Learning Worksheet Innovation in Vocational High School to Increase Students' Learning Engagement and Critical Thinking

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Abstract. The goal of this research and development is to produce learning worksheet teaching materials that will boost critical thinking and learning engagement in the General Administration components of class XI Office Administration and Business Services program by being validated by material and teaching material specialists. This study employs the ADDIE model, which stands for analyse, design, develop, implement, and evaluate. Subjects included 30 students from class XI of Office Administration and Business Services program at one of the vocational high schools in East Java, Indonesia. The data analysis technique for learning engagement and critical thinking used the average percentage value, normality test, and independent sample t-test to see a significant increase. The learning worksheet produced is characterized by HOTS questions and case studies, developed with the help of Articulate Storyline 3 based on HTML5 web browser that can be accessed by smartphones. According to research and development, the findings of the validation of teaching material experts and material experts are very practicable to implement in order to greatly improve students' critical thinking and learning engagement. To keep the content relevant to the demands of vocational students, learning worksheet can be updated in accordance with curriculum and technological advancements.

Keywords: Learning Worksheet, Learning Engagement, Critical Thinking.

1. Introduction

Critical thinking and learning engagement play an important role in improving learning effectiveness. These two aspects encourage learners to be more active, independent, and able to analyze and solve problems systematically [1] [2]. Critical thinking is a skill where students must be able to analyze, evaluate, and interpret information in depth that can help make the right decisions in various situations [3] [4]. Critical thinking encourages students to consider various points of view in solving problems, so that students not only memorize concepts, but also gain a deeper understanding, which in turn can improve learning outcomes [5] [6]. To support the improvement of learning outcomes and ensure students' understanding of learning, efforts are needed to encourage students to actively participate in the learning process [7]. Student involvement in the learning process is the level of attention, curiosity, optimism, and enthusiasm of students during the learning process, which can increase student motivation, material understanding, ability to work together, and make better decisions [8]. Therefore, the use of teaching materials and media must support student engagement in learning and increase critical thinking [9] [10]. Teaching materials can help students understand the material studied [11]. Learning worksheet can improve learning outcomes because it can motivate students because

of its function that can help and facilitate learning activities [12] [13]. The success of learning is supported by the application of innovative approaches and strategies, such as problem solving learning so that critical thinking skills can be improved [14] [15]. Learning worksheet with a problem-solving case study model is effective in improving critical thinking skills, understanding each question with the stages of continuous problem solving [16][17].

Critical thinking and learning engagement have not received special attention in learning at one of the vocational high schools in East Java, Indonesia, which has implemented the Independent Curriculum. Based on preliminary studies that have been obtained through interviews with grade XI Office Management subject teachers, it is known that learning in the independent curriculum requires students to have the ability to think critically, creatively, communicate, and work together. Based on the six indicators of critical thinking, there are deficiencies in various aspects. Based on the results of preliminary study observations at one of the vocational high schools in East Java, Indonesia, with tests conducted on 30 students majoring in Office Administration and Business Services program, it was found that students' critical thinking skills were less than optimal. The acquisition of critical thinking and learning engagement of students in class XI of Office Administration and Business Services program, as shown in Figure 1.
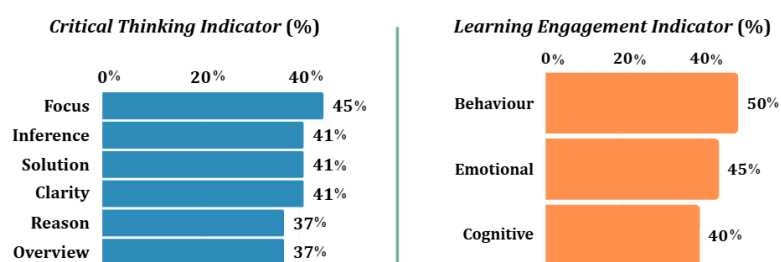
Figure 1. Percentage of Critical Thinking and Learning Engagement Indicators of Students

Overall, students have difficulty in understanding the problem correctly (focus), providing logical reasons based on evidence (inference), and drawing conclusions from problem solving. Students also have difficulty finding solutions that are relevant to the context of the problem (situation), delivering structured explanations (clarity), and evaluating answers thoroughly (overview), which is caused by a lack of understanding of the material, skills in connecting information, and practice in compiling and expressing answers clearly and systematically. These problems encourage research and development to produce teaching materials to improve students' critical thinking in learning. This research and development is differentiated by critical thinking which is often learned without considering individual differences between students, the context and application of critical thinking currently available is developed only for general education and less relevant if applied to vocational high schools. This suggests that there is a need for research that develops measurement instruments and relevant case studies in developing critical thinking for vocational education [18] [19].

The percentage of students' learning engagement shows that it is still relatively low. Students' behavior engagement is low, with few actively participating in learning activities due to a lack of motivation and teaching strategies that encourage interaction. Emotional engagement was also low, as students had no significant interest in the material being taught. Meanwhile, cognitive engagement is limited, as students are not yet fully engaged in critical thinking and problem solving due to learning approaches that do not support the development

of these skills. Learning worksheet was developed through Articulate Storyline 3 because the resulting product is interactive with the availability of various features such as quiz-making features, videos, audio, images and animations that can facilitate students in exploring learning materials well. The use of learning worksheet assisted by Articulate Storyline 3 effectively improves student learning because of its interactive nature [20]. The learning worksheet teaching materials produced are customized based on the elements of General Administration Management with HOTS questions and HTML5 web browser-based case studies assisted by Articulate Storyline 3. Different from previous studies, the development of learning worksheet considers the individual differences of students in the context of learning in vocational high school. This approach also increases learning engagement through collaboration and cooperation on practical tasks that are relevant to the world of work, so that students are more motivated and active in learning. The purpose of this teaching material is to increase learning engagement and critical thinking tailored to the competency needs faced in the world of work by students of class XI of Office Administration and Business Services program at one of the vocational high schools in East Java, Indonesia, through user trials.

2. Method

This study used the research and development (R&D) method, which adapts the ADDIE model that includes simple and systematic steps with five stages. The research and development was carried out by following the following stages: 1) Analysis, analyzing the needs of a product and collecting qualitative data by interviewing the XI Office Administration and Business Services program class teaching teacher at one of the vocational high schools in East Java, Indonesia, there is a lack of digital teaching materials to support learning with the Merdeka Curriculum and a lack of learning engagement and critical thinking of students in learning; 2) Design, the stage of designing the initial design of the product is developed in the form of learning worksheet using Canva and Articulate Storyline 3 as a developer application so that it can be used via smartphones with the internet which will be shared via a link, preparing validation instruments consisting of validation questionnaires from material experts and teaching material experts, as well as practicality questionnaires for users; 3) Development, developing products based on designs that have been made according to the initial design of the product; 4) Implementation, the application of research and development products with reference to the planned product for expert validation to obtain revisions to product improvements and continue the user trial process to a small group with 6 participants from class XI Office Administration and Business Services program; and 5) Evaluation, measuring the achievement of research and development objectives as a reference for making improvements if there are deficiencies so that the product can be declared feasible and has no deficiencies.

Figure 2. Stages of the ADDIE Research and Development Model

In this research and development, two types of data were collected. Numbers given by material expert validators and teaching material experts as well as student response

questionnaires about learning worksheet are quantitative data. While interviews, criticism sheets, and suggestions are qualitative data evaluated from material expert validators and teaching material experts as well as student response questionnaires. Interview activities were carried out twice to teaching teachers and students of class XI of Office Administration and Business Services program to find out responses before and after using learning worksheet in learning. Analysis of learning engagement data is measured through questionnaires filled out by observers and students which will be analyzed using the average percentage value, while student critical thinking data is measured through tests on pretest and posttest essay questions with each question adapting critical thinking indicators which results in the average value obtained by students. Furthermore, the comparison data of the test results were analyzed by calculating the normality test and independent sample t-test.

3. Results and Discussion
3.1 Results

This research and development produces learning worksheet OPTIMA (Office Problem Task in Administration and Management) teaching materials, namely learning worksheet which is presented with HOTS questions and case studies on the element of General Administration Management of Office Management subjects for class XI of Office Administration and Business Services program. The output of the HTML5 web browser-based learning worksheet development product can be accessed online via a smartphone on a browser without having to be downloaded. The display of learning worksheet teaching materials is designed to be attractive and easy to use. Learning worksheet teaching material products can be accessed online via the following link https://e-lkpd-optima.github.io/E-LKPD-OPTIMA-/. Learning worksheet is equipped with a menu to increase learning engagement (cognitive engagement, behavior engagement, and emotional engagement) and critical thinking in the General Administration Management element, learning outcomes of general administration management starting from correspondence, making a schedule of leadership activities every day, handling correspondence (mail handling), completing official travel documents, official accommodation and transportation, and managing business travel plans. learning worksheet displays the identity and main page that users can access as shown in Figure 2 below.
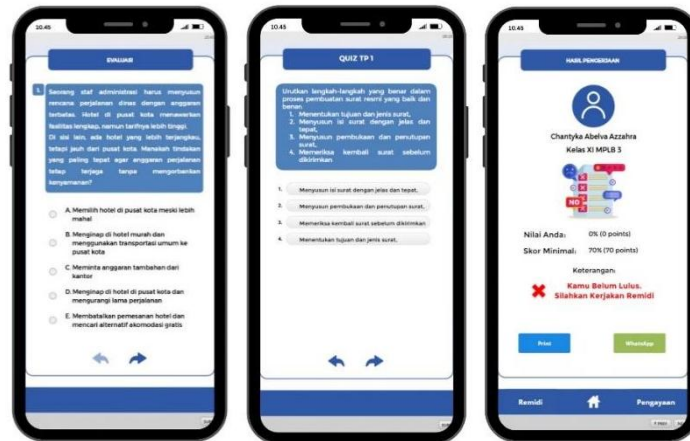
Figure 3. Learning Worksheet Home View

Figure 3 is the initial display when users access learning worksheet teaching materials to assist users in finding information. The initial display has a "Start" button which is the first step for students to operate learning worksheet teaching materials, then a login page will appear which must be filled in with the user's name and class. On the home page there is a menu consisting of, 1) Introduction, 2) Learning Outcomes, 3) Learning objectives-Flow of Learning Objectives, 4) Material, 5) Evaluation consisting of practice questions and quizzes, 6) Learning Worksheet, 7) Learning Video, and 8) Instructions for Use. The learning worksheet menu contains problem-solving case study questions to improve critical thinking as shown in Figure 4 below:
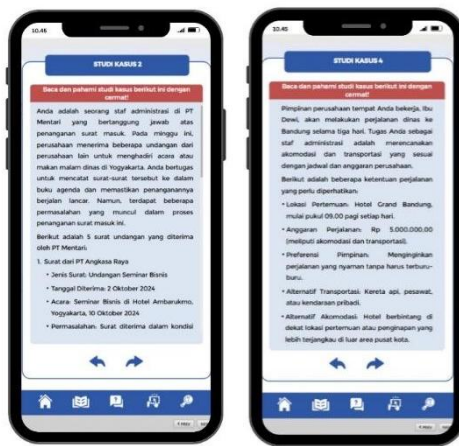
Figure 4. Learning Worksheet Menu View

The learning worksheet menu is designed to make it easier for students to understand the steps and access relevant summarized material to solve case study-based problems to improve critical thinking based on theory with practice in the world of work. Learning worksheet is designed to increase students' cognitive engagement and behavior engagement through learning activities that involve deep understanding and active participation by forming study groups. Students are encouraged to discuss, exchange ideas, and analyze problems in depth. The "Evaluation" menu includes practice questions and quizzes as shown in Figure 5 below:

Figure 5. Evaluation Menu View

In learning worksheet, the evaluation menu is designed to improve students' critical thinking and emotional engagement. HOTS-based practice questions and quizzes encourage students to think, evaluate, and create solutions to problems related to the world of work. To increase emotional engagement, quizzes are equipped with a time-to-work feature that provides challenges and encourages students to focus on managing time well to solve problems. The remidi menu is designed to provide opportunities for students to improve their understanding of material that they have not mastered. While the enrichment menu is designed to improve comprehension and mastery of the material as a whole.

Furthermore, the feasibility level of learning worksheet teaching materials was tested based on the results of expert validators, then analyzed using descriptive percentages. The following table 1 shows the results of the validation of material experts from Office Management teachers in class XI of Office Administration and Business Services program:

Table 1. Material Expert Validation Results

No.	Aspect	Percentage	Criteria
1	Content Eligibility	93.00%	Highly Worth It
2	Contextual Assessment	80.00%	Quite Decent
3	Language Qualifications	97.50%	Highly Worth It
Average		**90.17%**	**Highly Worth It**

Source: Data processed by Researcher (2024)

The results of the analysis in Table 1 show that learning worksheet has been validated by material experts who have met the criteria as experts in their fields, namely teachers teaching the General Administration element of class XI of Office Administration and Business Services program and have taught for at least two years. The validation results produce very feasible criteria. The assessment from material experts has met the aspects of content feasibility which include the breadth, depth, and completeness of the material. Language feasibility includes effectiveness, accuracy of sentence structure, accuracy of spelling and grammar, and ease of reading comprehension have also been met. Contextual assessment received a sufficient percentage because the material is still theoretical and does not fully reflect the authentic situations faced in the world of work. Furthermore, material experts also conveyed criticism and suggestions that the material presented was quite broad, but could be more adapted to real

situations in the world of work. So it is concluded that the material in the learning worksheet teaching material is included in the criteria of very feasible or very valid to be applied to the Office Management subject of the General Administration Management element. Table 2 below shows the results of the validation of teaching material experts for lecturers in the field of teaching planning from the Faculty of Economics and Business, State University of Malang:

Table 2. Results of Validation of Teaching Material Experts

No.	Aspect	Percentage	Criteria
1	Graphic Qualification	95.55%	Highly Worth It
2	Media Quality	100.00%	Highly Worth It
3	Layout Media	93.33%	Highly Worth It
4	Characteristics of Teaching Materials	97,80%	Highly Worth It
Average		**96.67%**	**Highly Worth It**

Source: Data processed by Researcher (2024)

Table 2 shows the results of the validation analysis of teaching material experts who meet the criteria in their fields, namely lecturers with relevant knowledge in developing teaching materials. The validation results show very feasible criteria because they have met four aspects, namely graphic feasibility, media quality, media layout, and characteristics of teaching materials. The assessment of the characteristics of teaching materials includes the completeness of the learning worksheet structure, ease of access and instructions on the learning worksheet, and learning worksheet can be used in different learning variations and students. The media layout received the lowest percentage because the presentation of visual balance and arrangement of elements in the learning worksheet which still needs improvement is not optimal. The advice of teaching material experts is to adjust cognitive level questions with learning objectives. Furthermore, a product trial was conducted on a small group as a user response consisting of 6 class XI of Office Administration and Business Services program students to determine the ease, usefulness, and attractiveness of the product for use in learning. The results of the study on the small group trial can be seen in Table 3 below:

Table 3. User Trial Validation Results

No.	Aspect	Percentage
1	Ease	85.83%
2	Benefits	86.67%
3	Attractiveness	88.89%
Average		**87.13%**

Source: Data processed by Researcher (2024)

The results of the user trial that has been conducted on 6 students with low, medium, and high abilities. Furthermore, research was conducted on a large group including 30 students of XI of Office Administration and Business Services program. The research was conducted to determine whether students' learning engagement and critical thinking increased both before and after using the development product. Table 4 below shows the results of increasing student learning engagement:

Table 4. Learning Engagement Data Result

Indicator	Sub-Indicator	Before	After
Behaviour Engagement	Students are interested in things related to learning		
	Students listen carefully while studying		
	Students strive to learn	74,33%	84,47%
	Students are active in interacting and discussing		
	Students enjoy completing learning activities and assignments		

Cognitive Engagement	Students complete assignments on time		70,87%	83,87%
	Students want to try to apply what they have learned			
	Students discuss the learning material in depth with classmates			
	Students ask questions when having difficulties			
	Students share what they have learned through discussion			
Emotional Engagement	Teacher's teaching method makes students feel happy		67,50%	83,17%
	Students love the exercises and assignments given in class			
	Students enjoy learning the material			
	Students love it when the teacher asks questions			
Average			**70,90%**	**83,83%**

Source: Data processed by Researcher (2025)

The average percentage score of learning engagement results after using learning worksheet teaching materials was 13% higher than before using. One of the highest percentage scores in these three aspects, namely in the aspect of behaviour engagement, so that students have active participation through involvement in learning activities using learning worksheet. The average score of the percentage of learning engagement before using learning worksheet shows sufficient criteria, so it can be concluded that learning worksheet teaching materials can increase student learning engagement. In line with research that shows an increase in learning engagement after the application of interactive teaching materials in learning [21] [22].

The critical thinking test is carried out by providing a pretest and posttest based on critical thinking indicators and cognitive level C4-C6 to students to find out the difference in critical thinking in the form of grades obtained before and after participating in learning using learning worksheet. The results of the analysis of the average critical thinking are presented in Table 5.

Table 5. Critical Thinking Data Result

Indicator	Before	Criteria	After	Criteria
Focus	87,67%	High	92,67%	Very High
Reason	76,67%	Enough	85,67%	Very High
Inference	71,00%	Enough	81,67%	Very High
Situation	75,33%	Enough	87,67%	Very High
Clarity	75,33%	Enough	87,33%	Very High
Overview	75,67%	Enough	90,33%	Very High
Average	**76,78%**	**Enough**	**87,56%**	**Very High**

Source: Data processed by Researcher (2025)

Table 5 shows the increase in critical thinking skills of 30 students after the use of learning worksheet with all critical thinking indicators increasing. This indicates that the use of learning worksheet contributes significantly to improving students' critical thinking skills. Furthermore, students' critical thinking tests were measured through normality tests and independent tests of t-test samples to find out the difference in test results between before and after using learning worksheet teaching materials. First, a normality test was carried out on the results of the pretest and posttest of students' critical thinking test results in Table 6.

Table 6. Normality Test Data

	Shapiro-Wilk			
	Value	*Statistic*	df	Sig.
Critical Thinking	*Pretest*	.962	30	.345
	Posttest	.969	30	.506

Source: Data processed by Researcher (2025)

If the Sig. value is greater than 0.05, the data is distributed normally. According to Table 4, the pretest and posttest results are qualified, which means that the result data is normally distributed. An independent test of the t-test sample is the second step that can be taken if the results of the Shapiro-Wilk normality test measurement show a normal distribution. The independent test results are show in the following Table 7:

Table 7. Independent Test Data of T-Test Samples

		t	df	Sig. (2-tailed)	Mean Difference
Critical Thinking	*Equal variances assumed*	11.486	58	.000	8.26667
	Equal variances not assumed	11.486	56.669	.000	8.26667

Source: Data processed by Researcher (2025)

There is a significant difference between the pretest average and the posttest average, as shown by the results of the independent test sample t-test. These differences are used as evidence that the application of learning worksheet teaching materials in learning can increase students' critical thinking. Data analysis shows the difference in the average value of critical thinking test results between pretest and posttest is shown in Table 8.

Table 8. Descriptive Analysis of Critical Thinking

		Descriptive Statistics			
	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
Pretest	30	76.00	87.00	80.8000	2.56502
Posttest	30	84.00	95.00	89.0667	2.99348
Valid N (listwise)	30				

Source: Data processed by Researcher (2025)

Based on Table 6, the students' critical thinking posttest results test has a higher average score than the pretest results. So it is proven that there are differences in the results of students' critical thinking tests before and after using learning worksheet teaching materials in learning.

3.2 Discussion
Learning Worksheet

Research and development resulted in learning worksheet on general administration management elements used for class XI of Office Administration and Business Services program at one of the vocational high schools in East Java, Indonesia. The development of learning worksheet teaching materials utilizes digital technology and is designed as attractively as possible with text, audio, video, images, and animation. The learning worksheet was designed with the help of the Canva application as the initial product design and using Articulate Storyline 3 as the developer application. Canva was chosen because of its ease in designing an attractive and interactive appearance, so that OPTIMA learning worksheet, has a more visual, intuitive, and easy-to-understand design for students. Meanwhile, Articulate Storyline 3 is used because of its ability to present interactive elements, such as quizzes, simulations, and animations, which support problem-based learning and increase student engagement. Articulate Storyline 3 is used because of the development of interactive products with the availability of various features such as quizzes, videos, audio, animations and images to help students understand the lessons well

[16] [20]. This learning worksheet teaching material has the characteristics of HOTS questions which include the cognitive level of Bloom's Taxonomy ranging from C4 to C6. At the C4 level, students are able to solve problems through a complex process of information analysis. At the C5 level, students evaluate information or situations by giving a strong reason. At the C6 level, students develop new ideas or solutions based on a deep understanding to encourage students' critical thinking. learning worksheet is presented based on critical thinking indicators that are compiled in a sequential and continuous manner. learning worksheet can help students think logically and systematically in solving the problems they are facing [22] [23]. Through case study questions, students are faced with practical situations that reflect the duties of a secretary in daily office work, such as managing incoming and outgoing mail, preparing leadership schedules, and preparing for official travel needs. Therefore, critical thinking and problem-solving skills relevant to the world of work can be improve [23]. In addition to critical thinking, in increasing learning engagement, students carry out various learning activities, such as group discussions, project assignments, and case-based problem-solving. These activities encourage active student participation, increase interaction in learning, and strengthen concept understanding through hands-on experience [24].

Learning worksheet teaching materials are presented in an attractive way through the combination of videos, pictures, writing, and animation so that it can support students' active involvement and increase motivation in the learning process. The development of teaching materials is made more interactive to make it easier to find materials and practice questions on menus that can be combined with color displays. The goal is for students to be more motivated and easily understand the material through an attractive display [20]. Another menu contained in this learning worksheet teaching material is practice questions, which contain quizzes and evaluation questions. In learning worksheet, evaluation questions are made to measure how well students understand the material that has been learned. with varying levels of difficulty, ranging from cognitive level C4-C6. These questions can improve students' critical thinking, such as analyzing cases, providing solutions, and making decisions based on available information, with an evaluation format in the form of multiple choice HOTS that requires deep reasoning [25]. There is a menu of remidi questions for students who obtain results that are less than the competency standards (CS), an enrichment question menu for students who get scores above the CS. Quiz questions in learning worksheet are designed to increase student learning engagement in an active and fun way. Interactive displays and direct feedback, quiz questions encourage students to be more motivated in understanding the material [26]. The quiz contains short questions to test basic understanding with interactive formats such as multiple-choice, fill-in, sorting, and drag-and-drop. Quiz questions are used as a tool for quick reflection or warming up before entering deeper learning [27] [26]. On the quiz question menu, students get an automatic response to answers, both in the form of true and false confirmation. This feature helps students to immediately spot their mistakes and improve their comprehension in real-time [28]. These menus are available in the learning worksheet teaching materials so that teachers and students do not need to open other teaching media so that learning is more effective. Through interactive quizzes, student engagement in learning can be increased [26].

Learning Worksheet Validation Results

The learning worksheet teaching material products before being applied to learning, the products are validated by material experts and teaching material experts. This aims that the learning worksheet produced in accordance with the requirements is used as teaching material [29] [30]. This process is very important to ensure that the product is appropriate and can be used properly so that there are no errors when used [31]. Small group trials, material expert

validators, and teaching material expert validators were used to test the product before use. Material expert validation was carried out by teachers in the General Administration Management element of class XI of Office Administration and Business Services program, aspects assessed include aspects of content feasibility related to the accuracy and depth of the material, contextual aspects, namely the relevance of the material to real-world situations, and aspects of the feasibility of the language used in the product development. The material presented in learning worksheet is very feasible because it is in accordance with the curriculum and learning objectives. Validation of teaching material experts was carried out by lecturers who have expertise in the field of teaching material development and learning planning in order to determine the level of feasibility and media of teaching materials. The results of the teaching material expert validation are very feasible in terms of graphic aspects related to product design and appearance, aspects of presentation quality related to the suitability of the use of images or animations with learning materials, layout of teaching materials, and characteristics of teaching materials related to the completeness of learning worksheet. The process of accessing from the learning worksheet link to the menu presented can be done easily with the selection of the right theme, color, and menu icon. Next, a small group trial was conducted to determine user responses regarding learning worksheet with very decent results in terms of ease, usefulness, and attractiveness. This is supported by the ease of accessing learning worksheet via students' smartphones, understanding of the contents of the material, ease of accessing learning videos, and evaluation questions as a means to measure the extent to which students have mastered or understood a learning material. In addition, the appearance of colors, writing, images, animations, and text styles are presented attractively so that they can increase students' interest in learning. Based on the validation, it is known that learning worksheet is valid and very feasible to support learning activities.

Based on the results of interviews with office management teachers, it was found that the material in the teaching materials was arranged systematically and easily accessible to students, learning became more interactive due to the use of technology as teaching materials. The teacher revealed that there was an increase in students' ability to analyze the tasks given. The teacher also added that students became more active in discussions and were able to connect theory with real situations in the world of work. Before using learning worksheet, teachers gave assignments without emphasizing the development of critical thinking and student learning engagement. The assignments given were informative without actively involving students in analysis or problem solving. However, the interactive features, HOTS-based questions, and contextual case studies in learning worksheet succeeded in encouraging students to think critically, discuss, and be more enthusiastic about participating in learning. Students became more active and focused in understanding the material, and showed greater interest in learning activities [22] [32]. learning worksheet is considered to be very student-oriented, thus encouraging the overall active involvement of students in learning. This learning worksheet not only provides material passively, but also facilitates students to interact with the material through features that support critical thinking. Students can improve their ability to think critically and solve problems in groups [21]. There is a weakness of its use in learning, namely there are technical obstacles faced by students during the learning process. One of the main obstacles is the unstable internet network so that it can hinder access to learning worksheet. In addition, because learning worksheet is based on an HTML5 web browser, the difference in browsers used by students is also an obstacle. Some browsers may not fully support interactive features or require an update to run learning worksheet optimally, except on Chrome and Safari. Suggestions based on the results of the interview, that to overcome these constraints, efforts to

improve accessibility are needed, such as providing offline download options or adjusting the design of the application to be compatible with different types of browsers.

Learning Engagement and Critical Thinking Result

Learning with the application of interactive teaching materials can increase student engagement and understanding of concepts well. In addition, student learning engagement with group discussions can increase learning motivation [33] [34]. Before using learning worksheet, the level of student learning engagement was less than optimal in the indicators of behavioral, cognitive, and emotional engagement. However, after using learning worksheet, student engagement increased to be more active in answering questions, participating in problem solving, and showing high enthusiasm for learning. As for emotional engagement, there was an increase of 16%, learning worksheet has a positive impact on student interest and motivation. Features such as providing direct feedback can increase their emotional engagement in learning. The quiz feature given with limited time triggers challenges that can arouse students' enthusiasm to obtain maximum scores. In addition, the interaction in the group discussion forum allows students to feel more connected to other students. Learning with learning worksheet teaching materials can effectively support student engagement in learning, especially in vocational education environments such as vocational high school [10]. In the cognitive engagement indicator, there was a 13% increase, because the use of learning worksheet teaching materials with HOTS questions helps students think critically and deeply to solve problems. Students not only memorize information, but also connect existing concepts to create the right solution. Students are trained to analyze, evaluate, and design solutions based on the situations given in the case study. Learning that focuses on problem solving makes students more cognitively involved, because students are faced with challenges that require high-level thinking [9] [6]. After using learning worksheet teaching materials, there was a 10% increase in student engagement behavior. Students were more involved in learning activities, such as group discussions and solving problems based on case studies. Students also began to show initiative to seek additional information and discuss more deeply about the material being studied. Participation in discussion activities and collaboration between students in groups was able to encourage learning engagement [35][36]. Efforts to help improve learning outcomes and ensure that students do not only understand the material theoretically, namely by students being actively involved in learning. This study shows that student learning engagement increased significantly after using learning worksheet. Student involvement emotionally, cognitively, and behaviorally can improve understanding of lessons, increase a sense of responsibility for participating in learning activities [7]. The interesting learning worksheet learning experience and increasing student learning engagement can also be assisted by its interactive features [12] [35]. This proves that the use of learning worksheet makes vocational school students' learning more relevant and meaningful.

Improving critical thinking in learning is based on constructivist learning theory by Piaget and Vygotsky, which emphasizes that students build understanding through active experiences. As an effort to support active learning experiences, learning worksheet is designed so that students are able to connect concepts, analyze problems and compile reports, search for sources on the internet, and evaluate their skills in the learning process. So that learning worksheet can improve students' critical thinking because of the case studies with problem-solving questions presented based on critical thinking indicators. The case studies direct students in analyzing, compiling arguments, and drawing conclusions. In addition, the presence of HOTS questions for evaluation and practice can also hone high-level thinking skills systematically. The use of learning worksheet improves students' critical thinking, as shown by

the posttest results with an increase in the focus, reason, inference, situation, clarity, and overview indicators. The focus indicator increased by 5%, indicated by students finding it easier to find the main problem than before because they were helped by trigger questions and analysis. Reason increased by 10%, there was an increase in compiling more logical arguments based on data and concepts. Inference increased by 11%, students were able to draw comprehensive conclusions by connecting various facts, compared to previously ignoring several aspects. Situation increased by 12%, indicating that students are more skilled in designing solutions based on structured situations. Clarity increased by 12%, students' answers became more coherent and structured after getting used to writing and presenting their analysis with learning worksheet. While overview increased by 15% because students were more critical in evaluating solutions, considering more effective alternatives, and reflecting on deeper analysis. This increase was influenced by reflective questions, group discussions, and repeated exercises that helped students review solutions, compare approaches, and strengthen high-level thinking skills. This increase proves that learning worksheet helps encourage students' critical thinking skills more systematically and deeply. learning worksheet is not only effective in improving learning outcomes, but has succeeded in developing critical thinking which is essential for work readiness in the field of office administration [35][28]. learning worksheet with a case study model of effective problem solving in improving critical thinking skills, understanding each question with the stages of problem solving continuously [12] [16] This study is distinguished by the presentation of problem-solving-based case studies and the application of scaffolding learning through step-by-step instructions, trigger questions, and HOTS exercises to improve students' critical thinking skills. It is proven that students show a difference in critical thinking test results of 8.26 points between before and after the application of learning worksheet in learning. Normality tests and independent sample t-tests were conducted to determine the differences in students' critical thinking test results before and after using learning worksheet. The results of the t-test also show that the average quality has a Sig. value of 0.000 less than 0.05, which means that there is a significant difference between the average pretest and posttest. This difference is used as evidence that the application of the developed learning worksheet can improve students' critical thinking. So it can be concluded that the development of learning worksheet assisted by Articulate Storyline 3 has succeeded in significantly improving students' critical thinking and learning engagement.

4. Conclusion

This research and development produced the OPTIMA (Office Problem task in Management and Administration) learning worksheet assisted by Articulate Storyline 3 which was specifically designed for general administration management elements through validation by material experts and teaching material experts to improve critical thinking and learning engagement of class XI of Office Administration and Business Services program at one of the vocational high schools in East Java, Indonesia. This learning worksheet contains materials, HOTS questions, and case studies based on the Merdeka Curriculum Phase F, which encourages students to work together, analyze problems, evaluate situations, and formulate effective solutions to prepare them to face the world of administrative work professionally. Expert validation shows that this learning worksheet is valid and decent to be applied in learning. The results of the study prove an increase in critical thinking in the focus, reason, inference, situation, clarity, and overview indicators, as well as an increase in learning engagement in the behaviour behavior engagement, cognitive engagement, and emotional engagement aspects. Interactive features such as case study simulations, quizzes, and evaluations create an interesting learning experience and increase student engagement and critical thinking skills as a whole.

Suggestions for teachers to make more use of learning worksheet in learning to improve critical thinking and student learning engagement in a wider scope. Teachers also need to understand the use, materials, and features in learning worksheet. Students should be able to use learning worksheet to improve their understanding of the material, think critically, discuss and collaborate, and utilize evaluation features. For further research, the development of learning worksheet needs to be updated according to curriculum and technology developments so that it remains relevant to the needs of students and the world of work. Updates can also include monitoring features by teachers, such as work statistics and success rates, as well as digital discussion spaces to support online collaboration. Further research is needed to examine in more depth the impact of using learning worksheet on other non-cognitive aspects, such as collaboration, creativity, or student communication skills, as well as explore the effectiveness of learning worksheet in a hybrid or online learning environment. Therefore, learning worksheet products can continue to be relevant so that they can be more useful in vocational education.

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