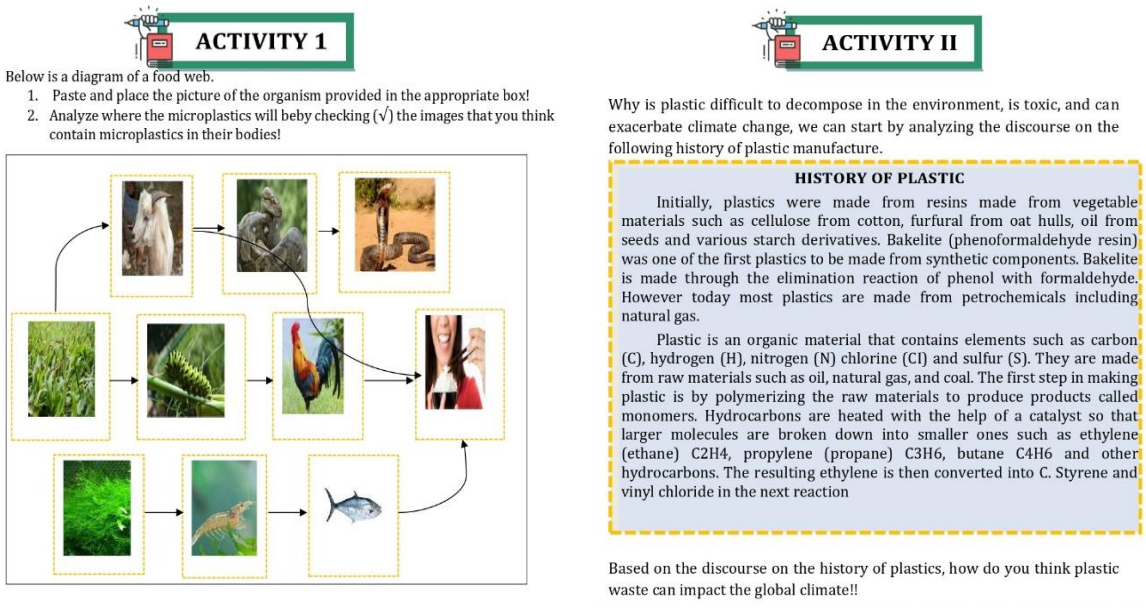
CT in the exploration phase discussed the theory of developing a PjBL-based worksheet and a study on the suitability of the content with the applicable curriculum. Based on the study in the exploration phase, three basic competencies (KD) could be used and packaged in project-based learning (PjBL). The three basic competencies in class VII SMP included i) KD 3.7: analyzing interactions between living things and their environment and population dynamics due to these interactions; ii) KD 3.8: analyzing the process of environmental pollution and its impact on the ecosystem; and iii) KD 3.9: analyzing climate change and its impact on the ecosystem. The three basic competencies are presented with the theme "plastic waste and climate change" with lesson plans, as shown in Figure 2.

Lesson Plan About Plastic Waste and Climate Change

Subjects	Science	Time Allocation	3 hours (180 minutes)
Class Semester	VII/ Second	years	2019 – 2020
Learning Objectives	Basic Competence 3.8 Basic Competence 3.9 Basic Competence 3.10	Basic Competence 4.8 Basic Competence 4.10	
	Through a teaching and learning model of project based learning (PBL) students describe the interactions between living thing and the environment, especially the impact of lifestyle and plastic waste on human life and other living things in the food chain at ecosystem and analyze in long-term impact on global warming and climate change by presenting the results of observations of the form of analyzing the food chain in the ecosystem. As well as presenting data and information on global warming and providing suggestions for overcoming problems one of which is by creating green plastic creativity with a disciplined, responsible and honest		
Learning materials	Food web, water, soil and air polution due to plastic waste and global warming		
Model: *Problem Based Learning* **Description** Collaboratively working on plastic waste and climate change worksheet then watching teachers demonstrate doing experiments on making geen plastics (on video) After that students together in group make green plastic creativity from the main material that is different from what the teacher is modeling **Tools, Materials and Media** Worksheet, Starch from Potatoes ,water, hydrocloric acid, Glycerol, food coloring Thermometer, pH meter, beaker bunsen, filmer paper and jars	Learning steps **Preliminary:** Greetings, lead prayers, check student attendance, convey learning scenarios **Core Learning:** 1. Start With the Essential Question • Can plastic affect life in the ecosystem? • Whether plastic can affect global warming and climate change? • How plastic affects both of the above? **2. Design a Plan for the Project** • Students carry out several activities in the worksheet that aim to answer the essential questions above, including designing the tools and materials needed to help complete the project • The teacher provides directions regarding group assignments in working on worksheet **3. Create a Schedule** • The teacher guides students by giving an example of one form of making green plastic as a form of overcoming plastic and environmental problems • Teachers and students collaboratively compile a schedule activities in completing green plastics projects new ways • Teacher and students collaboratively make completion deadlines project **4. Monitor the Students and the Progress of the Project** • The teacher is responsible for monitoring the activities of students while working on a project by making a rubric that can record all important activities of students **5. Assess the outcome** • The teacher conducts a standard achievement assessment and es feedback on the level of understanding of students • The teacher clarifies the result of students' analysis • Students pay attention to the teacher's clarification **6. Evaluas the Experience** • At the end of the leason, the teacher and students reflect on the activities and result of the project that has been carried out • The reflection process is carried out both individually and in groups by expressing their feelings and experiences during the completion of the project so that in the end new findings are found about making effective green plastics **Closing** The teacher reflect appreciates and follow up	
Assessment			
The reacher assesses the results of student discussions and student activay in learning The teacher provides a likert scale sheet about changes in student attitudes towards using single-use plastics The teacher provides a product assessment of the green plastic produced			

Figure 2. PjBL lesson plan with the theme "plastic waste and climate change"

Figure 3 presents three key activities. Activity 1, as visibly demonstrated in Figure 3(a), involves an exploration of the relationship between food webs and plastic waste, reflecting the principles of KD 3.7 and 3.6. Activity 2, depicted in Figure 3(b), investigates the pertinent link between plastic waste and climate change, aligned with the objectives specified in KD 3.9. Finally, the project activity (activity 3), constructed on the guidelines of KD 4.8, offers a feasible solution to the pressing issue of plastic waste via the concept of green plastic, as displayed in Figure 4. These activities collectively provide a comprehensive insight into the topic at hand, consolidating the outlined competencies.



(a) (b)

Figure 3. Worksheet activity in (a) activity 1 and (b) activity 2

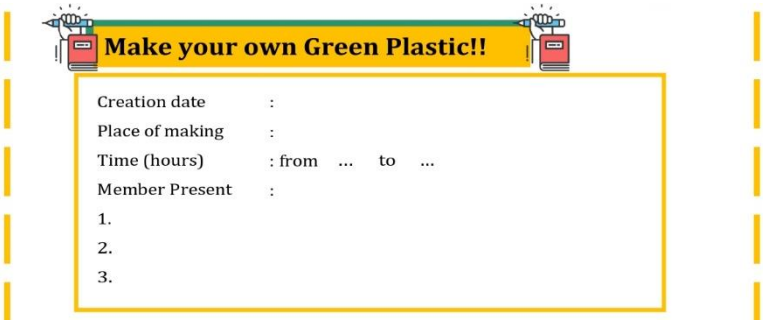


Figure 4. Green plastic-making project

Initially, the group project was designed for students to have various solutions to plastic waste. However, when it was validated, there were suggestions. First, the form should be specific to only one solution, namely green plastic making. However, to facilitate student creativity, the selection of primary materials and tools could be free and creative. Second, the worksheet should include all PjBL learning model phases: i) starting with the essential question; ii) designing a plan; iii) creating a schedule; iv) monitoring the progress; and v) assessing the outcome. Initially, the steps in points 2-5 were already in the worksheet, while the first syntax inclusion was entered in the form of a worksheet as in Figure 5.

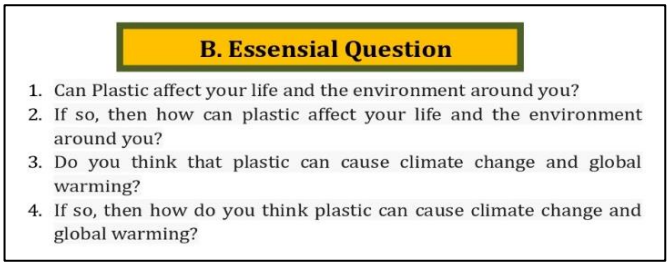


Figure 5. Essential questions in the worksheet

Developing an integrated science worksheet by combining three different KD requires a certain amount of knowledge about the components and pedagogical skills to package them in a lesson. In-service and pre-service teachers have difficulty making integrated learning in their classes [28]. This difficulty is caused by the lack of training [29]–[31]. Another point is that when teachers develop an integrated learning curriculum without collaborating, there will be many terms and knowledge that ultimately make them avoid developing an integrated curriculum [32].

Feedback from expert validators in the form of limiting the type of project is the right thing. Based on the research between traditional learning and PjBL [33], [34], it was found that PjBL often produced low scores in student final exams. The same thing happened when several researchers [35], [36] compared the open inquiry learning model and guided inquiry. From their research, it was uncovered that students who were not used to inquiry learning would find it difficult to learn with open inquiry; these difficulties caused a decrease in student success in learning. In this study, the development of worksheets was aimed at seventh-grade students who were beginners in working on PjBL-based worksheets.

3.2. Collaboration teaching in the development phase

The worksheet design obtained from CT activities in the exploration phase is called the construction design. This design was tried limitedly three times, each of which was for 15 students in the developing phase. The findings after each DO were used as input for revising the worksheet. The worksheet design would be revised for each trial process based on the SEE feedback results. It is referred to as the construction design. The revision can be seen in Table 2.

Table 2. Findings and revisions of LKPD trial results at each step of PjBL learning

No.	Findings	Revisions
1	The essential questions placed at the beginning of the worksheet are shown in Figure 4. In the first trial, students were too fixated on the essential questions so they forgot that essential questions should not be answered and discussed.	Essential questions on the worksheet were deleted and used as introductory questions for learning by including them in PowerPoint in the introduction.
2	In the first trial, many students were not ready to learn. It was proven from the worksheets that had not been printed, and the students were still confused about which group to enter.	One day before the lesson, the teacher distributed softcopy worksheets in the WhatsApp group and asked each student to print the worksheet and reminded the notes about which group the students should be in so that when zooming was on the breakdown, they had already known which group they should be in.
3	The worksheet's learning activities took a lot of time, and it was difficult for students to start the next activity.	Activities were divided into two: activities in the class and project activities outside the classroom. Therefore, the introductory discourse in Activity 2 was eliminated, and the questions were taken by simplifying the form of questions and adding conclusions, as in Figure 6.
4	In activity 1, students had difficulty attaching pictures of organisms to create and analyze a food chain. This difficulty was caused by unclear pictures and students not knowing of the process of eating and being eaten; for example, a snake is eaten by a king cobra.	a. The organism image was provided directly in the worksheet. Students simply made food chain arrows, which pointed from one organism to another. b. Teachers looked for images that were more suitable and understood by the students, such as shrimp. c. Below the picture of the organism in question, the name in the Indonesian language is given. The revision in this section can be seen in Figure 7.
5	Students encountered a little difficulty following the project work instructions. It was because students were still in the first level of junior high school, with various elementary school backgrounds, so neither group could produce plastic ore from their PjBL project during the first trial.	Revisions to project activities and a video link for making iron ore can be seen in Figure 8.

Based on Table 2 in section 3, we gathered a salient observation: the learning activities inscribed within the predesignated worksheet were unduly time-consuming, presenting formidable obstacles for the students in propelling to the subsequent exercise. Addressing these inefficiencies, the once-included introductory speech in Activity 2 was strategically excised, an alteration compelled not by convenience but by optimum utilization of available time. Simultaneously, question formats within the exercise received significant simplification, with the objective remaining the homogenization of comprehension, engagement, and efficiency while precluding the sacrifice of any of the aforementioned parameters at the altar of rigid temporal constraints. Furthermore, to commendably maintain the academic rigor and integrity of the learning activity, conclusions were incorporated within the revised format. These comprehensive amendments are best

visually encapsulated within Figure 6 [11], providing a tangible representation of a responsive adaptation to previously observed academic challenges.

3. From the food webs that you created, is it possible that microplastics will enter the human body. Tell me the reason!
……

4. If plastic waste has such a big impact on the ecosystem, how plastic waste can also affect global warming and climate change!
……

5. Make a conclusion from the discussion you did from question 1 to 4!
……

Figure 6. The results of the revision of the second activity

According to Table 2 point 4, Students found it challenging to attach images of species to design and analyze a food chain in activity 1. Students did not understand the process of eating and being eaten, such as when a king cobra consumes a snake, which contributed to this issue. Figure 7 represents the first activity's revision, for which the organism image was already included in the worksheet. Students only created arrows that indicated the food chain from one organism to another. Teachers also searched for pictures of things that students could relate to and understand, like shrimp, and the name of the organism is provided in Indonesian below the image of it.

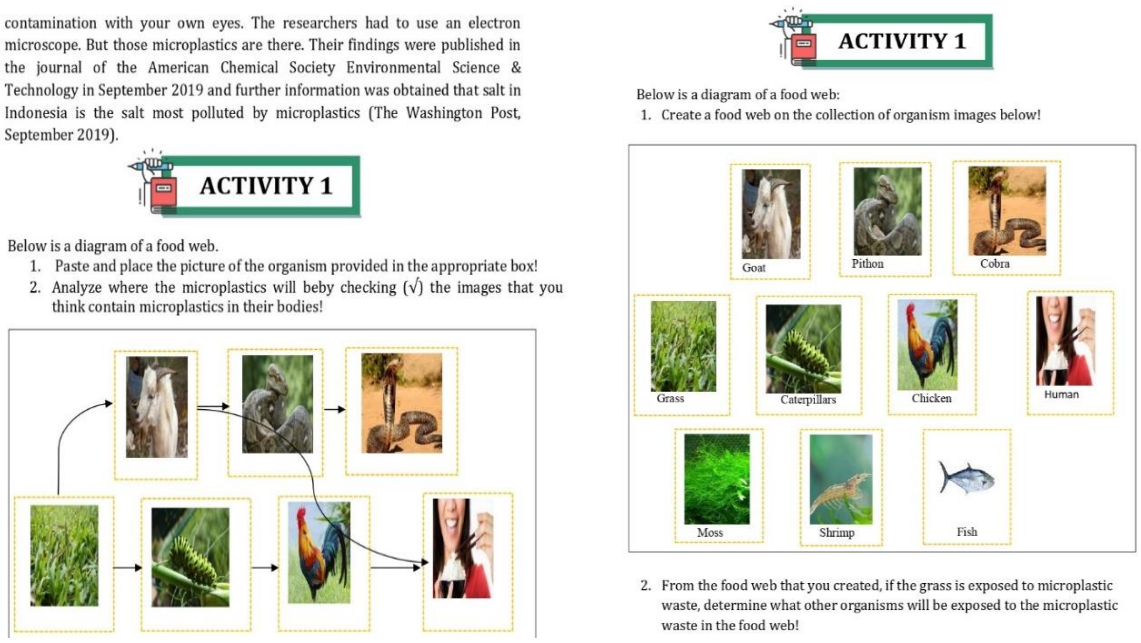


Figure 7. The results of the revision of the activity 1

Based on Table 2 point 5, Students had a little trouble following the project work directions in activity 1. Both groups were unable to generate plastic ore for their PjBL projects during the first trial since the students were still in junior high school's first level and came from different elementary school backgrounds. Figure 8 shows changes to project activities and a video link for producing iron ore.

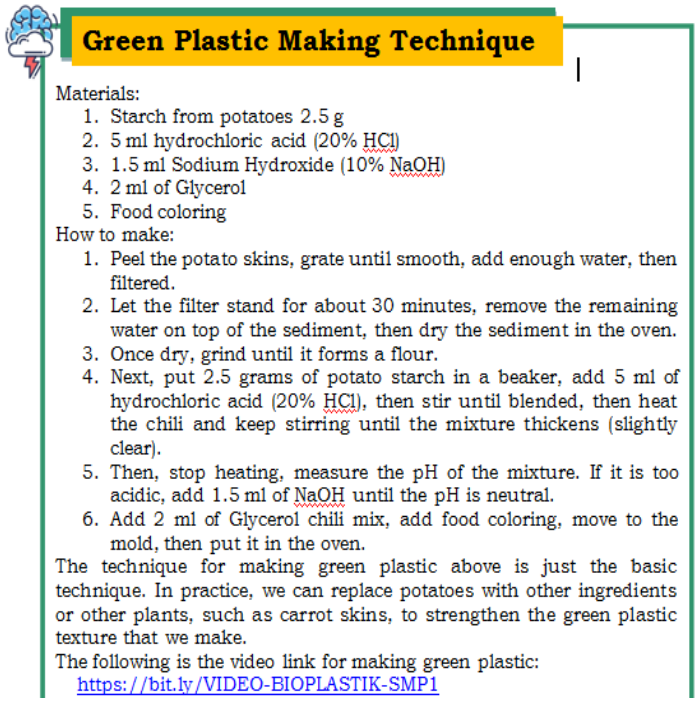


Figure 8. The results of the revision of the first activity

Based on Table 2, several points can be discussed, including points 1, 3, and 4. At point one the essential questions are introductory questions to make students think in general about the vital knowledge to understand the subject matter content [37]. Therefore, as an improvement, essential questions were employed as introductory questions, which the teacher asked without suggesting the correct answer so that they were placed in the PPT at the beginning of the lesson. In Shultz and Li study [38], the teachers insert syntax in core activities. The primary factor was teachers had difficulty making the essential questions that will guide students in PjBL activities [39], or often, essential questions developed by the teacher were not connected with the material to be taught [40].

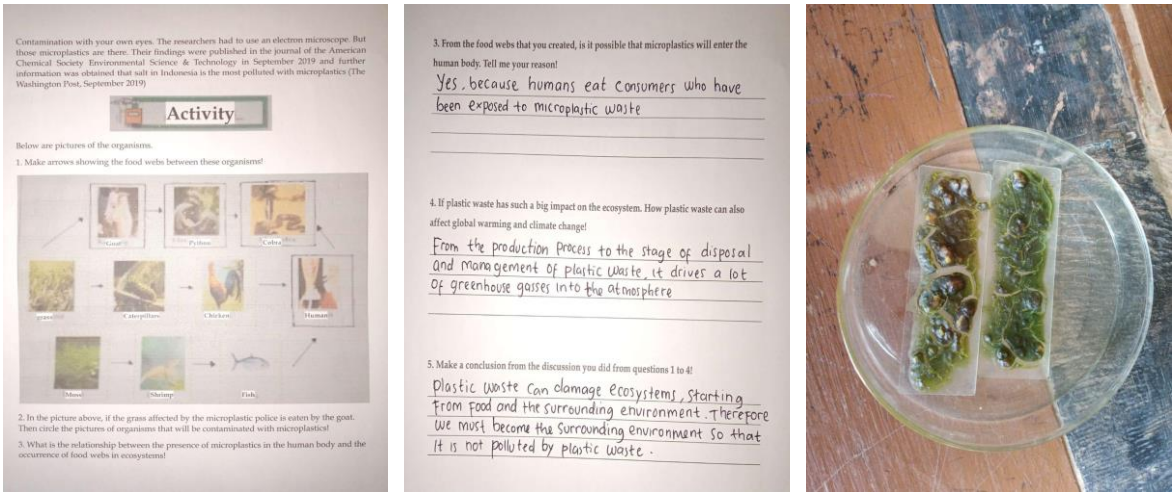
Based on the research findings above, it could be concluded that it is vital to ask essential questions in developing PjBL worksheets. However, it should not be put in the worksheet but included in the lesson plan and used as guided questions. After three trials in the developing phase with DO and SEE cycles, the results of developing the worksheet were successful.

Based on the third trial results as shown in Figure 9, it took 09.17 minutes to carry out the opening learning activities, as shown in Figure 9(a), 45 minutes for core activities, and five minutes for closing activities. In the opening activity, the learning objectives were conveyed and ended with students starting to divide into groups. Meanwhile, the core learning activities were done in the form of group and class discussions, while the closing activities were conducted with conclusions and introductions for making projects.

In the third point of Table 2, students did not experience significant difficulties. From the research of Friesen and Scott [41], it was found that PjBL learning is more of learning that applies knowledge; in other words, when doing PjBL learning, students are deemed to have sufficient knowledge to apply their knowledge in the form of projects. However, based on several studies [42], [43], it was revealed that the right learning model could often trigger a culture of inquisitiveness in students, which was done in the form of asking questions. The fourth point about students' difficulty following the work steps of the green plastic project, was overcome by adding a video link as an additional project development guide. The process of observing learning and discussing improvements to the worksheets developed was carried out after the learning process took place, as in Figure 9(b). Meanwhile, student-made PjBL products and students' correct answers to learning activities in the worksheet are in Figure 9. Figure 10(a) and 10(b) is shown the results of student's answers from the final worksheet developed. Figure 10(c) shows the student-made green plastic project sheets.

(a) (b)

Figure 9. Third trial: (a) opening activity and (b) discussion of model teachers and observers to improve the worksheets



(a) (b) (c)

Figure 10. PjBL (a) products and students' answers; (b) results of student's answers from the final worksheet developed; and (c) student-made green plastic project sheets

3.3. Teacher professional development

To measure teachers' professional competence, a Likert scale questionnaire and semi-structured interviews were employed, using the Hargreaves framework [16] modified by Wardoyo *et al.* [44]. The levels of professionalism referred to were the pre-professional phase, autonomous phase, collegial phase, and post-professional phase. The level of teacher professional competence on the measured indicators was analyzed and divided into three groups: i) indicators before collaborative teaching; ii) after collaborative teaching; and iii) indicators that remained after CT had been carried out.

Based on Table 3, teachers involved in CT had met the pre-professional phase's basic standards, even before attending CT, and were more persistent after attending CT, combined with worksheet development. However, some indicators did not change. The autonomous phase of CT combined with worksheet development changed two fundamental paradigms: i) to make teachers aware of full collaboration in developing integrated science learning; and ii) viewing technology as something difficult and should be studied formally. CT and worksheet development require teachers to collaborate in a high-learning atmosphere to become confident. The collegial phase was the most affected and changed a lot after the CT implementation. Meanwhile, the stage that has not changed much due to CT being modified with worksheet development was the post-professional stage.

Table 3. Levels of teacher professionalism

Phases		Indicators	Mean
Pre-professional phase	Before CT	Students are motivated to be competent.	4.5
		The teacher applies the same strategy to the same material in each class.	3
		Pedagogic aspects are crucial only during an internship or when there is supervision.	4
	After CT	Students are motivated to collaborate with each other.	4.5
		The teacher applies different strategies to the same material in each class.	4.5
		The pedagogical aspect should be a concern at all times.	4.5
	Remained	Mass education that treats students the same in one class is still considered better.	4.0
		Teachers have made use of various books and learning resources.	4.75
		Teachers dominate learning in the classroom.	3.25
		The teacher revises the teaching materials used every year.	2.5
		Teaching is still considered the same as managing a class.	4.5
Autonomous phase	Before CT	My pedagogy is qualified enough to teach students today.	4
		Having commitment and investment in developing technology and innovation in formal education	5
	After CT	After attending the collaborative teaching training, I thought that my science knowledge should be added so that I could teach integrated science well.	5
		Having commitment and investment in developing technology and innovation in education formally and informally	4
		The view that the length of time in the profession as a teacher makes someone lose their professionalism	3.5
	Remained	Teachers get full autonomy to teach in class.	4.5
Collegial phase	Before CT	Before CT, teachers thought that teachers could teach science by sharing subject matter content with teachers in other fields without even collaborating.	4
		The teacher understands that the discussion about learning difficulties and students' personal problems is the homeroom teacher's authority and the counseling teachers.	3.5
	After CT	Teachers start working collaboratively because they realize that to teach integrated science, they must collaborate.	5
		The teacher knows a lot about how to teach when observing the teacher's instruction during CT.	5
		The teaching materials owned are growing rapidly.	5
		The teacher believes that the development of science and teaching methods will develop rapidly with CT.	5
		The teacher begins to allocate much time for discussion sessions about learning difficulties and student personal problems.	4.7
	Remained	Multicultural challenges are not yet a big problem for teachers.	
		The teacher community has grown.	
Post-professional phase	Before CT	-	-
	After CT	-	-
	Remained	Professionals have become ingrained in motivation.	3.75
		Collaborative work is no longer limited to one institution.	2.5
		Teachers increase professionalism at the formal level.	2.5

An interesting point in Table 3 lies in the autonomous phase of the paradigm of professionalism. The prevailing general view is that the longer one takes the profession as a teacher, making him a professional teacher. However, this view is contrary to, the model teacher. They stated that the longer the teacher taught, the less professional the teacher was. It seems that the views of the model teacher were mixed between professionalism and idealism. This view changed in the model teacher after following CT. Model teachers began to realize that professional education can be achieved through collaboration, discussion, and observation.

Another interesting point in Table 3 is that before CT, one teacher still used the same strategy for the same material in different classes. However, while doing CT, teacher C realized that the same strategy could not be applied in different classes. On the point of teaching materials, it does not mean that teachers immediately have many textbooks after CT. However, CT made teachers aware, so that they initiate CT in the form of developing teaching tools in the future. Table 3 shows that the stage that has not changed is the post-professional stage.

The results found in this study are consistent with those exhibited by Kyvik and Larsen [45], who found that the professional competence of teachers who have a learning community and collaborate to research learning will increase gradually. It corroborates Willemse and Boei [46] statement that there is a close relationship between teachers' research and the teaching and learning process they do in the classroom. Introducing research in the form of teaching tool development and jointly discussing to observe the learning process of the model teacher in the classroom provides opportunities for teachers to reflect and exchange experiences [47], focus on research methodology, develop a "collective research journey" [48], and ultimately, improving professionalism [22].

4. CONCLUSION

Based on the research findings, it was possible to draw the conclusion that the project-based learning worksheet on the subject of "plastic waste and climate change" was valid and appropriate for use in the classroom, provided that it did not include all of the necessary questions in the worksheet but provided enough in the lesson plan, limited the project activities to prevent student confusion, and included video links when creating project samples. It also required that students have the necessary background knowledge to readily learn new material. This study also suggested that collaborative teaching with worksheet development activities could enhance teacher professionalism, particularly up to the collegial phase.

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