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

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Abstract. Creative thinking skills are very important in the 21st century. This research aims to determine the perceptions of Natural Science teachers towards electronic student worksheets based on chicken manure waste processing projects to improve students' creative thinking abilities. This research uses mixed methods with a sequential explanatory design. Data was collected through questionnaires, then descriptive analysis was carried out. Questionnaires were distributed to 18 natural science teacher respondents and 115 junior high school students in Lampung Province. The research results show that 83% of teachers have not used project-based e-worksheets; 79% of teacher respondents have implemented Project Based Learning; while only 56% of teachers have not carried out creative thinking ability tests. Based on student response questionnaires, 82% of teachers have given project assignments, but these projects are not based on real problems in the environment. The survey results show that 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 the research results, it can be concluded that e-worksheets based on chicken waste processing projects are needed to improve students' creative thinking abilities.

Keywords: E-Worksheets, creative thinking skills, Project Based Learning.

Introduction

Technological developments in the 21st century will always be accompanied by very rapid developments in science. Learners must have the skills needed in the 21st centur (Yildiz & Yildiz, 2021) namely higher order thinking skills (HOTS) one of which is creative thinking skills (CTS) (Suganda et al., 2021; Chen et al., 2019) to generate new and useful ideas as alternatives/solutions to a problem (Dawati et al., 2018; Ersoy & Baser, 2014). Project based learning (PjBL) is an ideal learning model to fulfill 21st century education because it involves 4C principles (critical thinking, communication, collaboration, and creativity) (Utama et al., 2021). Studies have shown that the PBP learning model improves

HOTS such as creative and creative thinking skills (CTS), and problem solving. Innovative learning that is relevant to the involvement and active role of students in developing CTS. The ability of creative thinking can be increased (Astuti et al., 2020). Creative thinking obtained will be developed teaching materials that can help students in the learning process to improve students' CTS (Shih-Yeh Chen, 2019; Athifah, 2019; Jodion et al 2019). E-worksheet based on project is feasible to be used as a learning media to promote students' creative thinking (Andartiani et al, 2022; Dwi, et al, 2020; Safitri, et al, 2018; Mahanal et al, 2017).

This PjBL model isone of the learning models suggested in the 2013 curriculum which aims to encourage students' ability to produce contextual work, both individually and in groups (Jodion, et al., 2023). PBP allows students to be involved in designing, solving problems, making decisions, provides opportunities to work relatively independently for longer periods of time, and produces tangible products. The PjBL model canestablish communication, cooperation, and collaboration through discussion and investigation (Fajar et al., 2020). PjBL learning was carried out using the classroom action research method with projects produced by students in the form of pyrolysis and simple distillation tools. The results showed that CTS increased in each cycle (Ella & Kartika, 2022; Wijayati & Supanti, 2019). Teaching strategies or models aim to develop and cultivate students' creative teaching abilities through various effective routes and approaches (Ridong et al., 2016). There are five steps related to the PjBL model, namely planning the investigative process according to the driving question, seeking theoretical background from the driving question, presenting the theoretical background and discussion of the problem, determining group studies and data collection and analysis methods, and evaluating data, reaching conclusions , present the project in class as desired, and discussion.

On March 24 2020, the Minister of Education and Culture of the Republic of Indonesia issued Circular Number 4 of 2020 concerning the implementation of education policies in the emergency period of the spread of covid. The circular letter explains that the learning process is carried out at home through online learning or distance learning to provide a meaningful learning experience for students. Online learning is learning that utilizes the use of the internet network in the learning process. Online learning requires educators to utilize their abilities to use learning support materials by utilizing technological developments in distance learning. Online learning certainly has advantages and disadvantages. The advantage of online learning is that students have the freedom to study anywhere and anytime with various media. Meanwhile, the weaknesses of online learning are that not all teachers and students have adequate technological equipment, connection quality, data package availability, and low digital literacy skills so that many teachers experience difficulties in carrying out online learning (Hamdani & Priatna, 2020). The lack of teacher skills in using technology and the limitations of learning tools in online learning result in learning not running optimally and affecting the quality of learning. So that it is necessary to develop teaching materials that support students, namely through the development of student work sheets (e-worksheet).

E-worksheet is one of the teaching materials in the form of sheets containing material, summaries, and instructions for carrying out tasks as a guide for students to carry out learning activities (Dachi et al., 2021). According to (Noprinda & Soleh, 2019). e-worksheet is a learning tool used by educators to increase student participation in learning as an effort to form basic abilities that are in accordance with learning achievement indicators. Student worksheets that are generally used in schools are printede-worksheet. The use of printed worksheets in online learning is less effective. So that in line with the development of science and technology, as well as in the framework of the learning adaptation process during the covid-19 pandemic, more innovative e-worksheet are

needed and can be packaged in online form or can be called electronic student worksheets (e-worksheet). During the implementation of PjBL students are given e-worksheet to guide students in carrying out learning projects. Provision of e-worksheet can be adapted to current technological developments where initially in print form it can be designed using digital media in electronic form to make it easier for students to use it. E-worksheet is one of the computer-assisted media which was originally printed in electronic form (Wibowo et al., 2021). E-worksheet is an internet-assisted learning tool (student worksheet) which is arranged systematically in certain learning units presented in electronic format. E-worksheet can display videos, images, text and questions that can be graded automatically. E-worksheet can also be designed and adapted to the wishes and creativity of educators so that they can be attractive and can optimize the online teaching and learning process (Kholifahtus et al., 2021). Some of the methods and strategies may have been done by the teacher in the learning process to provide positive reinforcement to students by providing a variety of props, and displays very important information. Creating a positive action is an important factor in stimulating brain function that can show and create a good learning styles. By using the appropriate method or strategy that means teacher in learning more save energy, time and improving learning achievement students (Lince, 2016).

The integration of PBP with e-worksheet allows students to take part in generating original ideas and developing them into specific products through digital technology(Sari et al., 2021) so that it is expected to create a creative classroom environment through science projects and can increase students' interest in learning (Sener, 2017). One of the problems that are commonly faced everyday and requires 21st century skills is environmental issues. Various pollution occurs, one of which is in the aquatic environment. Water pollution is categorized as a serious environmental problem because it can reduce the availability of clean water (Yamin et al., 2020). In the era ofthecovid-19 pandemic, there were routine activities that had to be carried out, namely hand washing which could cause liquid waste which could contaminate the environment, especially the school environment.

This has becomethe basis for research to tackle hand washing water with soap, how waste materials can be reused for activities in the school environment. This article describes the perceptions of science teachers and students regarding science learning using e-worksheet based on the hand washing waste water treatment project to improve junior high school students' creative thinking skills. These findings also provide a glimpsein to the complexity of pedagogical work, which can in form teachers' professional development to develop the preparation of teaching materials in teaching and learning activities.

Methods

The participants in this study consisted of 18 science teacher respondents and 115 junior high school student respondents for the 2022/2023 academic year. This study uses mixed methods research adapted from (Creswell, 2002) and the strategy use dissequential explanatory design by combining data collection and analysis of qualitative and quantitative data. This research was conducted on April 1-14 2022 at Public and Private Middle Schools in the City of Bandar Lampung. First, researchers conducted a literature study by analyzing the results of recent studies one-worksheet, PjBL and CTS. Furthermore, the researchers developed an instrument to analyze the needs of science learning educators, then the instrument was distributed to 18 science teacher respondents and 115 junior high school student respondents in the city of Bandar Lampung via the google form. There are three indicators of questionnaire statements regarding the needs of teachers and students as well as interview guidelines, namely: to find out theuseofe-worksheet in science learning, PjBL based on problem solving, and CTS.

Figure 1 is a research design scheme in sequential research stages, starting with quantitative research and continuing with qualitative research following the sequential explanatory design state strategy (Shorten & Smith, 2017).

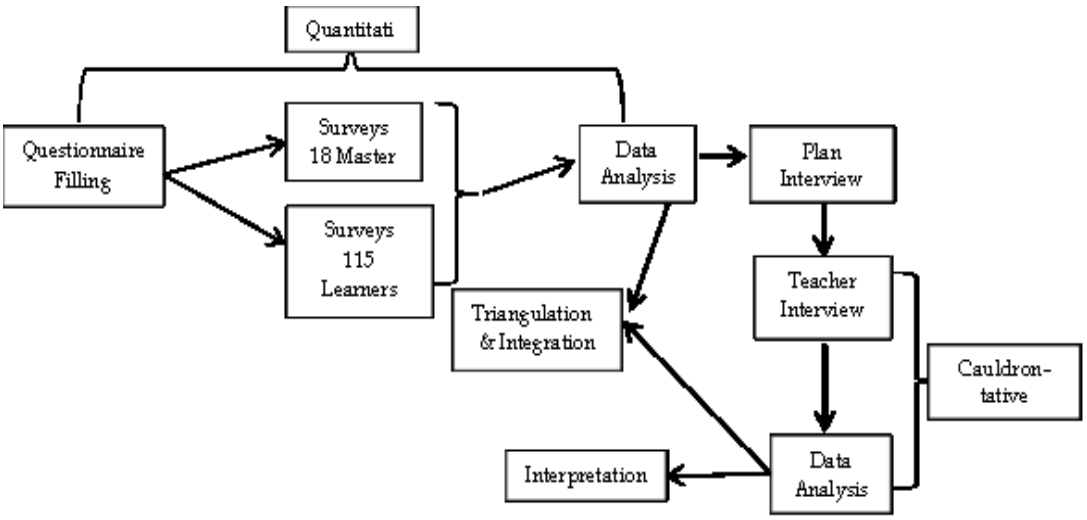

Figure 1. The Research Design Schematic

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 throughout the City of Bandar Lampung, 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, determination also eliminates 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 and also draws conclusions and verification (Miles & 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, PjBL model in science learning, andCTS. Quantitative analysis were carriedout in an integrated and triangulated manner.

Research data obtained from teacher & student questionnaires were analyzed with 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 content softh equestion, namely: "Yes" and "No" with a score of "1" and "0". Then calculate the percentage score and interpretit qualitatively.

Results and Discussion

This section describes the discussion and research findings based on data collection and analysis. The results of distributing the questionnaire to 18 science teachers in Natar, South Province of Lampung are shown in Table 1.

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

Questions	Yes (%)	No (%)
Do you use e-worksheet in science learning?	88	12
Current technological advances allow e-worksheet to be presented in the form of electronic (e-worksheet). Is the use of e-worksheet in Science Learning very important?	100	0
Have you used the project-based e-worksheet in Science Learning?	17	83
Is science learning on the topic of environmental pollution already based on real problems in the surrounding environment?	79	21
Have PjBL activities on the topic of environmental pollution been implemented?	73	27
Do you know about CTS?	100	0
Have you trained your CTS in learning?	78	22
Does practicing CTS really need to involve solving real problems in the environment?	100	0
Have you implemented hand-washing waste water treatment PjBL to improve the CTS of junior high school students?	16	84
Have you ever taken a test for measuring CTS?	44	56
If yes, are the students' CTS as expected?	38	62
Is it necessary to develop teaching materials in the form of an e-worksheet based on hand washing waste water treatment to improve CTS?	92	8

Table 1 illustrates that 88% of science teachers have used e-worksheet in science learning, and all teachers agree on the importance of using e-worksheet in science learning along with increasingly advanced technology so that students can access learning anywhere and anytime through the e-worksheet. Electronic e-worksheet is a student practice sheet that is done digitally and is carried out systematically and continuously for a certain period of time. This e-worksheet can be designed and created according to the goals to be achieved in the learning process and the creativity of each teacher, where later students can access this e-worksheet through the internet with the hope that it can help students to better understand the material provided by teacher so that learning objectives can be achieved (Lathifah et al., 2021).

However, in the application of project-based e-worksheet as many as 83% of teacher respondents have not used the project-based e-worksheet. 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 (Widayanti et al., 2018). Teachers experience difficulties in implementing project-based electronic worksheets in science learning during the covid pandemic because

science learning is carried out online and teachers provide little material, teachers tend to be pessimistic about the success of projects completed by students, and teachers feel difficult if they have to control the progress of participant projects educate.

As many as 79% of teacher respondents stated that they had applied the topic of science learning based on real problems, besides that 73% of teachers had applied the topic of environmental pollution to PjBL. PjBL according to Colley (Dawati 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 (Hanum et al., 2023). While the problem that occurs in the surrounding environment is the large amount of hand washing water 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 PjBL steps (Coryna et l., 2023).

All teacher respondents already know about CTS, but the indicators of CTS that teachers understand are different from the indicators of CTS 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. Creative thinking has four indicators according to Torrance (1974) in (Rosyidah & Rahayu, 2022) namely fluency (thinking fluently), flexibility (thinking flexibly), originality (thinking original), and elaboration (thinking in detail). As many as 78% of teacher respondents stated that they had not trained their CTS, while 22% of teacher respondents had not measured CTS. As many as 92% of teacher respondents responded positively to the development of teaching materials in the form of e-worksheet based on the hand washing waste water treatment project to improve students' CTS.

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

Questions	Yes (%)	No (%)
Does the teacher apply various methods in learning?	85	15
Do teachers use electronic student worksheets (e-worksheet) on environmental pollution & biotechnology?	45	55
Have you ever been asked in groups to solve a problem in the environment?	59	41
Has the teacher ever given assignments in the form of a project?	82	18
Does the teacher give assignments to solve problems in the school/home environment?	62	38
Are there any problems related to environmental pollution around your neighborhood?	89	11
Does hand washing waste water treatment really need to be done in environmental pollution studies?	98	2
Is it important to develop an e-worksheet based on hand washing waste water treatment?	94	6

The results of completing a questionnaire by 115 SMP/MTs students from several public and private schools in Natar, south province of Lampung are shown in Table 2. Based on table 2, as many as 85% 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. Various methods are expected to increase the perseverance, enthusiasm and activeness of students in learning (Supriantoro, 2022). As many as 45% of student respondents answered that they had never used an e-worksheet on environmental pollution material. As many as 82% of student respondents answered that the teacher had given assignments in the form of projects.

Based on 38% of respondents stated that the projects made by students were not based on real problems in the environment. As many as 62% of student respondents answered that the teacher had given assignments to solve problems in the school/home while the problems that occurred in the school environment were hand washing water waste produced by the routine activities namely hand washing which could cause liquid waste which could contaminate the environment, especially the school environment. The results also show that as many as 94% of student respondents responded positively to the development of teaching materials in the form of e-worksheet based on the hand washing waste water treatment project. The following is data from interviews with 5 science teachers, this was done to find out their reasons for using worksheets in class, PjBL in science learning, and CTS.

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 PjBL, namely learning that prioritizes products produced by students as an effort to solve problems that occur. However, not all teachers know the syntax or steps that need to be considered in using the PjBL 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 PjBL *include:Determination of projects, steps, determination of schedules, evaluations and making reports. Project-based learning is important to be applied 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,sothatstudents' creativitywillbetrained in findingsolutions 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 PjBL *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, it is important that project-based learning is applied to science learning because it can*

improvethe quality of student learning in certain materials and makes students able to apply knowledge in certain contexts, especially in terms of solving problems. I have implemented PjBL*, 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 of PjBL *include define topics, design product plans, develop production schedules, monitor project progress, test results, evaluate. In my opinion, it is important that* PjBL *is applied 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 superior generation in the world of work becausein their 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 PjBL *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 cantrainstudents' CTS 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 for PjBL *include: preparing task plans, determining time with students, evaluating work results, through presentations of student work, giving suggestions/comments. In my opinion, it is important that* PjBL *is applied 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, according to Colley (Dawati 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. 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 some of the respondents above, it is known that the application of PjBL in science learning is very important so that it can train students' various skills including CTS, communication, collaboration, problem solving and so on.

Teacher Opinions 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 reasons underlying the importance of using e-worksheets areto make it easier to deliver 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 the world of education is growing rapidly both in information and technology, so students need to follow these developments so that the learning process is more interactive and interesting so that it is not boring because of worksheets, textbooks, and other learning materials. can be accessed anywhere because the e-worksheet is linked to the internet, and I have never made and used a project-based e-worksheet in science learning."

Teacher 3 as the resource person stated:

"The reasons underlying the importance of using e-worksheets are teachers or students get convenience in the process of working on and collecting assignments because they can be accessed using electronic-based devices anywhere and anytime, as well as assignments, worksheets used are the result of the teacher's own development, and I have never made and used a project-based e-worksheet in science learning".

Teacher 4 as the resource person stated:

"The reasons underlying the importance of using e-worksheets areIn the era of technology that is increasingly advanced and developing rapidly, students are expected to be able to follow these developments, so that students are able to gain broad knowledge. Some of the worksheets used come from the internet which were self-developed according to the school environment and the abilities of the students. I have never used project-based e-worksheets in science learning."

Teacher 5 as the resource person stated:

"The reasons underlying the importance of using e-worksheets are Ease of giving assignments and the assessment process to students is characterized by an automatic assessment. As well as the worksheets used are downloaded from the internet, I have never made and used a project-based e-worksheet in science learning."

The findings obtained arefive respondents gave reasons that e-worksheets are very suitable forimprovingstudents' CTSsupportedbytime efficiency and teaching materials that

are easily accessible, provide student motivation, are interesting to learn.Thisis in line with research results (Apriliyani & Mulyatna, 2021) which states that students canuse the e-worksheet any time and any where so that students can better understand the material contained in the e-worksheet. Further more, based on the results of a survey analysis that was conducted with 40 junior high school teachers in Bandar Lampung regarding the need for using e-worksheet in ecology material, it showed that only 59.375% of teachers used e-worksheet. This means that teacher has not usede-worksheetin electronicform. Even though today technology has developed rapidly, so it can be utilized properly (Barlenty et al,. 2017).

Based on the results of interviews with some of the respondents above, it is known that the e-worksheets they use are mostly downloaded from the internet, and they have not used e-worksheets based on real problem solving projects in the environment. Opinion (Nuria, 2019) namely teachers need teaching tools that attract students' interest in learning so that they avoid feeling bored when carrying out teaching and learning activities. The learning process using e-worksheet is felt to be more effective. e-worksheetcanbeaccessedpractically via mobile phones and active internet, without the need to carry heavy books to school. E-worksheet is teaching material in electronic form, containing materials, summaries, and instructions that must be done (Khasanah & Setiawan, 2022). To add insight into knowledge and attractiveness, thecreatede-worksheetcanbeinsertedvideos, photos, pictures and links that students can access for learning. E-worksheet can be accessed using a computer/laptop/mobile phone that is supported by the flash player application. This is what makes e-worksheet superior as a learning medium.

Teacher's Opinion Regarding Improving Students' Creative Thinking Skills

In general, based on data collection conducted through questionnaires, the respondents showed positive results regarding the importance of practicing creative thinking skills in science learning, but teachers have problems in implementing science learning, these constraints are expressed in the following interview data.

Teacher 1 as there source person stated:

"I feel that there is a lack of time al location in the learning process of students and learning that Is only focused on the material and I see the implementation of PjBL activities in an effort to improve students' CTS."

Teacher 2 as there source person stated:

"I have not given this skill to students because there is no instrument for assessing creative thinking skills yet."

Teacher 3 as there source person stated:

"I am still having problems because there are some students whose interest in learning is still quite low."

Teacher 4 as there source person stated:

"The worksheets and assignment sheets that I use have not followed the steps of the learning process which can impose students' CTS."

Teacher 5 as there source person stated:

"I don't think it can be done because to think creatively requires sufficient time and also requires qualified skills."

Based on the findings above, teacher have not carriedout learning that emphasizes the process of creative thinking because of limited time in compiling learning tools that can train students' creative thinking abilities. Teachers need sufficient time to arrange students to carryout activities and provide guidance group (Leeuween & Jassen, 2019; Wartono, et al., 2018; Wahyu, et al., 2016).

Conclusion

Based on the results and discussion, the perceptions of science teachers and junior high school students regarding e-worksheets, PjBL and CTS are not as they should be. As many as 79% of teachers have not used the project-based e-worksheet. They also have never solved the problem of hand washing water waste. Mean while, the problem that occurs in Natar, south province of Lampung is hand washing water waste generated from hand washing activity at schools. As many as 86% of teacher respondents already know about CTS, but the indicators of CTS that teachers understand are different from the indicators of CTS that should be measured. Based on teacher interviews about teaching materials to improve CTS in secondary schools, itis necessary to provide teaching materials that train students to solve real problems that exist in the surrounding environment, namely e-worksheets based on hand-washing waste water treatment projects that can improve students' CTS.

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