

Interactive Student Worksheet Based on a Scientific Approach to Understanding Economic Concepts and Critical Thinking

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ARTICLE INFO

Keywords:

Interactive Student Worksheet;
Scientific Approach;
Social Science Learning;
Critical Thinking, Economic
Concepts

Article history:

Received 2025-12-11
Revised 2026-02-22
Accepted 2026-04-22

ABSTRACT

This study aims to develop interactive student worksheets based on a scientific approach for primary school students on the topic of 'Economic Activities.' Using the ADDIE model, the worksheets were validated by subject matter, language, and media experts. Data was collected through expert validation and practicality questionnaires from students and teachers. The pilot study involved 22 students and 1 instructor, and data analysis was conducted quantitatively. The results showed that the worksheets were highly feasible and practical, with expert validation scores of 96.5% for content, 94.75% for media, and 81% for language, and practicality scores of 86.28% from students and 80.61% from teachers. The pretest and posttest results indicated an improvement in students' scores from 61.8 to 82.7, with an N-Gain score of 0.6% (57.1%). This study highlights the effectiveness of interactive worksheets in improving students' understanding of economic concepts and critical thinking skills.

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1. INTRODUCTION

Critical thinking skills are essential for students to develop their cognitive potential. The challenges of the 21st century require human resources who can quickly adapt to their environment (Pare & Sihotang, 2023). The ability to adapt requires quick thinking to make decisions, which is why critical thinking skills are so important. Through education, the ability to understand material concepts can be maximised by training critical thinking skills (Nasution & Setyaningrum, 2024a). Currently, HOTS is an important component for students to deal with problems (Retnawati et al., 2018). When students develop advanced thinking skills, they will be more critical and intelligent when facing challenges both in the real world and in the classroom. Higher-order thinking skills enable students to critically analyse information and apply conceptual understanding in diverse contexts. Deep conceptual understanding is not just memorisation, but requires the ability to analyse and evaluate by implementing effectively designed HOTS learning tools, from planning and implementation to evaluation, all of which aim to facilitate students in thinking critically and creatively (Nasution & Setyaningrum, 2024b). The concepts of learning materials are contained in learning resources or teaching materials. Teaching materials in primary schools are provided by the

government, but in reality, one source is not enough because it is often irrelevant to needs (Nawawi et al., 2017).

The implementation of learning in primary schools still often uses conventional teaching materials that do not support the development of students' critical thinking skills. Non-interactive teaching materials tend to make students passive, so that the process of understanding concepts becomes limited (Hariyati & Rachmadyanti, 2022). Scientific learning can be integrated into learning resources such as books, handouts, modules, or worksheets. Students must play an active role in the learning process through the 5 stages of the scientific approach. These stages are observing, questioning, experimenting, thinking, and communicating, through which children can develop a better understanding of the ideas they are learning (Muslimah, 2020). To assist in this process, appropriate learning resources are needed for the use of the scientific method. The availability of innovative teaching materials can maximise students' cognitive functions (Gulton, Erdiana, 2017). One type of teaching material that can be made innovative is the Interactive Student Worksheet

The Student Worksheets currently in use often fail to encourage interaction among students. However, collaboration is an important aspect of learning. To overcome this problem, interactive student worksheet can be the solution. Interactive student worksheets are multimedia learning resources that not only contain questions and information, but are also equipped with computer-based animations (Rokhmah et al., 2017). By adopting a scientific approach, the development of interactive student worksheets is expected to increase student engagement and understanding of economic concepts. This approach has been proven to help students understand the material and develop critical thinking skills (Suja, 2019). For example, students are encouraged to collaborate in groups to solve problems, which ultimately trains them to understand other people's points of view and hones their critical thinking skills objectively (Wibowo, 2017).

Several studies have demonstrated the effectiveness of interactive worksheets in improving various aspects of learning, albeit with different focuses. Research by (Purwadinata & Wiyasa, 2022) focused on developing interactive worksheets for understanding specific material, namely animal locomotor organs, and succeeded in improving students' understanding and engagement. Meanwhile, research by (Nirwana & Andriani, 2024) also produced valid interactive worksheets, but specifically highlighted a significant improvement in students' critical thinking skills. On the other hand, (Rahmanto & Wilujeng, 2024) focused on creating science-based student worksheet aimed at improving concept mastery and problem-solving skills, with results showing an increase in student engagement and motivation. Supporting evidence from pre-test and post-test analyses confirmed the success of concept mastery. In contrast, the research by (Utami & Aznam, 2020) emphasises the development of student workSHEET that enhances students' creative thinking skills and the importance of local context in teaching materials. (Rosalina & Rangga, 2024) developed Android-based interactive learning media with the specific aim of improving the critical thinking skills of primary school students in science subjects, which proved to be effective. Thus, although all studies used interactive media, each study had different focuses and outcomes, ranging from material comprehension, critical thinking skills, concept mastery, to creative thinking skills. Based on the results of previous research analysis, the development of interactive student worksheet combined with a scientific approach for understanding learning material concepts has not yet been studied.

Based on observations at SDN Kota Malang, it was found that Natural and Social Sciences (IPAS) lessons still use conventional Student Worksheets that tend to be passive. These student worksheets are unable to encourage students to think actively and critically, resulting in them being less enthusiastic and involved in the learning process. In addition, the dominant one-way lecture method used by teachers further exacerbates this condition, leaving students with no room to explore and solve problems. As a result, students' understanding of the concepts in the material is less than optimal and their critical thinking skills do not develop (Dulyapit & Lestari, 2024); (Naumira et al., 2024); (Tsabit, 2020). Therefore, there is a need to develop interactive Student Worksheets based on a scientific approach. This student worksheets is expected to provide more contextual, participatory, and

challenging learning. This is an effort to increase learning motivation and train students' critical thinking skills more effectively through the stages of observing, questioning, trying, reasoning, and communicating (Suja, 2019).

To overcome the low quality of learning, an organised approach is needed. One of the main solutions is to develop interactive teaching materials, such as worksheets based on a scientific approach, which are designed to increase student engagement and critical thinking skills. Research shows that interactive teaching materials significantly improve critical thinking skills (Putri et al., 2024). Furthermore, worksheets combined with problem-based learning strategies have been shown to help students recognise, evaluate, and solve problems independently. Understanding of economic concepts can also be improved through more participatory strategies such as project-based discussions or simulations (Riadah et al., 2024). Participatory approaches have generally been shown to be effective in increasing student engagement and developing their critical thinking skills to deal with real-world economic issues (Amalia, 2024);(Dau et al., 2024). Therefore, the integration of interactive teaching materials with a participatory learning approach is expected to increase learning motivation, foster critical thinking skills, and deepen students' understanding of economic principles.

Given these issues, the purpose of this study is to produce interactive worksheets specifically for IPAS subjects that contain material on 'Economic Activities'. Thus, interactive worksheets can help students learn in various ways without feeling bored and can also help them develop critical thinking skills and understand concepts well. The use of learning resources that are in line with the objectives will ensure that learning runs smoothly. In the future, students and teachers will be able to enjoy learning and achieve their learning objectives. This interactive worksheet is one such learning resource. Research conducted by (Sastra et al., 2023) supports this statement by showing a positive correlation between the use of interactive teaching materials and helping primary school students develop their critical thinking skills.

2. METHODS

Research Design

This study uses research and development (R&D). This development research uses the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). Development research seeks to create and evaluate the feasibility of a product (Hariyati & Rachmadyanti, 2022). Because the ADDIE model is methodical with systematic steps in creating teaching materials, such as student worksheets, based on a scientific approach, this model is appropriate and facilitates the creation of social studies student worksheets in primary schools. The advantage of this model is its methodical and logical development process, which facilitates the production of more ideal teaching materials.

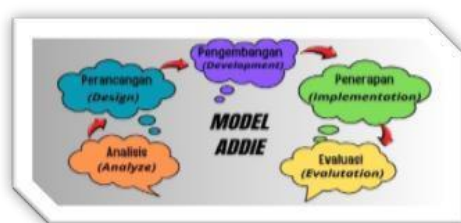


Figure 1. ADDIE Model Framework

The analysis stage aims to examine the curriculum, student characteristics, and resources to be created in interactive worksheets. This is to determine the needs of fourth-grade students at SDN Malang in understanding economic concepts. The research data was obtained from teacher interviews, curriculum assessments, teaching modules, and learning indicators. The design stage involves creating the layout and appearance of the student worksheet using Canva, taking into account visual and content elements, such as the selection of colours, text, and images to improve the readability and

appeal of the student worksheet, as well as content elements such as learning objectives, practice questions, instructions for use, and core competencies. To ensure the quality of the student worksheet's content and appearance, the development stage involves product production, validation by media and material experts, and changes based on feedback. To assess the suitability of using student worksheet in social studies learning, trials were conducted at SDN Kota Malang during the implementation stage. To improve the quality of teaching materials to better support students' understanding of economic concepts and critical thinking skills, the evaluation stage involved a comprehensive reflection on the effectiveness of student worksheet in terms of content, appearance, and ease of use in learning.

Participants

Research subjects can also be considered as data sources. Data sources are sources of information that are studied by researchers through observation, reading, or questioning, either directly or using questionnaires related to the research object (Nashrullah et al., 2023). The subjects of this study were students and teachers at SDN Tanjungrejo 1 Malang City, with a total of 22 fourth-grade students and one teacher. The location of the study was determined because the use of learning resources in the classroom was not interactive, and the students' mastery of the material did not demonstrate an understanding of the concepts. The object of this study was the results of the development of interactive worksheets based on a scientific approach for students' conceptual understanding and critical thinking skills. The selection of 22 respondents was based on the problems that arose during social studies learning in the fourth grade. Thus, the selection of respondents was in accordance with the conditions of the problems experienced using the purposive sampling method. The interactive student worksheet product based on the scientific approach was validated by three experts, including media experts, material experts, and language experts.

Data Collection

The data collection process in this study was carried out through pre-tests to determine students' initial understanding of economic activity concepts and critical thinking skills, as well as post-tests to determine changes in students' understanding of economic activity concepts and critical thinking skills. Data collection through tests was able to measure students' cognitive abilities as a result of their learning (Ndiung & Jediut, 2020). Data on the feasibility of the results of the development of interactive student worksheet based on a scientific approach was obtained from the results of validity questionnaires filled out by media experts, language experts, and subject matter experts. The experts examined the student worksheet produced by the researcher and filled out the questionnaire according to the existing components. Data on practicality and attractiveness was obtained from questionnaires given to students and teachers as users of interactive student worksheet based on a scientific approach.

Instruments

Data collection tools are referred to as research instruments (Sugiyono, 2017). The data collection tools used in this study were questionnaires for students and instructors, as well as product validation questionnaires for experts. After the student worksheet was compiled, it was validated by media experts to assess the ease of use of the student worksheet, its visual appeal, and whether it was confusing for users. The student worksheet was also validated by subject matter experts to assess the accuracy of the concepts, suitability with the curriculum, and the appropriateness of the examples or questions provided. Then, the student worksheet was validated by language experts to assess whether the language used in the student worksheet was easy for students to understand, unambiguous, and in accordance with linguistic rules. The student worksheet, which had been validated by media experts, material experts, and language experts, was one of the tools used for limited testing. After the student worksheet was implemented on the test subjects, namely 22 fourth-grade students and one teacher as users. To determine the response of student worksheet users, a questionnaire was given to teachers and

students to assess its practicality and attractiveness. The answers on the questionnaire had 4 options using a Likert scale, namely strongly agree, agree, disagree, and strongly disagree (Widoyoko, 2015). To determine how well students understood economic concepts and critical thinking skills, a test instrument was used. The questions in the test instrument were tailored to the objective of training critical thinking skills, so the questions were created at levels C4 (analysing), C5 (evaluating), and C6 (creating) based on Bloom's taxonomy (Nafiati, 2021).

Data Analysis

The collected data was then analysed to determine the effect of the treatment or research activity and its impact (Husnullail et al., 2024). The feasibility data from the experts was analysed descriptively based on each expert's input and simple calculations to determine the percentage of product validity. If the expert assessment results are valid, then the student worksheet product is feasible for development. Then, the practicality data was analysed descriptively and quantitatively to determine the level of practicality of the student worksheet. Furthermore, using the following scientific methodology and formula, the data analysis method used in this study was quantitative descriptive analysis of the feasibility of student worksheet:

$$NV = \frac{\text{Total Skor}}{\text{Skor maksimal}} \times 100\%$$

Source: (Muhsan et al., 2022)

The effectiveness of interactive student worksheet based on a scientific approach is obtained from student learning outcomes using pretest and posttest instruments. The effectiveness results are calculated to determine students' understanding and critical thinking skills. To obtain the average learning outcome results, N-Gain is used.

$$\text{Indeks Gain Ternormalisasi} = \frac{\text{Skor postes} - \text{Skor Pretes}}{\text{Skor Ideal} - \text{Skor pretes}}$$

Source: (Akbar et al., 2024)

Table 1. Gain Score Interpretation

Score Gain	Interpretation
N-Gain $\geq 0,7$	High
$0,3 < g \leq 0,7$	Medium
$G \leq 0,3$	Low

(Akbar et al., 2024)

3. FINDINGS AND DISCUSSION

A. Finding

The study on the development of SDN in Malang produced student worksheet using a scientific methodology that has been approved by experts. Analysis, planning, development, implementation, and evaluation are the five steps of the ADDIE methodology used to carry out the development. The student worksheet development process not only produced a product but also resulted in changes in the learning process and outcomes expected to achieve the learning objectives. The following is an explanation of the results of each step.

Analysis

The purpose of this study was to collect data on learning resources and student needs related to facilities and infrastructure that support the learning process through the use of student worksheet. Needs analysis was conducted through interviews and observations of instructors and students at SDN

in Malang. Based on the results of interviews with teachers, it was found that the majority of learning resources used were government textbooks, so there was a need for supplementary learning resources that could make students active in learning. Student activity in learning can train them to think more deeply to understand concepts. Based on the scope of IPAS material on economic activities, it was found that students' mastery and understanding needed to be improved. Based on the results of interviews and observations of students, there is a need for learning resources that are interesting and motivate learning in an interactive form. This is in line with the character of students at their age who enjoy activities to gain experience so that they can better understand the things they are learning.

The student worksheet also functions as an interactive learning tool that promotes active student participation. Aligned with CTL components such as the learning community, it encourages learners not only to observe and listen but also to engage directly through problem-solving tasks. Furthermore, the worksheet includes examples of Minimum Competency Assessment (AKM)-type questions, providing students with early exposure to real-world numeracy tasks embedded in cultural contexts. From the teacher's perspective, the worksheet simplifies lesson delivery and assessment activities, supporting various evaluation formats such as quizzes, assignments, and summative tests. Importantly, it allows teachers to contextualize instruction by connecting it to the students' everyday experiences through local cultural content.

Design

The scientific approach to student worksheet design is the objective of this stage. Reviewing the material and designing the student worksheet product are part of this product design. Evaluating the material and product design are the stages involved. During the design stage, the material to be included in the student worksheet is collected, and the presentation of the material, tasks, and evaluations to be completed by the students are designed. In addition, during the design stage, a visual presentation of the student worksheet is planned to attract the interest and motivation of the students to learn. The preparation of a student worksheet design that is easy to understand and attractive can have an impact on the willingness and learning outcomes of the students.

In addition to its contextual integration, the worksheet featured colorful illustrations and accessible language, which helped students better understand and retain the material. The increase in students' post-test scores and their more active classroom participation further support the worksheet's effectiveness in enhancing mathematics learning, particularly in the topic of fraction operations.

Development

Activities carried out during the development stage include: using Canva as a design tool for product creation. Compiling student worksheets in accordance with the design plan by incorporating material presented using language that complies with the rules and visualisations. Once the product is complete, it is validated by media, material and language experts. Media validation evaluates the technical and aesthetic aspects of the student worksheet content, while material validation determines whether the content is appropriate to the concept. Language validation assesses the appropriateness of the language used in presenting the material in accordance with Indonesian language rules and ease of understanding. Feedback from the validators recommends revisions to the product, with changes made to various parts of the content to better engage students so that their learning outcomes are improved and their understanding of economic concepts in social studies is enhanced.

Implementation

The student worksheet that has been validated and received feedback is then revised according to expert advice. Next, the student worksheet is trialled with students and teachers at SDN Malang as part of the implementation phase. The trial is conducted in several stages to see how well the student worksheet improves students' understanding of economic principles and their capacity for critical thinking. Teachers assist students in utilising the student worksheet as facilitators during the

implementation phase. The implementation is carried out in several stages to see the suitability of the product to the needs of students, so that it will show that the student worksheet product truly meets the needs in the field.

After the trial activities, students worked on evaluation questions individually to find out the results of their understanding after using the student worksheet products in learning mathematics. The value of the results of working on the evaluation questions would be analyzed and used as posttest scores.

Evaluation

The evaluation stage served as the phase in which the researchers assessed the overall quality and feasibility of the developed product. This involved a comprehensive review of each stage of the development process. At this point, the researchers analyzed various forms of data, including expert validation results, student response questionnaires, pre-test and post-test scores, as well as comments and suggestions from relevant stakeholders.

The development of student worksheet in IPAS learning is evaluated using scientific methodology. At the evaluation stage, the development process is evaluated to ensure that it is in accordance with the ADDIE development model and to assess student learning outcomes. This assessment of learning outcomes includes formative assessment. Using conceptual understanding assessment and observation of students' critical thinking skills, formative evaluation of student learning outcomes is conducted after implementation. The assessment findings show that student worksheet, which uses a scientific approach, has succeeded in improving students' critical thinking skills and understanding of economic ideas.

Table 2. Recommendations for improvement from media experts

Validation	Revision
	
• The cover of the student workbook should be tailored to the topic of economic activities. • The colour scheme of the layout needs to be enhanced with more appealing images. • The title of the story should be more focused on the topic of the material.	• The colour scheme of the student worksheets is varied and appealing. • The cover title is relevant to the topic of economic activities. • It has been adapted to the topic of the material.

The validation results from media experts on Table 2 of interactive student worksheet products based on a scientific approach provided notes for revision. The sections that need to be revised based on input from media experts are the title page, which needs to be adjusted to the topic of economic activities, the colours in the layout need to be varied with images to make it more attractive to users, and the story titles need to focus on economic activity material. Based on the revision notes from media experts, the interactive student worksheet display has been revised in accordance with the input. The revised student worksheet has an attractive display that is easy for students to understand, making the student worksheet development product very useful for its users, namely students and teachers.

Table 3. Suggestions for improvement from materials experts

Validation	Revision
  • Questions for assignments need to be added • Images related to economic activities need to be added	  • Questions have been added and are in line with the topic and learning objectives • Images depicting economic activities have been added and are appropriate

The validation results from subject matter experts in Table 3 of interactive student worksheet products based on a scientific approach received several notes for revision. The section that needs to be revised based on input from media experts is the questions section. The note is that questions need to be added to further train students' thinking skills, and images of economic activities need to be added to facilitate students' understanding with visual aids. Based on the notes from the subject matter expert, revisions have been made so that the interactive student worksheet display is in line with the input. This alignment can have an impact on improving students' understanding of the material and their active thinking.

Table 4. Suggestions for improvement from language experts

Validation	Revision
• Spelling, grammar, and writing still contain words that are difficult for students to understand. 	• Spelling and grammar in writing are quite good, but need to be improved further 

The validation results from language experts on Table 4 of interactive student worksheet products based on a scientific approach provided notes for revision. The sections that need to be revised based on input from language experts are those concerning spelling, writing that does not conform to grammar rules, and words that are difficult for students to understand. Based on the revision notes from the linguist, revisions have been made so that the interactive student worksheet display is in accordance with the input. The appropriateness of the language used will help users, especially students, in understanding the concepts in the material.

Based on the results of the expert validation assessment, the student worksheet development product based on a scientific approach to economic activity material needs to be revised. After revision, field trials can be conducted. The validity level of the student worksheet is obtained from the overall score achieved divided by the maximum score to obtain the validity percentage (Narulita, 2019). In this study, the validity of the student worksheet was calculated from the expert assessment results using a

percentage calculation. The percentage score was determined by comparing the score obtained with the maximum score, as in the following formula:

$$Pv - y = \frac{\sum x_i}{\sum y_i}$$

Source : (Narulita, 2019)

Description:

Pv = integer Percentage of assessment

Xi= The value of validity for the aspect-i

Yi = The maximum value of validity for the aspect-i

$\sum x_i$ = The sum of the validity values for all aspects

$\sum y_x$ = The maximum value of validity for all aspects

Based on the calculation results, the percentage of student worksheet validity from the experts is categorised as follows:

Table 5. Eligibility Categories

Criteria	category
85 - 100%	Very Valid
70 – 84%	Valid
50 - 69%	Quite Valid
≤ 49%	Invalid

Source: (Akbar et al., 2024)

Table 6. Validator Feasibility Results

No	Validator	Criteria
1	Media Expert	96,5%
2	Material expert	94,75%
3	Language experts	81%
	Amount	272,25
	Average	90,75 %

The validation results shown in Table 6 indicate that the student worksheet obtained a score of 96.5% from subject matter experts, who stated that the content of the student worksheet was highly valid and relevant to the learning objectives to be achieved. From media experts, the student worksheet received a score of 94.75%, indicating that the appearance and presentation were excellent and highly valid. Meanwhile, validation from language experts reached 81%, which is still valid, but revisions are needed to improve the appropriateness and clarity of the language used. Revisions from language experts to make it easier for students to understand the material. Overall, the average validation score reached 90.75% with a total score of 272.25, meaning that the student worksheet can be categorised as valid and applicable. Based on the feasibility test results from media, material and language experts, the student worksheet development still has areas that need improvement. Thus, this student worksheet can be used in learning with minor improvements in language aspects to make it more optimal. User-based student worksheet assessment as a measure of practicality and attractiveness is in accordance with the following criteria:

Table 7. Practicality and Appeal

Criteria	category
85 - 100%	Very Practical
70 – 84%	Practical
50 - 69%	Quite practical
≤ 49%	Not practical

Source: (Akbar et al., 2024)

Table 8. User Validity Results

Responden	Result
Student	86,28%
Teacher	80,61%
Average	83,45%

The results of the respondents' assessments were used in the practicality and attractiveness validation stage to determine how practical and attractive the Interactive Student Worksheets based on the scientific approach could be used in the teaching and learning process. This validation involved teachers and students as respondents. The students' assessment results were 86.28%. Based on these results, it can be seen that the student worksheet is well accepted and helps improve students' understanding of economic activity material. Although a different scale was used for teachers, the average score obtained by instructors was 83.45%, indicating that the student worksheet has a high level of feasibility for application in educational activities.

The validation results presented in Table 8 show that the practicality and attractiveness of the student worksheet by teachers and students obtained an average of 83.45%, which is considered practical and attractive. From the perspective of teachers and students, this shows that the student worksheet has met the needs of social studies learning in the subject of economics in Grade IV. The high student ratings indicate that the student worksheet is interesting, easy to use, and helps students understand the subject matter. The teacher ratings indicate that the student worksheet has met the relevant educational standards, but still needs adjustment or improvement to increase its effectiveness in the teaching and learning process.

The student worksheet products that have undergone the development process were then assessed, with an average suitability rating of 90.75% from media experts who recommended the attractiveness of the presentation, supported by the suitability of the material from the assessment of material experts and the suitability of the language used from language experts, making the student worksheet products suitable for use. Furthermore, through field trials or user testing, the products were found to be practical and interesting, with an average score of 86.28%. Thus, the student worksheet products produced can meet the needs of students in terms of material adequacy and increase their interest and motivation to learn with interesting resources. This is in line with the results of the needs analysis conducted in the ADDIE analysis stage.

In addition, through field tests or user tests, these products were proven to be practical and attractive, with an average score of 86.28%. Therefore, the student worksheet products produced can meet students' needs in terms of material adequacy and increase their interest and motivation to learn with attractive resources. This is in line with the results of the needs analysis conducted at the ADDIE analysis stage.

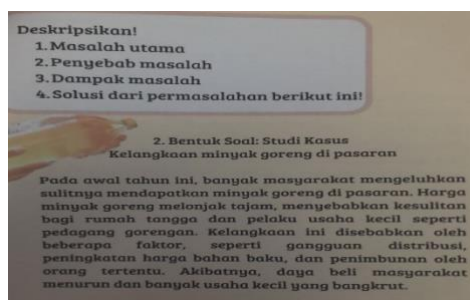


Figure 2. Example of problem-based questions

After students learned using interactive worksheets based on a scientific approach, learning outcomes based on post-test results showed students' understanding and critical thinking skills, as shown in Table 9 below.

Table 9 Pre-test and post-test scores of student learning outcomes

Average Pra-Tes (x)	Average Posttest (y)	y-x	Score N-Gain	Score N-Gain (%)
61,8%	82,7%	20,9%	0,6%	57,1%

Based on Table 9, student learning outcomes show an improvement from a pretest average score of 61.8% to a posttest average score of 82.7%, with an N-Gain score of 0.6% and an N-Gain percentage of 57.1%. The difference between the pretest and posttest results was 20.9%. The N-Gain score result falls into the moderate category. The students' response to the interactive student worksheet on economic activity material helped them to understand the material more easily so that they could complete the tasks well. Meanwhile, the teachers' response stated that the interactive student worksheet helped them to make the students understand the material and made them more active in learning.

This interactive student worksheet product has been declared feasible and practical, but it still needs improvement for further product development due to limitations in the development of this interactive student worksheet, which is only within the scope of economic activity material. Therefore, further development can be expanded or linked to other material topics. In addition, limitations in the implementation of trials can be expanded with more extensive field trials. However, it can be concluded that interactive student worksheet based on a scientific approach is effective in helping students understand economic activity concepts and improve critical thinking skills, as demonstrated by students' completion of problem-solving tasks.

B. Discussion

The purpose of developing interactive scientific worksheets is to make learning more interesting and productive. By increasing student participation in the learning process, the scientific method improves conceptual understanding and critical thinking skills (Afnan et al., 2022); (Sugiyono, 2017). Critical thinking skills can only be developed by consistently and continuously training students in every learning process. This can be done using learning resources in the form of problem-based worksheets. To obtain interactive worksheets that can train students to think critically, they need to be designed by incorporating real-life problems for students to solve (Noprinda & Soleh, 2019). To produce the desired interactive worksheets, this development uses the ADDIE development model through five systematic stages (Akbar et al., 2024).

Analysis Stage

The analysis stage is the initial step in assessing and understanding the curriculum taught at school. At this stage, researchers collect data on learning indicators, basic skills, learning modules, and syllabi that will be used as guidelines in developing student worksheet. Several important analyses are

carried out at this stage, including material analysis, curriculum analysis, and student characteristic analysis so that the student worksheet as teaching material functions as an important learning resource for achieving learning objectives (Widianti & Sari, 2022)(Lase & Telaumbanua, 2024). The results of the school curriculum analysis show that it follows the national curriculum, where the material of choice is economic activities. The results of the needs analysis indicate the need for learning resources that can encourage students to think actively and critically as a supplement to the main learning resources. Supplementary learning resources can complement the learning material needs for students' mastery of concepts (Widianti & Sari, 2022). In addition, students in the fourth grade of primary school will be more interested in learning while playing or engaging in concrete learning activities that contain real experiences (Dau et al., 2024).

Design Stage

The design stage using Canva focuses on creating student worksheet, which covers two main things. The first stage is to create student worksheet content that is arranged based on a standard format and includes a cover, introduction, learning outcomes, learning objectives, indicators, usage guidelines, learning resources, and questions. The suitability of the learning resource content with the learning objectives can be a measure of the achievement of those objectives (Rokhman & Yuliati, 2010). The second stage is to make the appearance more attractive and easier to understand by considering technical factors such as the selection of text, graphics, and colours. student worksheet products as attractive teaching materials can increase students' interest in learning (Rokhman & Yuliati, 2010). This is also in line with the characteristics of primary school students, who are more visually oriented. The product design stage is an important part of development because it determines the quality and usefulness of the results (Hartini et al., 2018).

Development Stage

There are three main phases in the development stage. First, utilising the Canva tool to create the product. The Canva application provides a variety of attractive design options. The attractiveness of the product is important in order to motivate students as users (Andyny, 2022). The interactive student worksheet then goes through the second stage, which is validation by media, material, and language experts to see whether the appearance, content, and language usage of the student worksheet are appropriate. Suitability is a key requirement for the success of a development product and an indicator that the development product can be used in the field (Purwadinata & Wiyasa, 2022). Third, the student worksheet product is improved to enhance its quality. Improvements to the student worksheet are made based on feedback from the validators. This feedback must be followed up on so that the student worksheet product is in line with the needs analysis in the field (Lin et al., 2022).

Implementation stage

During the implementation stage, interactive student worksheets that have undergone a feasibility test are then tested in limited field trials. The trial was conducted on fourth-grade students at SDN Kota Malang while studying social studies with economic activity content to test the student worksheet that had been produced. The purpose of this stage was to evaluate the use of interactive student worksheet based on a scientific approach. The implementation of the trial was intended to determine the practicality and appeal of interactive student worksheet based on a scientific approach. The implementation stage is part of testing the interactive student worksheet product to obtain feedback from students and teachers as users. This is to measure the practicality of the interactive student worksheet. The practicality of the development product will lead to wider recognition and is a requirement for the student worksheet to be used more widely beyond the test subjects (Rahmanto & Wilujeng, 2024).

Evaluation Stage

A comprehensive assessment is conducted after all previous stages have been completed. The evaluation stage is a process of analysing and assessing the interactive student worksheet development process up to the implementation stage to identify the strengths and weaknesses of both the interactive student worksheet product and its development process. The development process has gone through the 5 stages of ADDIE, so from a development perspective, it is sound. The implementation of development following the model used greatly assists in the suitability of the expected development product (Sari & Setiawan, 2018). The purpose of this assessment is to improve the quality of the student worksheet at each stage of development so as to produce a learning product that is suitable for use. In addition, the evaluation stage also implements formative assessment to measure changes in the mastery of economic activity concepts and critical thinking skills. This formative evaluation is a measurement of cognitive abilities. The cognitive abilities used are based on Bloom's taxonomy cognitive levels, which include levels C4-C6 (Nafiati, 2021).

Subject Matter Expert Validation

The level of difficulty, complexity of concepts and alignment with scientific methods were the main concerns of subject matter experts in validating the student worksheet content. Subject matter experts assessed whether the information provided was in line with the learning objectives of the economic activity material and whether it could improve students' understanding of concepts and critical thinking skills. The value range was on a Likert scale of 1-4. The results of validation by subject matter experts showed that it was highly valid at 96.5%. Feedback from subject matter experts indicated that more questions were needed to improve critical thinking exercises as a process of concept mastery. In addition, more pictures of economic activities were needed to better visualise the concepts. These validation findings were used to improve the content of the student worksheet in line with the concepts so that it would better help students understand economic ideas (Apfani, 2022). According to (Widianti & Sari, 2022) material validation is very important to ensure the quality of teaching materials. This is in line with the results of their research in developing student worksheet, which obtained a score of 74% and was declared feasible. student worksheet must obtain a minimum average score of 2.8% on a 4-point Likert scale, which is included in the Valid category ($\geq 70\%$) to be considered feasible. Additionally, the results of the development of 3R-based learning media by (Sulistiyowati et al., 2021) were also declared valid with a percentage of 86%. Based on the results of previous development research, it can be said that interactive student worksheet based on the scientific approach is deemed highly suitable.

Media Expert Validation

Media expert validation aims to assess the appearance, design, and interaction of interactive student worksheets. Factors assessed include text readability, colour choices, layout, navigation, and suitability to the LPD format. This assessment is important to ensure that LPDs support science-based learning as effectively as possible, are visually appealing, and are easily understood by students (Andyny, 2022). It should be noted that the student worksheet is declared feasible if the minimum score is in the Valid category ($\geq 70\%$), which is a minimum average score of 2.8% on a 4-point Likert scale. This validation uses a Likert scale-based evaluation tool. After being adjusted to the eligibility criteria table, the media expert's score of 94.75% based on the validation results falls within the "Highly Valid" criteria, although with several notes for revision, namely that the cover needs to be adjusted to the topic of economic activities, more colour variation needs to be added to the layout with more interesting images, and the story title must be in line with the topic of the material. Feedback from media experts is essential to ensure that the developed product is suitable for the characteristics of the users (Nirwana & Andriani, 2024). The assessment by media experts indicates that the product is suitable for field testing with modifications based on the recommendations provided. This aligns with the opinion of (Maivi & Erita, 2023) who state that results obtained in media expert validation with a 90% criterion are

considered suitable and highly valid for use. Valid media validation results provide a strong foundation for conducting trials on research subjects (Sulistiyowati et al., 2019).

Language Expert Validation

Language experts validate student worksheets to evaluate their readability, clarity of instructions, appropriateness of terminology, and grammar. The use of communicative language that is appropriate for children's cognitive development and does not cause ambiguity is an important component of this validation. Research by (Saputri et al., 2023) states that it is important to use linguistic validation so that students are able to understand the layout, use of language, and readability, in other words, the importance of understanding linguistic elements in creating teaching materials. According to (Sugiyono, 2017), recommendation, a 4-point Likert scale can clarify the evaluation results because it is more measurable. According to the findings of this study's validation, students can understand the student worksheet and successfully improve the learning process. The student worksheet must obtain a minimum average score of 2.8 out of 4 on the Likert scale, which is included in the Valid category ($\geq 70\%$), to be considered feasible. Linguists gave a score of 81% based on the validation results, which, after being modified to the eligibility criteria table, was included in the "Highly Valid" criteria, although with some notes for revision, namely improvements in spelling, grammar, and vocabulary using words that are difficult for students. However, the validation results showed that this product was feasible for field testing with the necessary modifications. The language element in learning resources is one aspect that should not be overlooked because language serves as a medium for understanding the content, greatly facilitating its users (Noprinda & Soleh, 2019).

User Attractiveness Questionnaire

The student attraction questionnaire was used to determine the extent to which students were interested in using interactive student worksheet based on a scientific approach. The aspects assessed included clarity of material, visual appeal, interactivity, ease of use, and benefits in learning. The results of this questionnaire help in refining electronic student worksheet teaching materials to better suit student needs and increase student motivation to learn (Hariyati & Rachmadyanti, 2022). Based on the results of the student questionnaire, a score of 86.28% was obtained, indicating that the student questionnaire results were very practical.

This questionnaire was intended for teachers to assess the extent to which scientific-based interactive student worksheets assist in the learning process. The aspects assessed included alignment with the curriculum, ease of use, effectiveness in improving student understanding, and suitability for implementation in the classroom. Teachers' assessments are very important for adjusting worksheets to the actual learning needs in the classroom (Lase & Telaumbanua, 2024)(Lin et al., 2022). Based on the results of the teacher questionnaire, the score reached 80.61%, so the teacher questionnaire results were declared to be very practical. The practicality test results for the science worksheet on the charm of Parangtritis Beach scored 3.87 on a maximum score range of 4, placing it in the highly practical category (Utami & Aznam, 2020).

Effectiveness of Interactive Student Worksheet Based on Scientific Approach

Product development testing needs to be carried out to determine its effectiveness (Hartini et al., 2018). Based on the results of testing the effectiveness of interactive student worksheet based on a scientific approach on students, it shows that the development of interactive student worksheet based on a scientific approach on economic activity material is effective. This is indicated by a change in student learning outcomes from an average pretest score of 61.8% to 82.7% on the posttest. Good teaching materials contain concepts that are easy for students to understand in accordance with their daily lives (Rokhman & Yuliati, 2010). Meanwhile, the N-Gain calculation result of 0.6% with a percentage of 57.1% falls into the category of moderate effectiveness. Based on these results, the interactive student worksheet based on a scientific approach is good. student worksheet can function

as a medium that contains teaching materials that can improve material comprehension and encourage students to think critically and analyse (Rosalina & Rangga, 2024)(Sari & Setiawan, 2018). The results of the interactive student worksheet development have demonstrated feasibility, practicality, and effectiveness according to each criterion, so that the interactive student worksheet based on a scientific approach can be used in the field. However, the interactive student worksheet produced still requires expansion of material. In addition, the interactive student worksheet can be transferred to a digital application that is in line with the demands of the times and is more practical to use with gadgets (Sa'diyah, 2021).

4. CONCLUSION

Based on the results of the study, the purpose of developing interactive worksheets based on the scientific method in social studies education is to produce effective worksheets that can support primary school students' understanding of economic concepts and critical thinking skills. In order for students to be able to analyse, evaluate, and apply concepts in various situations, HOTS-based learning is now essential. However, the use of traditional learning resources that are not very interactive remains an obstacle to the use of the scientific method. Based on the results of the study, interactive worksheets that have been approved by language experts, media experts, and content experts have a high level of feasibility and can increase students' interest, motivation, and understanding, as well as encourage students to think critically. In order to be used as an effective learning tool to help critical thinking skills and economic understanding in social studies education, the worksheets produced have gone through the steps of analysis, design, development, implementation, and assessment using the ADDIE development technique. Teachers and researchers in the future can develop more innovative and varied teaching materials to facilitate student learning so that learning becomes more motivating for students.

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