Teachers' Perception toward Electronic Student Worksheet Based on chiken manure Waste Treatment Projects to Improve Students' Creative Thinking Skills

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Abstract: The objective of this research was to investigate the Science teachers' perception toward e-worksheet based on chiken manure waste treatment projects to improve students' creative thinking skills. The method used in this research is mixed methods with Sequential Explanatory Design. The data was collected through questionnaire, then analyzed by using descriptive analysis. The questionnaires were distributed to 14 Science teacher respondents and 127 junior high school students in North Metro District. The result shows that teacher have a positive perception toward usage of the electronic students' worksheets based on chiken manure waste treatment projects. The results showed that 79% of teachers had not used project-based e-worksheets; based on students' response questionnaires, 37% of teachers have given project assignments, but the projects were not based on real problems in the environment. Environmental problems that occur in North Metro District is the amount of chicken manure waste issue that causes pollution to the environment around society's houses. The current worksheets has not completely train students' creative thinking skills and that's skills was in low category. Based on the result It can be concluded that a e-worksheet based on chiken manure waste treatment projects is needed to improve students' creative thinking skills.

Keywords: Creative; Thinking skills; e-Worksheet; Project-based learning.

Introduction

The world industrial revolution is entering its fourth era which is also called Industry 4.0. The industrial revolution has changed the way humans work to digitalization through innovations (Suwardana et al., 2018). Everyone is given the opportunity to create their own jobs that require skills. The skills needed in the business and industrial world in this era are innovation skills and information technology and media skills (Ghufron, 2018; Wijaya et al., 2016). Skills that must be possessed in order to lead someone to be successful in competition in this era are creative thinking skills (Binkley et al., 2012; Bybee, 2013).

Creative thinking skills are highly demanded in this era in order to form students who have the potential to be able to modify, reuse, or even put forward ideas or create new products (Nakano and Wechsler, 2018; Rahardjanto et al., 2019). Creative thinking skills train students to be flexible and see opportunities and face challenges in a world that continues to grow rapidly, and to be able to develop unique and useful solutions for life in the future (Ritter and Mostert, 2017; Siew and Ambo, 2018). Creativity is a mental phenomenon that results from the application of ordinary cognitive processes such as working memory and the ability to categorize and manipulate objects (Ritter et al., 2020). Creative thinking is a skill to generate new ideas; or create new constructive combinations based on existing data, information, or elements, with different perspectives, which appear as manifestations of perceived problems, resulting in useful solutions (Diawati et al., 2017; Syahrir, 2019).

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How to Cite:
Agustin, M.S., Diawati, C., & Jalmo, T. (2023). Teachers' Perception toward Electronic Student Worksheet Based on chiken manure Waste Treatment Projects to Improve Students' Creative Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1050–1058. https://doi.org/10.29303/jppipa.v9i3.2881

Based on the results of an international study, the Global Creativity Index (GCI) in 2015 showed that students' creative thinking skills in Indonesia were low with an index of 0.202 which was ranked 115th out of 139 participating countries. The results of previous studies also show that creative thinking skills, especially in the field of education, are still low and even very low (Patmawati et al., 2019; Lubis, 2015).

Learning conducted by teachers during the Covid-19 pandemic generally did not use adequate learning programs to train and develop creative thinking skills, the results of a survey on the implementation of Distance Learning (PJJ) conducted by KPAI (Indonesian Child Protection Commission) out of 1700 respondents showed 81, 8% of respondents answered that during the 4-week PJJ, it turned out that the teachers put more emphasis on just giving assignments, rarely even explaining the material, discussing or asking questions. As much as 55.5% answered the assignment in the form of making videos, 44.5% of the respondents answered the assignment in the form of answering questions in a large number of up to 50 questions, even though it was multiple choice but doing it was quite tiring, especially questions that counted, as many as 39.4% of respondents answering assignments in the form of summarizing chapters.

The teacher's ability to package designed learning experiences greatly influences meaningful experiences for students. Learning experiences that show the relationship between conceptual elements will make the learning process more effective (Diawati et al., 2020). Learning that should be done by the teacher is learning that is able to train students' creative thinking skills so that learning is not only limited to giving assignments. Learning in this era is based more on students' abilities to use information to solve real problems that occur in life, to be able to adapt and innovate in response to new demands and changing circumstances as well as expand the power of technology to create new products (Septikasari, 2018). The different educational backgrounds of teachers and the limitations in increasing literature reviews have an impact on reducing students' creative thinking skills because learning is still monotonous and less interesting (Wilsa et al., 2017). There is no innovation in the learning program yet, moreover the material used is only the result of downloading on the internet, so the learning program used is not based on real problems that occur in life and the learning references used have not trained students' creative thinking skills (Tran et al., 2021) .

Efforts that can be made to improve creative thinking skills are by training students in dealing with real problems that exist in the environment (Diawati et al., 2017; Muhammad and Atmojo, 2018) and students creatively provide solutions to these problems. North

Metro District has real problems that can be used as media in learning. The problem that occurs is the large amount of chicken manure which has an impact on environmental pollution around people's homes, namely the appearance of unpleasant odors, lots of flies and fears of spreading the H_5N_1 virus. On the other hand, chicken manure can be used as liquid fertilizer, compost and biogas.

The problems described above can be overcome through the PjBL learning concept. Project Based Learning (PjBL) engages students in real-world activities, enabling them to work with knowledge to be acquired or already acquired (Juuti et al., 2021). PjBL allows students to study material in an integrated manner and use their knowledge to solve problems in the form of projects (Bilgin et al., 2015). In PjBL students are challenged to solve problems with a variety of useful solutions. Project-based learning is complex learning where students are required to exchange ideas, make predictions, make decisions, work in groups, give freedom to students to design a product, and present their ideas and findings to others (Blumenfeld et al., 1991). Project-based learning establishes a learner-driven paradigm in which problems can "lead" them to the core concepts of a particular subject matter. This project has to carry out constructive inquiry of the learner whereas this includes inquisition, decision making, and resolution of the learner. Implementation of project-based learning in class, the teacher acts as a facilitator, not as a subject matter expert. In facilitating students, continuous discussion between teacher and students plays a major role. In addition, projects are usually complex and tend to have challenging assignments that require students to solve problems. Therefore, teachers must facilitate students in completing complex tasks (Jumaat et al., 2017).

Most student projects are carried out outside the classroom, where students work independently within a certain time frame to solve a problem. Thus, a guide is needed in the form of student worksheets to guide their projects. Advances in technology now allow worksheets to be presented in the form of E-worksheet, making it easier for students to access it. E-worksheets is a teaching material that is designed using digital media, is symmetrical, systematic, attractive to achieve learning objectives, and is easily accessible using the internet network (Sholehah et al., 2021). Several researchers have reviewed the project-based E-worksheets including: Febriansyah et al, 2021 concluded that the project-based E-worksheet using Fliphtml5 is stated to be very valid, this validity can be seen in terms of material, construct, design and practicality in stimulating students' science process skills (Febriansyah et al., 2021). Research conducted by saifudin & kunjoro, 2021 concluded that ecopreneurship waste recycling-based e-worksheets

were stated to be very feasible both theoretically and empirically to train students' entrepreneurial interest (Saifuddin & Kuntjoro, 2021). Research conducted by Sari et al. (2020), concluded that the development of a project-based E-Worksheet with the theme of city noise was included in the very good category according to didactic, construction and technical aspects. Thus, it is suitable for use as a learning medium to improve students' creative thinking skills and digital literacy (Sari et al., 2021). However, there is no research that examines E-worksheets based on real problems in the surrounding environment, namely the chicken manure waste processing project.

This research describes the perceptions of science teachers and students regarding science learning using the e-worksheet based on the chicken manure waste project to improve junior high school students' creative thinking skills. These findings also provide a glimpse into the complexity of pedagogical work, which can inform the professional development of teachers to develop their teaching materials preparation.

Method

The participants in this study consisted of 14 science teacher respondents and 127 junior high school student respondents for the 2022/2023 academic year. This study used mixed methods research adapted from creswell and the strategy used was a Sequential Explanatory Design by combining data collection and analysis of qualitative and quantitative data (Creswell, 2002). This research was conducted on April 1-14 2022 at public and private junior high schools in Metro Utara District. First, researchers conducted a literature study by analyzing the results of recent studies on e-worksheet, PjBL and creative thinking skills. Furthermore, the researchers developed an instrument to analyze the needs of science learning educators, then the instrument was distributed to 14 science teacher respondents and 127 junior high school student respondents in Metro Utara district via the google form. There are three indicators of questionnaire statements for teachers and students' needs as well as interview guidelines, namely: to find out the use of e-worksheet in science learning, project based learning based on problem solving, and creative thinking skills. Figure 1 is a research design scheme in sequential research stages, starting with quantitative research and continuing with qualitative research that follows a sequential explanatory design state strategy (Shorten & Smith, 2017).
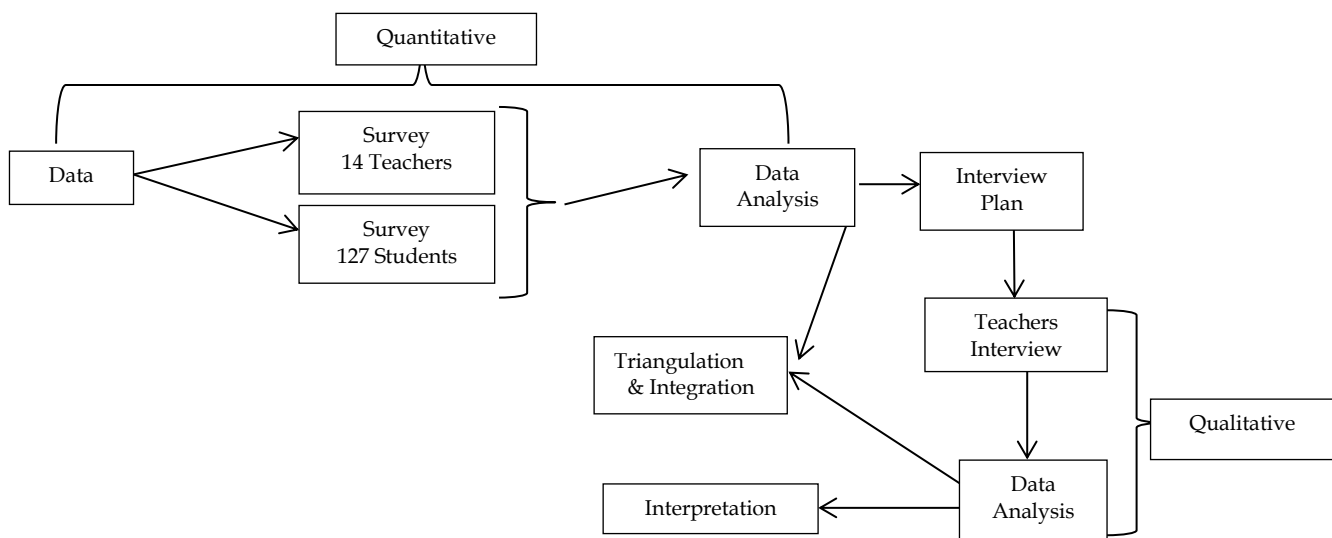

Figure 1. Schematic research design

Data analysis techniques used in this study include data collection, data reduction, data display and verification. The data collection started with the process of entering the researcher at the research location, namely Public and Private Middle Schools in North Metro District, the data collected was then reduced to focus on important matters relating to the main points of research, which at this stage the process of determining, determining also eliminating data that is not needed, then summarized and compiled in a complete and systematic manner so that the research data obtained is accurate and can be completed, then in the final stage, namely data presentation and drawing conclusions where at this stage the researcher presents the initial data to completion also gets conclusions and verification (Milles & Huberman, 1992). After the data is described, it can be verified through the completeness of interview data and documentation. The procedure when

conducting interviews includes their responses about the learning process at their school. Furthermore, interviews were conducted to find out their reasons for using worksheets in class, project-based learning models in science learning, and creative thinking skills. Quantitative data analysis and qualitative analysis were carried out in an integrated and triangulated manner.

Research data obtained from teacher & student questionnaires were analyzed by grouping answers based on questionnaire questions, giving a score to each answer according to the scoring criteria, calculating the total score of the answers to each question. The questionnaire uses the Guttman scale which has answer choices according to the contents of the question, namely: "YES" and "No" with a score of "1" and "0". Then calculate the percentage score and interpret it qualitatively, while the formula used to calculate the percentage score for each item is as follows:

$$\%Jin = \frac{\sum Ji}{N} \times 100 \%$$

(1)

(Sudjana, 2005)

Where, $\% Jin$ is the percentage of choice answer i, $\sum Ji$ is the number of respondents who answer the answer i, and N is the number of all respondents (Sudjana, 2005).

Result and Discussion

This section describes the discussion and research findings based on data collection and analysis. The results of distributing the questionnaire to 14 science teachers in North Metro sub-district are shown in table 1.

Table 1. Results of Interpretation of Teacher's Perception Questionnaire

Question	Percentage	
	Yes	No
Do you use worksheet in science learning?	100.00	0.00
Current technological advancements allow worksheets to be presented in e-worksheet form. Is the use of e-worksheets in Science Learning very important?	100.00	0.00
Have you used project-based e-worksheets in Science Learning?	21.00	79.00
Is science learning on the topic of environmental pollution already based on real problems in the surrounding environment?	79.00	21.00
Have project-based learning activities on the topic of environmental pollution and biotechnology been implemented?	79.00	21.00
Do you know about creative thinking skills?	100.00	0.00
Have you trained your creative thinking skills in learning?	86.00	14.00
Does practicing creative thinking skills really need to involve solving real problems in the environment?	100.00	0.00
Have you implemented project-based learning on chicken manure waste management to improve the creative thinking skills of junior high school students?	7.00	93.00
Have you ever taken a test to measure creative thinking skills?	36.00	64.00
If yes, are the students' creative thinking skills as expected?	14.00	86.00
Do we need teaching materials in the form of e-worksheets based on chicken manure processing to improve students' creative thinking skills?	93.00	7.00

Table 1 illustrates that all science teachers have used worksheets in science learning, and they also agree on the importance of using e-worksheets in science learning on the grounds that as technology advances, it is hoped that students will be able to keep up with its developments, so that students are able to assess the knowledge they need. more. In this era of technological development, most students are more interested in teaching materials that utilize other media such as computers/laptops, even smartphones compared to teaching materials in the form of printed worksheets. E-Worksheets can help and facilitate the process of teaching and learning activities so that effective interactions will be formed between students and teachers so that they can increase student activity in improving learning outcomes (Haryanto et al, 2019) . However, in implementing project-based e-worksheets, as many as 79% of teacher respondents had not used project-based e-worksheets. E-worksheet is a practice sheet that guides students in completing a project or discovering a theory. Students work digitally and are carried out systematically and continuously for a certain period of time (Lathifah et al., 2021). Teachers experienced difficulties in implementing project-based electronic worksheets in science learning during the covid pandemic because science learning was carried out online and the teacher provided little material, teachers tended to be pessimistic about the success of projects completed by students, and teachers felt

difficult if they had to control the progress of student projects.

As many as 79% of teacher respondents stated that they had implemented PjBL, but only 35% of teachers knew the PjBL steps correctly. Project-based learning according to Colley (Diawati et al., 2018) consists of 6 learning stages, namely the orientation stage, identifying and determining projects, planning projects, implementing projects, documenting and reporting projects, and evaluating and implementing projects. The teacher only gives assignments to students, such as separating organic & inorganic waste boxes, making tempeh and making tapai. PjBL implemented by the teacher is also not based on existing problems. While the problem that occurs in North Metro District is the large amount of chicken manure waste. The teacher never guides students to complete it. This shows that the PjBL steps that are understood by the teacher are not as they should be. Further information is explained in the data from teacher interviews regarding project-based learning steps.

As many as 86% of teacher respondents already know about creative thinking skills, but the indicators of creative thinking skills that teachers understand are different from the indicators of creative thinking skills that should be measured. They stated that students were said to have thought creatively if students were able to solve problems, find ideas, argue and detail. The indicators that the teacher understands are not as they should be. Indicators of creative thinking skills according to Al-sulaiman (2009), namely fluency, flexibility, originality, elaboration, and evaluation. As many as 64% of teacher respondents stated that they had never taken a test for measuring creative thinking skills, while as many as 36% of teacher respondents had taken a measurement of creative thinking skills. They think that this thinking ability is too high for high school students. As many as 93% of teacher's respondent react positively to the development of teaching materials in the form of e-worksheets based on chicken manure processing projects to improve students' creative thinking skills.

Table 2. Results of Interpretation of Student's Perception Questionnaire

Question	Percentage	
	Yes	No
Does the teacher apply various methods in learning?	95.00	5.00
Do teachers use e-worksheets on environmental pollution and biotechnology?	28.00	72.00
Have you ever been asked in groups to solve a problem in the environment?	49.00	51.00
Has the teacher ever given assignments in the form of a project?	37.00	63.00
Does the teacher give assignments to solve problems in the school/home environment?	49.00	51.00
Are there any problems related to environmental pollution around your neighborhood?	75.00	25.00
Does the processing of chicken manure really need to be done in environmental pollution studies?	90.00	10.00
Are teaching materials needed to guide solving the problem of chicken manure?	90.00	10.00

The results of completing a questionnaire by 127 SMP/MTs students from several public and private schools in North Metro District are shown in table 2. Based on table 2, as many as 95% of student respondents stated that the teacher applied various methods in learning. The methods used by the teacher include: the lecture method, the experimental method, and the discussion method. The teacher's ability to develop learning activities is one of the factors to improve students' conceptual understanding abilities (Susantini, 2000). As many as 72% of student respondents answered that they had never used project-based e-worksheets on environmental pollution and biotechnology material, as many as 28% answered that they had. As many as 37% of student respondents answered that the teacher had given assignments in the form of a project, and as many as 63% of student respondents answered that they had never. Projects made by students are not based on real problems in the environment, this is in line with the teacher's response, namely the assignment of projects to students, in the form of separating organic & inorganic waste boxes, making tempeh and making tapai. As

many as 49% of student respondents answered that the teacher had given assignments to solve problems in the school/home environment, while as many as 51% of other student respondents had never. Meanwhile, the problem that occurs in North Metro District is chicken manure generated from community farms and disturbs the comfort of local residents. The results also show that 90% of student respondents responded positively to the development of teaching materials in the form of e-worksheets based on chicken manure processing projects.

The following is data from interviews with 5 science teachers, this was done to find out their reasons for using worksheets in class, project-based learning (PjBL) in science learning, and creative thinking skills.

Teacher's Opinion Regarding Project-Based Learning

In general, based on data collection carried out through questionnaires, the respondents showed positive results, namely the teacher already knew information about the project-based learning model, namely learning that prioritized products produced by

students as an effort to solve problems that occurred. However, not all teachers know the syntax or steps that need to be considered in using the project-based learning model. In this interview, the urgency of implementing PjBL in learning was also asked, this was reinforced by the following interview data.

Teacher 1 as the resource person stated:

"*In my opinion the steps of project-based learning include: Determining projects, steps, determining schedules, evaluating and making reports. Project-based learning is important to apply to science learning because it trains students to be more sensitive to problems, both those in the surrounding environment or problems on a large scale, so that students' creativity will be trained in finding solutions to solve these problems. However, I have never applied this learning to science learning because during the Covid pandemic, students' enthusiasm for learning decreased, I was worried that students would not be able to complete their projects*".

Teacher 2 as a resource stated:

"*The project-based learning syntax includes: Setting the theme of the project to be carried out, Setting the learning context, Planning activities to be carried out, Carrying out activities or activities that have been planned to complete the project that has been set. In my opinion, project-based learning is important to apply to science learning because it can improve the quality of participant learning in certain materials and makes students able to apply knowledge in certain contexts, especially in terms of solving problems. I have implemented project-based learning, namely turning waste into something more useful and distinguishing organic and inorganic waste in their respective bins*".
Teacher 3 as the resource person stated:

"*In my opinion, the steps for project-based learning include determining topics, designing product plans, compiling production schedules, monitoring project progress, testing results, evaluating. In my opinion, project-based learning is important to apply to science learning because it can encourage cooperation between students in completing assignments, so that students' communication and collaboration skills can be trained. This is very important to prepare a generation that excels in the world of work because in daily life a worker always interacts with the team and everyone in the team has different expertise. The project I have done in science learning is making a simple water filter to solve water pollution problems*".

Teacher 4 as the resource person stated:

"*The project-based learning syntax includes: Defining the project, establishing the learning context, Planning the Project, and Implementing. In my opinion, project-based learning is important to be applied to science learning because students can integrate theory and practice which allows students to combine old knowledge with new ones, this can*

train students' creative thinking skills in solving a real problem in the environment. In science lessons, a project that I have implemented is making compost from dry leaf waste that is around the school."

Teacher 5 as the resource person stated:

"*In my opinion the steps of project-based learning include: preparing task plans, determining time with students, evaluating work results, through presenting student work, giving suggestions/comments. In my opinion, project-based learning is important to apply to science learning because it can train students to manage time, in project-based learning students are given a certain amount of time to complete their projects. In science lessons, a project that I have implemented is making compost from aking rice as raw material.*"

The findings obtained are that the PjBL syntax that the teacher understands is different from what it should be, as project-based learning according to Colley (in Diawati et al., 2018) consists of 6 learning stages, namely the orientation stage, identifying and determining projects, planning projects, implementing projects, documenting and reporting on projects, and evaluating and executing projects. Some teachers have implemented PjBL, but some teachers have not implemented it based on real problems in the environment. Another perception as a research finding is that 100% of teachers agree that the issues raised are real problems in everyday life, not problems in reference books so that they can provide meaningful learning for students. From the interview answers of several respondents above it is known that the application of PjBL in science learning is very important so that it can train various student skills including creative thinking skills, communication, collaboration, problem solving etc.

Teacher's Opinion Regarding the Importance of Using E-Worksheets

In general, based on data collection conducted through questionnaires, the respondents showed positive results, namely the teacher agreed on the importance of using e-worksheets in science learning. This was reinforced by the following interview data regarding the reasons for the importance of using e-worksheets and using project-based e-worksheets. to solve real environmental problems.

Teacher 1 as the resource person stated:

"*The reason underlying the importance of using e-worksheets is to make it easier to convey material and give assignments. In my opinion, e-worksheets are flexible so students can do assignments wherever and whenever. The worksheets I use come from downloads from the internet, and*

I have never made and used a project-based e-worksheet in science learning."

Teacher 2 as the resource person stated:

"*The reason underlying the importance of using e-worksheets is that students are also aware of technological developments in the world of education, interactive e-worksheets can create a fun and not boring learning atmosphere, students will not feel pressured, are not afraid to ask questions and the learning atmosphere will not make tense students. The worksheets used come from downloads from the internet and textbooks, and I have never made and used a project-based e-worksheet on science learning*".

Teacher 3 as the resource person stated:

"*The reason underlying the importance of using e-worksheets is to provide convenience to teachers and students, including unlimited work on and collection of assignments while at school because they can be accessed using a mobile phone or laptop wherever they are. The worksheets used come from my own development, in science learning I have never made and used a project-based e-worksheet*".

Teacher 4 as the resource person stated:

"*The reason underlying the importance of using e-worksheets is that technology is getting more advanced, students are expected to be able to keep up with technological developments, thus students are able to access more knowledge. The worksheets that I used came partly from the internet, then combined with developing my own, adapted to school conditions and students' abilities. I have used project-based e-worksheets in science learning*".

Teacher 5 as the resource person stated:

"*The reason underlying the importance of using e-worksheets is to make it easier to give assignments to students and when giving grades because they can be assessed automatically. The worksheets I use come from downloads from the internet, and I have never made and used a project-based e-worksheet in science learning.*"

The findings obtained were five respondents giving reasons that e-worksheets are very suitable for improving students' creative thinking skills supported by time efficiency and teaching materials that are easily accessible, provide student motivation, and are interesting to learn. Students are trained to find concepts independently both in group discussions, students will complete a series of tasks with the aim of solving a problem and making conclusions independently (Nyeneng et al., 2021). From the interview answers of some of the respondents above it is known that the e-worksheets they use mostly come from downloads from the internet, and they have not used e-worksheets based on real problem solving projects in the environment.

Learning by using electronic worksheets can increase students' sensitivity to current environmental problems so that they are able to realize an action to overcome environmental problems and be more open to technological views, in other words scientific literacy will increase (Rochim et al., 2022).

Conclusion

Based on the results and discussion, the perceptions of science teachers and junior high school students regarding electronic student worksheets, project-based learning and creative thinking skills are not as they should be. As many as 79% of teachers have not used project-based e-worksheets. They also have never solved the problem of chicken manure waste. Meanwhile, the problem that occurs in North Metro District is chicken manure generated from community farms. As many as 86% of teacher respondents already know about creative thinking skills, but the indicators of creative thinking skills that teachers understand are different from the indicators of creative thinking skills that should be measured.

Based on teacher interviews about teaching materials to improve creative thinking skills in secondary schools, it is necessary to provide teaching materials that train students to solve real problems in the surrounding environment, namely electronic worksheets based on chicken manure processing projects that can improve students' creative thinking skills.

Acknowledgements

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