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DESIGN OF STUDENT WORKSHEETS BASED ON POLYA'S PROBLEM-SOLVING PROCESS TO FACILITATE STUDENTS' REFLECTIVE THINKING SKILLS

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Abstrak. Penelitian ini dilatarbelakangi oleh kondisi di lapangan yang menunjukan bahwa LKPD yang beredar di sekolah-sekolah pada umumnya memuat kegiatan belajar yang belum mendorong kemampuan berpikir reflektif peserta didik dan motivasi belajar peserta didik. Kondisi ini menyebabkan keterlibatan siswa dalam proses pembelajaran menjadi kurang optimal, sehingga proses pembelajaran berlangsung secara pasif dan tidak menantang. Oleh karena itu, penelitian ini memiliki tujuan untuk menghasilkan lembar kerja peserta didik berbasis Polya's problem solving process sebagai upaya memfasilitasi kemampuan berpikir reflektif belajar peserta didik. Metode penelitian ini menggunakan metode pengembangan ADDIE yang berfokus pada empat tahapan awal yaitu Analysis, Design, Development, Implementation. LKPD yang telah divalidasi kemudian diujicobakan secara terbatas pada satu kelas. Partisipan dalam penelitian ini adalah 25 peserta didik kelas X di salah satu SMA di Kota Bandung. Pengumpulan data dilakukan dengan lembar validasi, dan angket respon guru serta peserta didik. Berdasarkan hasil penelitian, dapat disimpulkan bahwa LKPD berbasis *Polya's Problem Solving Process* yang dikembangkan telah layak untuk dilanjutkan ke tahapan berikutnya, yaitu tahap evaluasi, sebagai upaya memfasilitasi kemampuan berpikir reflektif peserta didik.

Kata Kunci: LKPD, Polya's Problem Solving Process, Kemampuan Berpikir Reflektif.

Abstract. Abstract This research is motivated by the conditions in the field, which show that the Student Worksheets (LKPD) circulating in schools generally contain learning activities that do not encourage students' reflective thinking skills and student learning motivation. This condition results in suboptimal student engagement in the learning process, causing learning to remain passive and lacking in challenge. Therefore, this study aims to produce student worksheets based on Polya's problem-solving process as an effort to facilitate students' reflective thinking skills. This research method uses the ADDIE development method, which focuses on four initial stages: Analysis, Design, Development, and Implementation. The validated LKPD was then tested on a limited basis in one class. Participants in this study were 25 grade X students at a high school in Bandung City. Data collection was carried out using validation sheets and teacher and student response questionnaires. Based on the research results, it can be concluded that the developed LKPD based on Polya's Problem Solving Process is worthy of being continued to the next stage, namely the evaluation stage, as an effort to facilitate students' reflective thinking skills.

Keywords: LKPD, *Polya's Problem Solving Process*, Reflective Thinking Skills

A. Introduction

21st-century education requires students to possess a set of higher-order thinking skills, including critical thinking, problem-solving, and effective decision-making. These skills are essential for individuals to adapt to the dynamic developments in science and technology (Binkley et al., 2012; Tight, 2021). In the 21st-century learning framework developed by the

Partnership for 21st Century Skills (2019), critical and reflective thinking skills are central components supporting students' success in facing the complex challenges of modern life. One important dimension of higher-order thinking skills is reflective thinking, the ability to review, analyze, and evaluate learning experiences to gain a deeper understanding of a concept. Through the process of reflection, students not only remember information but also interpret meaning, connect new knowledge with prior experiences, and develop more effective thinking strategies (Nurdyansyah, 2016; Wang et al., 2023). Thus, reflective thinking serves as a means to internalize knowledge and build students' intellectual independence.

In the context of mathematics learning, reflective thinking plays an essential role because it helps students understand abstract concepts, interpret problems, and draw conclusions based on logical reasoning (Adha & Refianti, 2019; Prihatini, 2019). However, various research findings indicate that students' reflective thinking skills are still relatively low (Dwirahayu & Mas'ud, 2017; Nova, 2022). Mathematics learning, which is still oriented towards conventional methods, is teacher-centered, and emphasizes mechanistic procedures without allowing space for the exploration of ideas, is one of the main causes of this low reflective ability (Suparsawan, 2020; Simonovic, 2022). As a result, students tend to be able to solve routine problems but struggle with problems that require more complex reasoning and interpretation.

To commemorate a birthday, one mall offered discounts on select products. Indah and Leni went to the afternoon department and bought some items. Indah bought 2 pairs of pants and paid Rp. 360,000.00. Meanwhile, Leni bought a pair of pants and 2 shirts for a total price of Rp. 400,000.00. The next day, Anis bought 3 pairs of pants and 2 shirts at the same place. If for every purchase with a total price of more than Rp. 500,000.00 got a 30% discount. How much should Anis pay, and how much money would Anis have left if she brought Rp. 600,000.00.

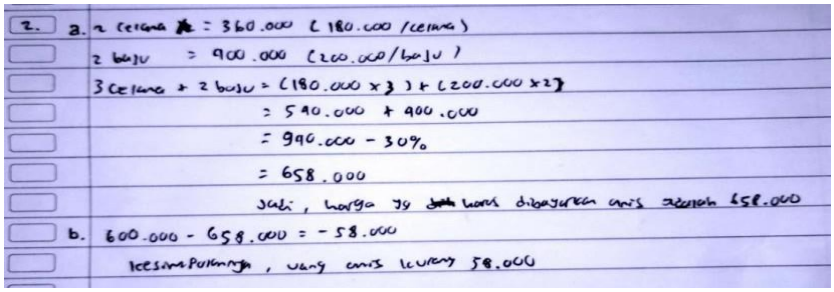

Figure 1. Preliminary Student Ability Test.

Initial findings from researchers at a high school in Bandung City revealed a similar phenomenon. Initial tests and teacher interviews indicated that students still struggled to interpret problems and draw appropriate conclusions. Learning was still dominated by lectures and textbook-based exercises, resulting in students being unmotivated and unaccustomed to reflecting on their thinking processes. This situation highlights the need for a more innovative and participatory learning approach to stimulate reflective thinking skills and increase student motivation. One relevant approach to addressing this challenge is the Polya's Problem-Solving Process-based learning model, which emphasizes four stages of problem-solving: understanding the problem, planning a solution, implementing the plan, and reflecting on the results (Polya, 1945). This approach has proven effective in fostering reflective thinking skills and increasing student motivation (Amar, 2021; Wijaya, 2022; Suparatulatorn et al., 2023).

In addition to learning models, supporting tools such as Student Worksheets (LKPD) play a crucial role in guiding an active and meaningful learning process. Well-designed

student worksheets (LKPD) can facilitate students' knowledge construction, reflection on their thinking strategies, and evaluation of learning outcomes (Aditama, 2019; Saraswati & Salsabila, 2021). However, various studies show that the LKPD used in schools is still conventional, containing only practice questions without any thinking guidance or space for reflection (Astuti et al., 2018; Karmila, 2018). As a result, these LKPDs are unable to develop reflective thinking skills or increase students' learning motivation.

Based on these problems, it is necessary to develop a Polya's Problem Solving Process-based Student Worksheet (LKPD) that is systematically designed to facilitate students' reflective thinking skills. The development of this tool is expected to be an alternative solution to create more meaningful, interactive, and 21st-century mathematics learning. Based on the background description above, the problem formulation in this study is how the stages of developing a Polya's Problem Solving Process-based Student Worksheet (LKPD), and whether the Polya's Problem Solving Process-based LKPD developed meets the validity and practicality criteria as a learning tool to facilitate students' reflective thinking skills.

B. Research Method

This study employed a research and development (R&D) method. Its goal was to produce and test the feasibility of Polya's Problem-Solving Process-based Student Worksheets (LKPD) for facilitating students' reflective thinking skills in mathematics. The development model referenced the ADDIE (Analysis, Design, Development, Implementation, Evaluation) framework, developed by Branch in Sugiyono (2015). However, this study focused only on the first four stages: analysis, design, development, and implementation. The evaluation stage will be addressed in subsequent research. The ADDIE model was selected for this study due to its systematic and flexible structure, which supports a staged development process and allows for revision at each phase. The study took place at SMA Negeri 9, Bandung City. It involved 25 10th-grade students as test subjects, one mathematics teacher as an educational practitioner, and three validators: a material expert, a linguist, and a media expert. The research procedure followed four stages: Analysis, Design, Development, and Implementation.

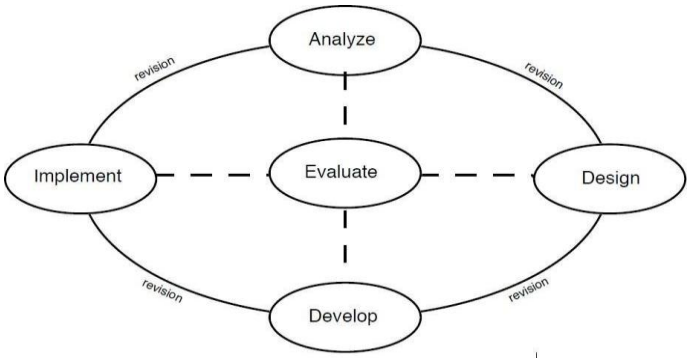

Figure 2. Steps of the ADDIE Model

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Data in this study were collected through observation, interviews, and questionnaires. The instruments used included observation sheets, interview guidelines, expert validation questionnaires, teacher response questionnaires, and student response questionnaires. The data obtained were analyzed descriptively and quantitatively by calculating the average score for each assessment component using a Likert scale. The validation analysis was used to determine the validity level of the student worksheets, while the results of the teacher and student response questionnaires were analyzed to assess their practicality. The student worksheets were categorized as suitable for use if they met the criteria of validity, practicality, and effectiveness based on the results of the data analysis.

1. Data Analysis Techniques for Product Validity Testing

The data analysis technique used to test product validity in this study involved processing expert assessment data based on the scores given for each statement in the validation instrument. The assessment was conducted using a Likert scale with four levels of agreement, which reflects the level of agreement with each statement. This scale facilitates researchers in measuring the extent to which the product meets the expected eligibility criteria. The weighting of each response is presented in Table 1 below.

Table 1. Validation Questionnaire Data Weights

Response	Weight
Strongly Appropriate	4
Appropriate	3
Inappropriate	2
Strongly Inappropriate	1

The data obtained from the validator's assessment was then calculated to determine the average score and product validity level. The validity percentage was calculated using the following formula:

$$\mathrm{p} = \frac{\text{Obtained Score}}{\text{Ideal Score}} \times 100$$

Where:

p = Percentage of assessment result

Ideal Score = Maximum possible score $\times$ Number of questionnaire items

The results of the calculation are then classified based on a score range adjusted to the number of statements in the validation instrument. Based on the calculation, the lowest score is obtained if all items receive a score of 1, while the highest score is obtained if all items receive a score of 4. The lowest score is converted into a percentage using a previously determined formula, and the value range is then determined according to the score range table below:

Tabel 2. Feasibility Criteria Based on Percentage Analysis

Percentage (%)	Category
$p < 40$	Not Feasible
$40 < p \leq 55$	Less Feasible
$55 < p \leq 70$	Fairly Feasible

$70 < p \leq 85$	Feasible
$p > 85$	Highly Feasible

The percentage results from the data analysis were then interpreted using descriptive analysis techniques. The percentage values obtained were compared with the feasibility categories in Table 3.9 to determine the product's validity level. The higher the percentage score obtained, the better the feasibility level of the Polya's Problem-Solving Process-based Student Worksheet (LKPD). Therefore, a product is declared valid if it reaches at least the Feasible category based on the classification results.

2. Data Analysis Techniques for Product Practicality Testing

Practicality data in this study were obtained through a questionnaire administered to teachers as educational practitioners and to students as product users. The results of the questionnaire were used to assess the extent to which Polya's Problem Solving Process-based Student Worksheet (LKPD) product can be practically applied in the learning process. Teacher and student response data were tabulated based on the scores given to each statement item in accordance with the assessment guidelines. The assessment instrument used a Likert scale with four levels of answers representing the level of respondent agreement with the statements posed. Each answer has a gradation from very inappropriate to very appropriate, as shown in Table 1. Next, the scores from the teacher and student assessment results were calculated to obtain an average value and determine the level of practicality of the product. The percentage of the assessment results was obtained using the percentage value formula used in the validity test data analysis. The analyzed data were then interpreted using descriptive analysis techniques. The percentage value of the ideal score obtained was compared with the categories in Table 2 to determine the level of practicality of the LKPD. The higher the percentage obtained from the teacher and student assessment results, the higher the level of practicality of the developed product. Thus, LKPD is declared practical if the analysis results show a minimum category of Good.

C. Result and Discussion

This research developed a Student Worksheet (LKPD) based on Polya's Problem-Solving Process to facilitate reflective thinking skills and increase student motivation in quadratic equations for 10th-grade high school students. The development procedure followed the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model.

1. Analysis

The analysis phase aims to identify the needs of teachers and students in the learning process as a basis for developing relevant tools. The analysis is conducted on three main aspects: curriculum, materials, and student characteristics.

a) Curriculum Analysis

Tabel 3. Learning Outcomes and Learning Objectives of the Merdeka Curriculum

Learning Outcomes	Learning Objectives
At the end of phase E, students can represent data in matrix form. They can define inverse functions, function compositions, and function transformations to model real-world situations using appropriate functions such as (linear, quadratic, exponential).	Demonstrate understanding of a quadratic equation. Determine the roots of a quadratic equation. Solve contextual problems related to quadratic equations accurately and carefully, while demonstrating critical thinking, creativity, and collaborative skills.

Curriculum analysis was conducted through observations at a high school in Bandung City that has implemented the Independent Curriculum. The results of this analysis serve as guidelines for developing learning materials aligned with learning outcomes and objectives. The scope of the 10th-grade mathematics material for the even semester of the 2022/2023 academic year covers several topics, namely quadratic equations and inequalities, quadratic functions, statistics, and probability. This research focused on the development of quadratic equations because initial test results indicated that students' reflective thinking skills in algebra were still low. In addition to learning outcomes, the researchers also examined learning objectives to ensure that the developed teaching materials align with the provisions of Permendikbudristek No. 008/H/KR/2022. The results of the analysis of learning outcomes and objectives for the quadratic equations subtopic are shown in table 3.

b) Material Analysis

Material analysis was conducted to align the learning content with the Merdeka Curriculum structure. The product developed was a student worksheet (LKPD) based on Polya's Problem-Solving Process, focusing on quadratic equations. This material was chosen because it is closely related to the application of mathematics in everyday life. The presentation of the material in the LKPD is designed to enable students to solve problems collaboratively through group activities.

c) Analysis of Learner Characteristics

Student characteristics were analyzed through interviews with mathematics teachers and initial ability tests on tenth-grade students at SMA Negeri 9 Bandung City. The interview results indicated that student learning motivation was still low, as reflected in classroom activities and suboptimal learning outcomes. The initial test also showed a tendency for low reflective thinking skills in algebra. Based on these findings, researchers developed a Polya's Problem-Solving Process-based Student Worksheet (LKPD) as a solution to help improve students' reflective thinking skills in mathematics learning.

2. Design

Tabel 4. Components of the Student Worksheet

Element	Description
Cover	The cover of the student worksheet (LKPD) is designed in alignment with the learning outcomes (CP) for the quadratic equations topic as specified in the curriculum.
User Instructions	Contains guidance on the learning process using the developed LKPD.
Learning Instructions	Provides directions on how students should engage in learning activities using the developed LKPD.
Learning Outcomes	Includes the curriculum analysis that has been conducted, accompanied by the intended learning objectives.
Supporting Information	Presents content related to quadratic equations that is aligned with the learning outcomes and learning objectives.
Work Steps	The LKPD includes step-by-step procedures for completing the worksheet activities.
Tasks	The LKPD contains tasks assigned to students, corresponding to the learning activities provided.
Assessment	Assessment is provided for each stage completed by students. These stages reflect learning steps based on Polya's Problem-Solving Process, integrated with indicators of reflective thinking skills.

In the design stage, the researcher began designing learning tools in the form of Student Worksheets (LKPD) based on the results of the needs analysis that had been

conducted previously. The product developed was an LKPD based on Polya's Problem Solving Process for quadratic equation material in grade 10. The researcher used a reference framework that focused on selecting material according to the character and competency demands, learning strategies, and evaluation used. Therefore, the researcher designed the quadratic equation material presented with problems as the starting point of learning.

In addition, the designed LKPD was also tested for suitability by experts, including material experts, language experts, and media experts, to ensure the validity of the content, presentation, and appearance. The LKPD design was developed by referring to the LKPD format proposed by the Ministry of National Education (2008), which consists of eight main elements. Details of these elements are presented in Table 4.

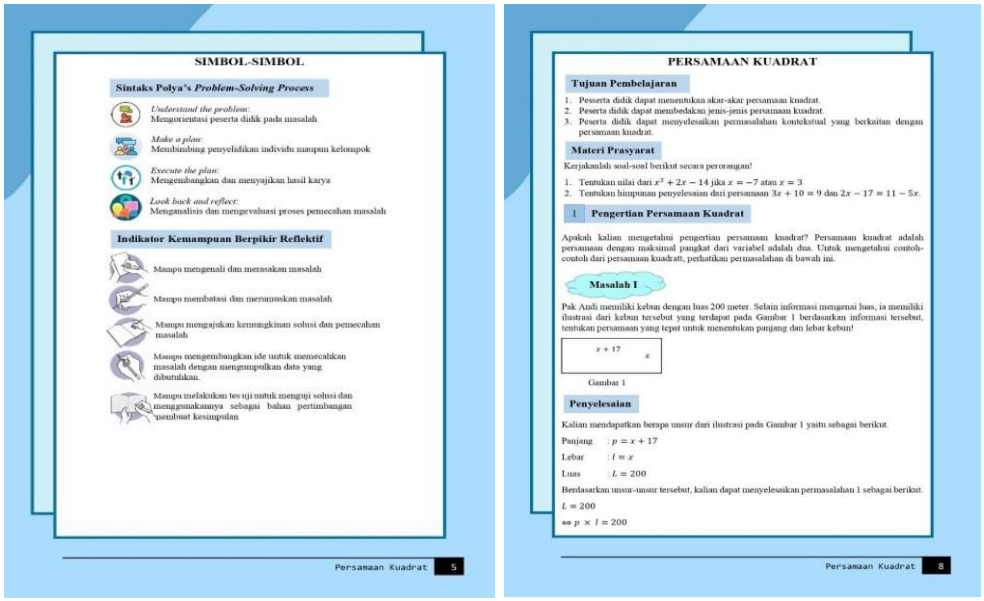

Figure 2. Sample of LKPD Content

In addition to the LKPD design, at this stage, the researcher also prepared a design for a reflective thinking ability test instrument, a learning motivation questionnaire, and various other instrument designs needed in LKPD development. At this stage, the researcher also began identifying potential validators. In this study, there were three product validators (LKPD). Details of the roles of each validator can be seen in Table 5.

Tabel 5. List of Research Validators

Validator	Description
KLN	Validation of the LKPD as a subject-matter expert.
AJ	Validation of the LKPD as a language expert.
HH	Validation of the LKPD as a media expert.

3. Development

At this stage, a validation process was carried out to assess the level of validity of the developed LKPD before the trial. Expert validation was carried out simultaneously on December 15, 2023. Mr. Dr. Karman La Nani, S.Pd., M.Si as a material expert, Ms. Ariyanti Jalal, S.Pd., M.Pd as a language expert, and Dr. Drs. H. Hasan Hamid, M.Si as a media expert. Then the researcher revised the LKPD according to the recommendations given by all

validators so that the product would be better and in accordance with the development objectives.

Validator	Description
KLN	It is recommended that the quadratic equation $2x^2 - 5x - 3 = 0$ be presented as a standard-form quadratic equation, $3m^2 + 9 = 0$ as a complete quadratic equation, and $4r^2 - 16 = 0$ as a perfect-square quadratic equation. For the example items involving a, b, and c, the instruction states "determine the values of a, b, and c," whereas these coefficients are already provided. Therefore, the instruction should be revised to "determine the roots of the quadratic equation.
AJ	All variables should be written in italic font. Correct all typographical errors.
HH	Revise the font used for the length and width labels in the rectangle diagram. The context of Problem 1 should be improved; create a problem that requires students to solve it using Polya's Problem-Solving Process. Replace the phrase "in the head" with "in the mind" or another more appropriate expression.

After the revisions were made, researchers assessed the validity of the LKPD quantitatively by calculating validation scores from material, language, and media experts. A tabulation of these validation scores is presented in the following table.

Tabel 6. Results of Material, Language, and Media Expert Validation

Validator	Score Obtained	Total Score	Score %	Category
KLN	64	68	94,12%	Highly Feasible
AJ	35	36	97,22%	Highly Feasible
HH	32	40	80,00	Feasible

The validation results showed that the LKPD was deemed very suitable, with an average score of 94.12% for material experts, 97.22% for language experts, and 80.00% for media experts. All validators gave a rating of "very good," thus the LKPD was declared valid in terms of content, language, and presentation. This illustrates that the content, language, and presentation components of the LKPD are in accordance with good learning principles and the characteristics of high school students. Validation by material experts ensures that learning content is relevant to the learning outcomes of the Independent Curriculum, while validation by language and media experts ensures the LKPD's readability and attractiveness as an interactive teaching material.

4. Implementation

In the implementation stage, the researcher conducted a product trial with students to evaluate the quality of the Student Worksheet (LKPD) from a practical aspect. The LKPD was tested on 25 students in class X-5. The group of students was given learning using Polya's Problem Solving Process-based LKPD for two meetings, followed by the administration of a student response questionnaire to assess the practicality of the LKPD. In the third (final) meeting, the researcher administered a reflective thinking ability test as well as a learning motivation questionnaire to assess the effectiveness of Polya's Problem Solving Process-based LKPD. After the learning process using Polya's Problem Solving Process-based LKPD was completed, the researcher distributed response questionnaires to teachers and students to evaluate the level of usability, ease, and clarity of the LKPD content in supporting the learning process.

Figure 3. Implementation of the Student Worksheet (LKPD)

The analysis showed that teacher responses scored 97.50% and student responses 97.29%, both of which fall into the "very good" category. This finding indicates that the developed student worksheets are highly practical for use in learning activities.

Tabel 7. Results of Teacher (Education Practitioner) Responses.

Validator	Score Obtained	Total Score	Score %	Category
NAA	39	40	97,50	Excellent

This high level of practicality reflects that teachers and students consider this LKPD easy to use, have clear instructions, and are able to motivate students to be active in the learning process. These results align with the findings of Adha & Refianti (2019) and Saraswati & Salsabila (2021), who reported that problem-solving-based learning tools are effective in increasing active student engagement and improving the quality of mathematics learning.

Furthermore, this LKPD provides students with the opportunity to think independently, collaborate with peers, and reflect on their learning outcomes. These characteristics align with the demands of 21st-century learning, which emphasize independence, creativity, critical thinking, and collaboration. By implementing this LKPD, students can more easily understand the concept of quadratic equations and demonstrate greater active involvement in the learning process. Therefore, this LKPD, based on Polya's Problem-Solving Process, is deemed suitable for further evaluation to assess its effectiveness in facilitating reflective thinking skills and student learning motivation. This effort is expected to improve the quality of mathematics learning at the secondary school level.

Tabel 8. Results of the Practicality Evaluation by Students.

Student Code	Total Score	Score Obtained	Score %	Category	Student Code	Total Score	Score Obtained	Score %	Categori
PD1	56	54	96,43	Excellent	PD14	56	51	91,07	Excellent
PD2	56	55	98,21	Excellent	PD15	56	55	98,21	Excellent
PD3	56	55	98,21	Excellent	PD16	56	52	92,86	Excellent
PD4	56	55	98,21	Excellent	PD17	56	54	96,43	Excellent
PD5	56	56	100,00	Excellent	PD18	56	54	96,43	Excellent
PD6	56	54	96,43	Excellent	PD19	56	56	100,00	Excellent
PD7	56	53	94,64	Excellent	PD20	56	56	100,00	Excellent
PD8	56	55	98,21	Excellent	PD21	56	55	98,21	Excellent
PD9	56	54	96,43	Excellent	PD22	56	55	98,21	Excellent
PD10	56	55	98,21	Excellent	PD23	56	54	96,43	Excellent
PD11	56	54	96,43	Excellent	PD24	56	56	100,00	Excellent
PD12	56	55	98,21	Excellent	PD25	56	55	98,21	Excellent
PD13	56	54	96,43	Excellent	**Average**	**1.400**	**1.362**	**97,29**	**Excellent**

This research is a developmental study in mathematics education. It aims to produce learning tools in the form of student worksheets (LKPD) based on Polya's problem-solving process to facilitate students' reflective thinking skills in quadratic equations. The

development method used is the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), which focuses on the first four stages: analysis, design, development, and implementation.

The first stage, analysis, involves collecting data to understand students' needs, goals, and characteristics. The researcher conducted interviews with mathematics teachers at a high school in Bandung. Based on these interviews, the researcher obtained several pieces of information, including the curriculum used at the high school, which follows the "Merdeka Curriculum" (an independent curriculum). Teachers need learning tools that can support more effective and efficient teaching and learning activities and motivate students. However, the availability of existing learning tools is not optimal in supporting teaching and learning activities. This aligns with surveys conducted by Fahrurrozi (2020) and Zagoto & Dakhi (2018). Learning activities still tend to be teacher-centered, and teachers are still textbook-oriented. Furthermore, observations also indicated that students exhibited low levels of reflective thinking skills and learning motivation. The results of the school needs analysis were then used by researchers as a reference in developing learning products. Based on these analyses, the researchers ultimately decided to develop student worksheets (LKPD) based on Polya's problem-solving process to facilitate students' reflective thinking skills.

The second stage is Design. At this stage, the researcher begins designing and drafting the product (LKPD). The LKPD structure generally consists of a title, learning instructions, learning outcomes, supporting information, tasks and work steps, and assessments (Depdiknas, 2008). Several LKPD components developed by the researcher include the cover, LKPD identity, foreword, table of contents, symbols, concept map, learning activities section, bibliography, and author profile. The material in the LKPD consists of quadratic equations. The LKPD was designed using Canva.com. After completion, the design was saved as a PDF and printed on A4 paper. Following the Design stage, the third stage is Development. At this stage, the researcher created an assessment instrument to validate the previously designed LKPD draft. Furthermore, the researcher also created a research instrument needed for product trials. Expert validation results showed that the average score from material experts was 95%, categorized as "very good," the score from language experts was 94.44%, categorized as "good," and the score from media experts was 97.5%, categorized as "very good." This indicates that the developed Polya-based student worksheet (LKPD) is "valid" or suitable for use (Rahayu & Budiyono, 2018; Safrida et al., 2016).

Building upon the successful validation in the Development stage, the fourth stage, Implementation, involves the researcher conducting a product trial. After the LKPD was declared suitable for use, the researcher then conducted a trial of the LKPD with a group of 10th-5th grade students at a high school in Bandung. The trial (research) involved two meetings for teaching and learning activities and one meeting to test students' reflective thinking skills. The results of the teacher response questionnaire showed an average score of 97.50%, categorized as "very good." The results of the student response questionnaire showed an average score of 97.29%, categorized as "very good." Therefore, the developed LKPD was deemed practical for use (Nurliawaty et al., 2017).

The principle that a developed product must meet the criteria of validity, practicality, and effectiveness serves as a fundamental guideline commonly applied across various fields, such as product development, research, and innovation. This principle emphasizes that a product is not only required to meet established quality standards but must also be practically applicable and capable of generating significant positive impact (Mesra, 2023). Thijs & Van Den Akker (2009). further asserts that every effort in product development or innovation must satisfy these three criteria to be considered feasible for implementation.

The developed Student Worksheet (LKPD) possesses distinctive characteristics compared to conventional LKPD. It is structured according to the stages of Polya's Problem

Solving Process, which not only aids students in understanding quadratic equations but also provides more organized and reflective learning activities to foster higher-order thinking skills (Hartati, 2019; Rachman, 2025). Research findings indicate that the Student Worksheet meets eligibility criteria for both validity and practicality. This is substantiated by expert validation data and practicality test results derived from teacher and student questionnaires administered during the learning process. These results suggest that the Student Worksheet is suitable for implementation in the subsequent development phase, specifically the evaluation stage, to assess its effectiveness in facilitating grade 10 students' reflective thinking skills regarding quadratic equations.

D. Conclusion

Based on the results of the research and discussion that have been conducted, it can be concluded that the Student Worksheet (LKPD), based on Polya's Problem Solving Process, which was developed, has met the valid and practical criteria to facilitate students' reflective thinking skills on the quadratic equation material at SMA Negeri 9 Bandung City. The validation results show that the LKPD obtained a score of 94.12% from material experts, 97.22% from language experts, and 80.00% from media experts, which overall are in the category of adequate to very adequate, indicating that the content, language, and appearance of the LKPD are in accordance with the standards for developing good learning tools. From the practical aspect, the results of the limited trial showed a score of 97.50% from teacher responses and 97.29% from student responses, both of which are classified as very good, so the LKPD is considered easy to use, clear in presentation, and able to motivate students to actively think and be involved in the learning process.

Thus, Polya's Problem Solving Process-based Student Worksheet (LKPD) is suitable for use in the evaluation stage to assess its effectiveness in facilitating students' reflective thinking skills. In the future, the development of this LKPD is expected to be expanded to facilitate various other higher-order thinking skills, such as critical thinking, mathematical communication, and creative problem solving. Furthermore, the application of similar LKPD can be adapted to various other mathematics learning materials, thereby enriching learning strategies oriented towards developing 21st-century competencies. The results of this study are also expected to serve as a reference for educators and curriculum developers in designing contextual, reflective learning tools that foster student independence and creativity.

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