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Training High School Students to Think Creatively through Vlog Learning Tools Based on Local Wisdom in Kampung *Semanggi* Oriented towards Project-Based Learning

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ABSTRACT

Purpose - This study aims to develop a valid, practical, and effective Vlog-based learning tool, integrated with the local wisdom of Kampung Semanggi Surabaya, to train high school students' creative thinking skills in ecosystem materials.

Methodology - This research is a development study using the ADDIE model, which comprises five stages: Analysis, Design, Development, Implementation, and Evaluation. The tools developed include teaching modules, student worksheets, Vlog media, and pretest-posttest instruments. The research subjects consisted of three expert validators, field observers, and 10th-grade high school students in the trial stage. Data were collected through validation sheets, observation sheets, and creative thinking skills tests. Data analysis was performed using percentages for validity and practicality and N-Gain calculations for effectiveness.

Findings - The results showed that the teaching modules, Vlog media, LKPD, and test instruments achieved 93.50%, 88.50%, 89.00%, and 88.25%, respectively, all in the highly valid category. The results of the practicality test, based on the implementation of learning, showed an average implementation of 97.7% and a highly practical rating. The effectiveness test results showed an increase in students' creative thinking skills, as indicated by pretest-posttest scores, with an N-Gain value in the moderate range.

Contribution - This study contributes to the development of a local wisdom-based biology learning tool that integrates digital media and the PjBL model, which has been proven effective in training students' creative thinking skills.

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INTRODUCTION

21st-century education requires students not only to master concepts but also to develop higher-order thinking skills to prepare for dynamic global challenges. Biology learning at the senior high school level has a strategic role in equipping students with 21st-century competencies, particularly higher-order thinking skills (Widodo et al., 2020; Rahmawati & Ridwan, 2020). One important higher-order thinking skill to develop is creative thinking. Creative thinking enables students to generate diverse (fluency), flexible (flexibility), original (originality), and elaborate ideas (elaboration) in facing and solving contextual problems (Torrance, 2008). This skill is an important requirement for addressing dynamic, complex global challenges in the 21st century (OECD, 2021; Sani, 2020). However, despite its importance, the development of creative thinking skills in biology learning has not been optimally achieved in actual classroom practices, indicating a gap between expected competencies and real learning conditions.

However, various studies show that biology learning in schools still tends to be oriented towards mastery of concepts and memorization, thereby not fully providing students with space to develop their creativity optimally (Widodo et al., 2020; Pratiwi et al., 2021). Teacher-centered learning with minimal contextual activities leads students to be less actively involved in the learning process and less skilled at generating creative ideas (Putri et al., 2022). This condition reflects a real problem in the field where students' creative thinking skills remain relatively low and learning activities are less meaningful. Therefore, learning innovations are needed that are not only well-designed theoretically but also proven effective in improving students' creative thinking skills. Thus, previous studies have identified the problem, but efforts to provide integrated, context-specific solutions remain limited.

One learning model that is considered relevant for training creative thinking skills is Project-Based Learning (PjBL) (Wahyuni & Rahayu, 2021). The PjBL model emphasizes students' active involvement in designing, implementing, and evaluating projects arising from real problems in the surrounding environment (Shiyamsyah et al., 2024; Kokotsaki et al., 2021). Through project-based learning, students can explore ideas, develop alternative solutions, and produce meaningful, authentic products. Several studies show that the application of PjBL is effective in improving students' creative, problem-solving, and higher-order thinking skills in science and biology learning (Putri et al., 2025; Wahyuni & Rahayu, 2021; Aminah et al., 2024). These studies indicate that PjBL has been widely researched and proven effective; however, most studies still implement PjBL in a general context without integrating local wisdom and digital media simultaneously. These findings indicate that the PjBL model is not only conceptually relevant but also has the potential to improve learning outcomes when implemented through systematically designed learning tools.

Ecosystem material is one of the biology materials that are highly relevant to develop through a contextual, environment-based approach. Because ecosystem material has a broad, real-world conceptual scope, students need guidance in discovering concepts independently through student-centered learning (Sari & Purnomo, 2023). In addition, the development of project-based learning tools on ecosystems can encourage higher-order thinking skills, such as problem-solving in real-world contexts faced by students (Indi Safitri & Purnomo, 2025). Therefore, integrating real-world contexts into ecosystem learning is important so that students can relate biological concepts to phenomena they encounter in their daily lives (Rahmawati & Ridwan, 2020; Putri et al., 2022). Nevertheless, the use of real-world contexts in ecosystem learning is not yet optimally incorporated into classroom practices.

The relationship between local wisdom and creative thinking is very relevant in PjBL-based learning. Local wisdom, with its values and knowledge embedded in the community's culture, provides a basis for students to develop creative ideas to address learning challenges. According to Brown & Duguid (2001), local wisdom can foster creativity by enriching thinking through real experiences in the community. The integration of local wisdom into learning encourages students not only to master scientific concepts but also to understand their context and real-world applications in everyday life. This aligns with research by Smith et al. (2013), which shows that context-based learning can enhance students' creativity in formulating solutions to the

problems they face. However, previous studies generally integrate local wisdom only as contextual examples and do not fully integrate it with structured learning models and digital media.

One form of local wisdom in Surabaya with potential to serve as a source of biological learning is the Semanggi Suroboyo culinary specialty. Semanggi Suroboyo is not only known as a traditional food but has also become a local cultural identity and icon of the city of Surabaya. This culinary specialty uses water clover (Marsilea crenata L.) as its main ingredient, an aquatic plant that inhabits shallow water ecosystems and wetlands. The use of water clover as a local food ingredient reflects the interaction between biotic and abiotic components in an ecosystem and the community's sustainable use of natural resources (Rahayu, 2019; Hidayati et al., 2021). Thus, this local wisdom has strong potential as an authentic learning resource, although its use in formal biology learning remains limited.

Water clover (Marsilea crenata L.), the main ingredient of Semanggi Suroboyo, is cultivated by the community in Kampung Semanggi Surabaya. Kampung Semanggi serves as a center for water clover cultivation and is the main supplier for Semanggi Suroboyo sellers, with most of the community working as water clover farmers. By utilizing this local wisdom, learning about ecosystems can encourage students to develop creative solutions to community problems. This condition makes Kampung Semanggi an authentic learning environment relevant to studying ecosystem concepts, ranging from ecosystem structure and interactions between living things to the utilization of natural resources based on local wisdom (Putri et al., 2022). Authentic learning environments like this can enhance learning effectiveness by directly exposing students to the real context being studied. However, integrating such authentic environments into structured learning tools is still rarely done in previous studies.

Along with the development of digital technology, the use of technology-based learning media has become an alternative to improve the quality of biology learning. Digital technology-based learning media in the form of video blogs (Vlogs) have proven relevant and useful in biology learning because they can present content in a contextual, visual, and more engaging way for students (Rohmatin & Wisanti, 2023). In line with Vygotsky's (1978) constructivist theory, the use of Vlog media enables students to construct their own knowledge through direct experiences relevant to their lives. Even so, the use of Vlog media in learning is often still implemented separately from learning models and local context integration.

Vlog media, as a form of audiovisual media, allows the presentation of real phenomena in a contextual manner through direct visualization in the surrounding environment. The use of Vlog media in biology learning has been shown to increase learning motivation and student engagement and to support the development of creative thinking skills in project-based learning (Oviana et al., 2024; Elisma et al., 2025). Thus, the integration of Vlog media in PjBL-oriented learning tools is not only expected to be valid in design but also effective in improving students' creative thinking skills. However, studies that specifically examine the integrated use of Vlog media, PjBL, and local wisdom in a single comprehensive learning tool are still very limited.

The novelty of this research lies in the development of Project-Based Learning (PjBL) learning tools integrated with Vlog media and the local wisdom of Kampung Semanggi Surabaya on ecosystem material. This research offers a new approach that combines local wisdom as a learning resource in the context of technology-based biology learning, particularly in the use of Vlog media to improve students' creative thinking skills. The combination of project-based learning, Vlog media, and local wisdom provides an innovation that has not been widely applied in biology learning at the high school level, both in Indonesia and abroad. This study also fills the gap in previous studies that focused more on the separate use of PjBL and digital media by integrating the two into a systematic learning model. Therefore, this study positions itself as a development and validation study that bridges the gap between theory and practice in the context of technology-based biology learning.

The development of PjBL-based learning integrated with Vlog media and local wisdom requires high-quality, systematic learning tools, including teaching modules, student worksheets (LKPD), learning media, and assessment instruments. The learning tools developed must be able to accommodate the characteristics of

the PjBL model and indicators of creative thinking skills in an integrated manner. Before the learning tools are implemented in learning activities, a validation process is required to ensure the suitability of the content, presentation, language, construction, and integration with the learning objectives (Plomp & Nieveen, 2020; Akker et al., 2023). This stage is crucial to ensure that the developed product is theoretically sound and feasible for implementation.

However, valid learning tools are not necessarily practical and effective if their impact on improving student abilities has not been tested. Therefore, in addition to testing validity, this study also examines the practicality and effectiveness of learning tools through observation of implementation and analysis of improvements in students' creative thinking skills based on pretest and posttest results. Finally, to test its effectiveness, it is important to ensure that the Vlog-based learning tools, integrated with the local wisdom of Kampung Semanggi and oriented towards Project-Based Learning, are truly capable of significantly improving high school students' creative thinking skills in the subject of ecosystems. This comprehensive evaluation is necessary to ensure that the developed learning tools are not only valid but also applicable and impactful in real classroom settings.

Based on the above description, this study aims to assess the validity, practicality, and effectiveness of a Vlog-based learning tool, oriented towards Project-Based Learning, on ecosystem material to train high school students' creative thinking skills. Specifically, this study aims to (1) determine the validity of the developed learning tools, (2) analyze their practicality in classroom implementation, and (3) evaluate their effectiveness in improving students' creative thinking skills.

METHODOLOGY

Research Design

This study used the Research and Development (R&D) method with the ADDIE model, which comprises five stages: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009; Aman et al., 2025). The Analysis stage was conducted by identifying learning problems, analyzing curriculum needs, student characteristics, and the potential of Kampung Semanggi Surabaya as a source of ecosystem learning based on local wisdom. The Design stage involved preparing the Vlog media storyboard and script, designing Project-Based Learning (PjBL) activities, and developing research instruments and learning tools. The Development stage focused on producing and editing the Vlog media, integrating ecosystem materials and local wisdom content, and conducting expert validation, followed by revisions based on validators' suggestions. The Implementation stage was carried out through classroom trials in which students accessed the Vlog media through QR Codes, conducted project activities, and participated in learning using the PjBL model. At the same time, the researcher observed the implementation of the learning and collected data using pre- and posttests.

Meanwhile, the Evaluation stage involved analyzing the validity, practicality, and effectiveness of the developed media, reflecting on weaknesses, and revising the product to improve its quality. The development in this study resulted in a product: a Vlog on the ecosystem of Kampung Semanggi, Surabaya, based on local wisdom. The ADDIE development model stages used in this study are illustrated in Figure 1 below.

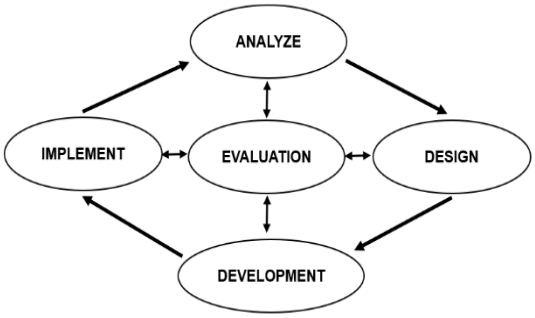

Figure 1. Stages of the ADDIE development model

Participant

Participants in this study included validators, observers, and students involved in the trial phase of the learning tools under development. The validation process involved three experts, comprising two lecturers in biology education and one senior high school biology teacher. These validators were selected based on their expertise in biology education, instructional media, and curriculum implementation to assess the validity of the developed learning tools. The trial phase involved 36 tenth-grade students from a senior high school (SMA Labschool Unesa Surabaya). The participants were selected using a purposive sampling technique, considering that the class had heterogeneous academic abilities and had studied ecosystem material, making it suitable for testing the developed learning tools. The students were generally aged 15-16 and represented diverse levels of prior knowledge and creative thinking skills. In addition, three observers were involved in this study. The observers were trained individuals responsible for monitoring the implementation of the learning process using the developed Vlog-based learning tools. Each observer was assigned to observe student activities and the implementation of Project-Based Learning (PjBL) stages during classroom sessions using structured observation sheets. The observers' role was to ensure objective data collection on the practicality of the learning tools by recording the extent to which the learning activities were carried out in accordance with the planned procedures. The observers also provided data on student engagement, participation, and the overall implementation of the learning process.

Data Collection

Data collection in this study was conducted systematically in accordance with the ADDIE model's stages, including validation, implementation, and evaluation. The data were collected through device validation sheets, implementation observation sheets, and pretest–posttest instruments of creative thinking skills. The overall data collection procedure was carried out chronologically as follows:

Device Validation Sheet

At the development stage, the initial draft of the learning tools, including teaching modules, student worksheets (LKPD), Vlog media, and assessment instruments, was validated by three experts (two biology education lecturers and one biology teacher). The validators assessed the learning tools using validation sheets covering aspects of content feasibility, presentation, language, and alignment with the Project-Based Learning (PjBL) model and creative thinking indicators. The validation results were then analyzed to determine the validity level and used as a basis for revising the learning tools before implementation.

Pretest of Creative Thinking Skills

Before the learning, students were given a pretest to assess their initial creative thinking skills. The test consisted of multiple-choice and essay questions designed based on four indicators of creative thinking: fluency, flexibility, originality, and elaboration. The pretest results served as baseline data for comparison with the posttest results.

Implementation Observation Sheet

During the implementation stage, the learning process using Vlog-based learning tools oriented towards Project-Based Learning (PjBL) was conducted over three meetings. Observations were carried out by three observers using structured observation sheets. The observers recorded the implementation of each stage of PjBL, student activities, and the overall learning process to assess the practicality of the developed learning tools.

Posttest of Creative Thinking Skills

After completing the learning process, students were given a posttest using the same indicators as the pretest to assess improvements in their creative thinking skills.

Data Flow of Collection

Overall, the data collection flow began with the validation of learning tools, followed by the administration of the pretest, the implementation of learning with observation, and ended with the posttest. This sequence was designed to ensure that the data obtained could comprehensively describe the validity, practicality, and effectiveness of the developed learning tools.

Instruments

The research instrument consisted of validation sheets for each learning device. The validation sheets for teaching modules and student worksheets covered aspects of content feasibility, presentation feasibility, and linguistic feasibility. The validation sheets for Vlog media covered aspects of content feasibility, presentation feasibility, linguistic feasibility, and suitability with the PjBL model and creative thinking indicators. The pretest-posttest instrument validation sheet covers aspects of material feasibility, construction, and language. Assessment uses a 1-4 Likert scale, with 1 indicating very poor and 4 indicating very good.

The PjBL-based Vlog implementation observation sheet contains observation aspects to assess the implementation of student activities in using the developed Vlog media. Three observers carried out the observation. There were four groups, each consisting of five members. One observer observed two groups. Each observer was given an observation sheet to assess the implementation of PjBL-based Vlog media during the learning process. The implementation observation sheet was adjusted based on the activities outlined in the media.

The pretest and posttest instruments were designed to measure both students' cognitive understanding and creative thinking skills. The pretest was administered before the learning process to assess students' initial understanding, while the posttest was administered after the learning process to evaluate learning outcomes. The cognitive aspect consisted of seven multiple-choice questions on ecosystem concepts. In contrast, creative thinking skills were assessed through four essay questions based on four key indicators: fluency, flexibility, originality, and elaboration. Fluency refers to students' ability to generate multiple relevant ideas or answers to a given problem; flexibility refers to the ability to produce varied ideas or approaches from different perspectives; originality refers to the ability to produce unique or uncommon responses compared to typical answers; and elaboration refers to the ability to develop and detail ideas into more comprehensive and structured explanations. Each essay item was designed to assess these indicators, enabling students to demonstrate their ability to propose solutions to ecosystem-related problems grounded in Kampung Semanggi's local context. The instruments were developed in accordance with the Ministry of Education and Culture's (2015) guidelines for upper secondary assessment.

Data Analysis

Data Analysis for Learning Tool Validation

The validity analysis uses quantitative descriptive methods to determine the validity of PjBL-based learning media. The assessment results from experts related to the developed media determine the validity of the learning model by looking at the answer scores and adjusting them to the categories below:

Table 1. Likert Scale

Assessment Score	Category
1	Strongly disagree
2	Disagree
3	Agree
4	Strongly Agree

(Source: Riduwan, 2013)

The validity value of each validator is calculated first, then the combined validity is calculated using the following formula:

$$V = \frac{Va^1 + Va^2 + Va^3}{3} = \cdots \% \quad (1)$$

In this study, the combined validity (V) represents the overall validity score obtained from all validators. The validity scores include Va_1, the validity assessed by the content expert; Va_2, the validity assessed by the media expert; and Va_3, the validity assessed by the biology teacher. Validity is calculated by comparing the empirical total score (TSe) obtained from the validation results with the maximum expected score (TSh). The combined validity value is then calculated to determine the overall level of validity of the developed learning tools.

The validity value of each validator is obtained by comparing the total empirical score (TSe) with the total maximum score (TSh) and then converting the result to a percentage. Next, the combined validity value is computed as the average of all validators' validity values. The combined validity calculation results are then confirmed against the validity level criteria presented in Table 2 below.

Table 2. Validity Categories

Assessment Score	Category
81–100%	Highly Valid
61–80	Valid
41–60	Fairly Valid
≤40	Less Valid

(Source: Riduwan, 2021)

This analysis was obtained using a validation sheet equipped with validation criteria. Vlog media is categorized as valid if its validity is ≥ 70%.

Practicality of Media Data Analysis

The implementation of learning tools was analyzed using descriptive and quantitative analysis techniques. Learning was evaluated against several predetermined criteria. The learning implementation data were compiled in an observation table, which was scored or assessed using the scoring criteria in Table 3.

Table 3. Guttman Scale Criteria

Answer	Score
Yes	1
No	0

(Source: Riduwan, 2013)

The feasibility data analysis is expressed in percentages calculated using the following formula:

$$skor\ keterlaksanaan\ (\%) = \frac{skor\ total\ yang\ diperoleh}{skor\ maksimal} \times 100\% \quad (2)$$

The percentage obtained is then interpreted based on the criteria in the following table:

Table 2. Implementation Score Interpretation Criteria

Practicality Criteria	Practicality Level
85.01% - 100%	Very practical
70.01% - 85	Practical
50.01% - 70	Fairly practical
25.01% - 50	Less practical
0.00% - 25	Not practical

(Source: Riduwan, 2013)

Based on the scoring criteria, PBL-based vlogs can be considered practical if ≥ 70%.

Analysis of the Effectiveness of Learning Tools

The effectiveness of Vlog media in improving students' creative thinking skills is determined from *pretest* and *posttest* scores. According to Hake (1999), improvements in student learning outcomes before and after treatment can be determined using a normalized gain score (g) calculated as follows.

$$g = \frac{(\text{S posttest}) - (\text{S pretest})}{Smaks - (S\ pretest)} \quad (3)$$

In this study, the normalized gain score (g) was used to assess improvement in students' learning outcomes from the pretest to the posttest. The value of g represents the increase in students' scores after the learning intervention. The posttest score (S posttest) is the score students obtain after the learning process, while the pretest score (S pretest) is the score they obtain before the intervention. The maximum score (S maks) is the highest possible score on the test. The normalized gain score was calculated to determine the extent of improvement in students' creative thinking skills after the implementation of the developed learning tools. The normalized *gain score* data is then analyzed using the categories in the following table.

Table 5. Normalized Gain Score (g) Category

Answer	Score
(g) > 0.7	High
0.3 > (g) > 0.7	Medium
(g) < 0.3	Low

(Source: Hake, 1999)

Learning is considered effective if the N-gain score is ≥ 0.4 according to Hake's criteria (1999). Students are considered to have improved their creative thinking skills if their test scores have increased, even though they have not yet reached the KKTP set by the school.

FINDINGS

Validity

Learning modules/tools developed. Validation was conducted by two expert lecturers (subject-matter and media experts) and one biology teacher using a 1-4 Likert scale. Validation was carried out on learning tools, including Teaching Modules, Vlog Media, LKPD, and Pre-test-Post-test Questions. The Teaching Module was validated based on three aspects: the feasibility of the presentation, the content, and the language. The Vlog Media was validated based on four aspects: content feasibility, presentation, language, and suitability with PjBL & creative thinking. The validation of the LKPD was reviewed from three aspects: feasibility of presentation, content, and language. The validation of the Vlog Media was reviewed from four aspects: content, presentation, language, and suitability with PjBL & creative thinking. The validation of the Pretest-Posttest Questions was reviewed from three aspects: feasibility of the material, construction, and language.

Table 6. Recapitulation of Teaching Module Validation Results

No	Assessed Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Average aspect (%)	Category
Content Feasibility						
1	Teaching Module Components	100,00	90,50	90,50	93,75	Very Valid
2	Project-Based Learning Aspect	100,00	87,50	100,00	95,75	Very Valid
3	Creative Thinking Aspect	100,00	75,00	93,75	89,50	Very Valid
Average		100,00	86,75	94,00	93,50	Very Valid

No	Assessed Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Average aspect (%)	Category
Presentation Feasibility						
5	Teaching Module Display	100,00	87,50	87,50	91,75	Very Valid
6	Layout Quality	100,00	81,25	75,00	85,50	Very Valid
7	Text Quality	100,00	100,00	100,00	100,00	Very Valid
Average		100,00	87,50	87,50	91,75	Very Valid
Language Feasibility						
8	Language Usage	100,00	81,25	100,00	93,75	Very Valid
9	Terminology Usage	100,00	91,75	100,00	97,25	Very Valid
Average		100,00	83,25	100,00	94,50	Very Valid
Overall Average		100,00	87,50	92,75	93,50	Very Valid

The teaching module achieved a feasibility percentage of 93.50%, indicating that it met the requirements for content, presentation, and language. Based on the results of the teaching module validation by three validators, all assessment aspects were found to be in the valid-to-highly valid category. The content feasibility aspect received the highest score from the three validators, indicating that the teaching module aligned with the curriculum requirements, the Project-Based Learning model, and the creative thinking indicators. The Project-Based Learning and creative thinking aspects also received high scores, indicating that the PjBL syntax and creativity indicators have been well integrated into the teaching module. The teaching module was assessed as containing complete learning components aligned with the PjBL model and as capable of fostering students' creative thinking skills.

Table 7. Recapitulation of Vlog Media Validation Results

No	Assessed Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Average aspect (%)	Category
Content Feasibility						
1	Coverage and Accuracy of Vlog Material	100,00	75,00	100,00	91,75	Very Valid
2	Kemutakhiran penggunaan media Vlog	100,00	75,00	100,00	91,75	Very Valid
3	Developing Skills and Curiosity	100,00	75,00	75,00	83,25	Valid
Average		100,00	75,00	91,75	89,00	Very Valid
Presentation Feasibility						
4	Suitability of Vlog Presentation Techniques	100,00	75,00	100,00	91,75	Very Valid
5	Suitability of Media Display	100,00	75,00	75,00	83,25	Valid
6	Communicative Aspect of Presentation	100,00	75,00	100,00	91,75	Very Valid
7	Audio Suitability	100,00	75,00	100,00	91,75	Very Valid
8	Suitability of Media Usage	100,00	75,00	75,00	83,25	Valid
Average		100,00	75,00	92,75	89,25	Very Valid
Language Feasibility						
9	Language Structure	100,00	75,00	100,00	91,75	Very Valid
10	Use of Terms and Symbols	100,00	75,00	100,00	91,75	Very Valid
Average		100,00	75,00	100,00	91,75	Very Valid
PjBL & Creative Thinking						
11	Suitability with Project-Based Learning (PjBL)	100,00	75,00	100,00	91,75	Very Valid
12	Fluency	100,00	75,00	75,00	83,25	Valid
13	Flexibility	100,00	75,00	75,00	83,25	Valid
14	Originality	100,00	75,00	75,00	83,25	Valid
15	Elaboration	100,00	75,00	75,00	83,25	Valid

No	Assessed Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Average aspect (%)	Category
Average		100,00	75,00	85,00	86,75	Very Valid
Overall Average		100,00	75,00	90,25	88,50	Very Valid

The Vlog learning media (Figure 2) obtained a feasibility percentage of 88,50% with a very valid category. The Vlog media was assessed to have presented contextual content on the ecosystem based on the local wisdom of Kampung Semanggi Surabaya, to have good visual and audio quality, and to be in accordance with the PjBL learning stages and creative thinking indicators.

Figure 2. Vlog learning media

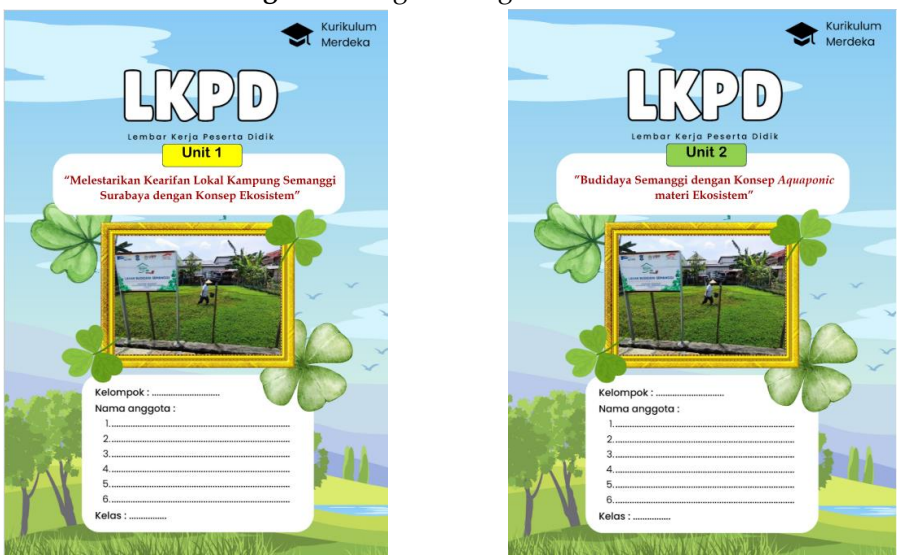

Figure 3. LKPD cover

Table 8. Recapitulation of LKPD Validation Results

No	Assessed Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Average aspect (%)	Category
Content Feasibility						
1	LKPD Components	100,00	90,00	100,00	96,75	Very Valid
2	Material Concept Quality	100,00	75,00	100,00	91,75	Very Valid
3	Project-Based Learning Aspect	100,00	79,25	91,75	90,25	Very Valid
4	Creative Thinking Aspect	100,00	75,00	75,00	83,25	Valid
Average		100,00	82,25	92,75	91,75	Very Valid

No	Assessed Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Average aspect (%)	Category
Presentation Feasibility						
5	LKPD Display	100,00	68,75	81,25	83,25	Valid
6	Layout Quality	100,00	75,00	81,25	85,50	Very Valid
7	Text Quality	100,00	68,75	75,00	81,25	Valid
Average		100,00	68,75	83,25	84,00	Valid
Language Feasibility						
8	Language Usage	100,00	68,75	100,00	89,50	Very Valid
9	Terminology Usage	100,00	75,00	100,00	91,75	Very Valid
Average		100,00	70,75	100,00	90,25	Very Valid
Overall Average		100,00	75,00	92,00	89,00	Very Valid

The LKPD obtained a feasibility percentage of 89,00% with a highly valid category. The LKPD was assessed as having facilitated students in carrying out project stages, from planning and implementation to project evaluation, as well as in developing creative thinking indicators in the form of fluency, flexibility, originality, and elaboration.

Table 9. Recapitulation of Pretest and Posttest Validation Results

No	Assessed Aspect	Validator 1 (%)	Validator 2 (%)	Validator 3 (%)	Average aspect (%)	Category
Material Feasibility						
1.	Suitability of Questions with Indicators and Learning Objectives	100,00	87,50	75,00	87,50	Very Valid
Construction Feasibility						
2.	Clarity of Question Formulation and Assessment Rubric	100,00	75,00	81,25	85,50	Very Valid
Language Feasibility						
3.	Clarity and Accuracy of Question Language	100,00	75,00	100,00	91,75	Very Valid
Overall Average		100,00	79,25	85,50	88,25	Very Valid

The pretest and posttest instruments obtained a feasibility percentage of 88,25% and were rated as very valid. The assessment instruments were considered to be in accordance with the learning objectives and creative thinking indicators, and they used clear, easy-to-understand language for students.

Practicality

The practicality of the Vlog media was reviewed based on the learning implementation observed during three meetings, using an implementation observation sheet. The observation was conducted to determine the extent to which learning activities using Project-Based Learning (PjBL)-based Vlog media could be carried out in accordance with the prepared learning plan.

Table 10. Results of Learning Implementation in Meeting 1

Learning Stage	Implementation Percentage (%)	Category
Preliminary Activities	100%	Very Practical
Main Activities	95%	Very Practical
Closing Activities	100%	Very Practical
Average	98%	Very Practical

Based on the observation results, the average practicality score for Meeting 1 was 98%, placing it in the "Very Practical" category. The first meeting lasted 2 JP (2 × 40 minutes) and included introductory activities,

core activities (Phases 1–3 of PjBL), and closing activities. All stages of learning were carried out well. Students were able to access the Vlog media through QR Codes, watch the videos enthusiastically, and actively participate in group discussions to determine projects and plan the steps for their completion. Teachers also played an active role in guiding and directing students during the learning process.

Table 11. Results of Learning Implementation in Meeting 2

Learning Stage	Implementation Percentage (%)	Category
Preliminary Activities	100%	Very Practical
Main Activities	90%	Very Practical
Closing Activities	100%	Very Practical
Average	97%	Very Practical

Based on the observation results, the average practicality score for Meeting 2 was 97%, which is categorized as "Very Practical." The second meeting was held for 1 JP (1 × 40 minutes) and focused on Phase 4 of Project-Based Learning, namely, teacher monitoring and project progress. The observation results showed that the learning activities were carried out well. Students were active in carrying out the clover cultivation project using the aquaponics concept and documented their activities for the vlog. Teachers consistently monitored, guided, and assisted students who encountered difficulties.

Table 12. Results of Learning Implementation in Meeting 3

Learning Stage	Implementation Percentage (%)	Category
Preliminary Activities	100%	Very Practical
Main Activities	95%	Very Practical
Closing Activities	100%	Very Practical
Average	98%	Very Practical

Based on the observation results, the average practicality score for Meeting 3 was 98%, which is categorized as "Very Practical." The third meeting was held for 2 JP (2 × 40 minutes) and covered Phases 5 and 6 of Project-Based Learning, namely report writing, presentation, project publication, and evaluation of the project process and results. Based on the observation results, the students were able to present the project results well, show the Vlogs they had made, and reflect on and evaluate the learning process. The posttest activity was also carried out as planned. A summary of the learning outcomes is presented in Figure 4 below.

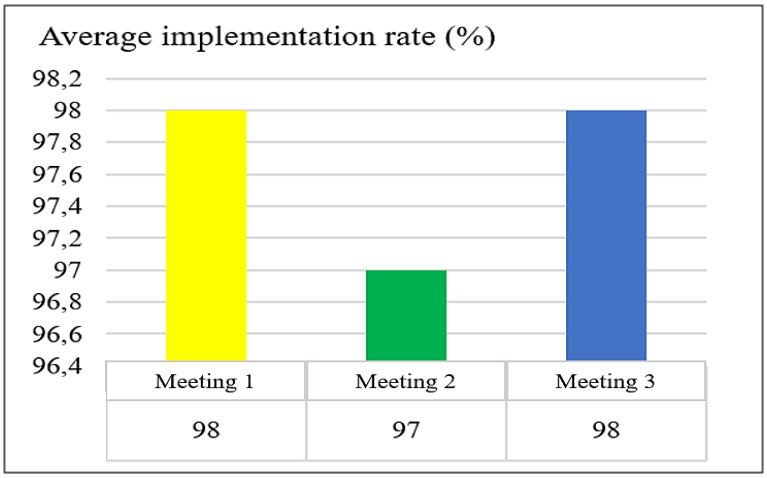

Figure 4. Recapitulation of learning implementation for each meeting

Based on the practicality test conducted during the learning implementation, an average implementation rate of 97.7% was achieved, with a rating of very practical. This shows that the Vlog media based on the local wisdom of Kampung Semanggi Surabaya, using the Project-Based Learning (PjBL) model, is easy to use, supports the implementation of learning according to the plan, and helps teachers and students carry out learning activities optimally.

Effectiveness

Students' creative thinking skills were measured through a creative thinking test administered before (*pretest*) and after (*posttest)* learning using the Vlog media based on the local wisdom of Kampung Semanggi Surabaya and the developed learning tools. This test aimed to determine the improvement in students' creative thinking skills after participating in learning using the Project-Based Learning (PBL) model.

Based on the analysis, the average pretest score for creative thinking skills was 49.36, while the average *posttest* score increased to 67.64. This increase indicates an improvement in students' creative thinking skills after the application of Vlog media in learning. The results of the N-gain calculation for students' creative thinking skills are presented in Table 4 below.

Table 6. Recapitulation of Pretest, Posttest, and N-gain Results for Creative Thinking Skills

Description	Score
Number of students	36
Pretest average	49.36
Posttest average	67.64
Maximum score	100
N-gain	0.36
Improvement category	Moderate

Based on Table 6, the N-gain value of 0.36 falls within the moderate category, indicating that learning using Vlog media grounded in the local wisdom of Kampung Semanggi Surabaya, with the Project-Based Learning model, significantly improves students' creative thinking skills. However, it has not yet reached the high category. Thus, the developed Vlog media is quite effective in training students' creative thinking skills.

Table 7. Recapitulation of N-gain Creative Thinking Ability per Indicator and Standard Deviation

Creative Thinking Indicators	Pretest Average	Posttest Average	N-gain	Standard Deviation	Category
Fluency	6,9	9,5	0,39	1,18	Moderate
Flexibility	6,4	10,2	0,41	4,59	Moderate
Originality	7,1	11,8	0,51	7,24	Moderate
Elaboration	6,5	11,4	0,52	8,35	Moderate
Overall average	49,36	67,64	0,36	5,34	Moderate

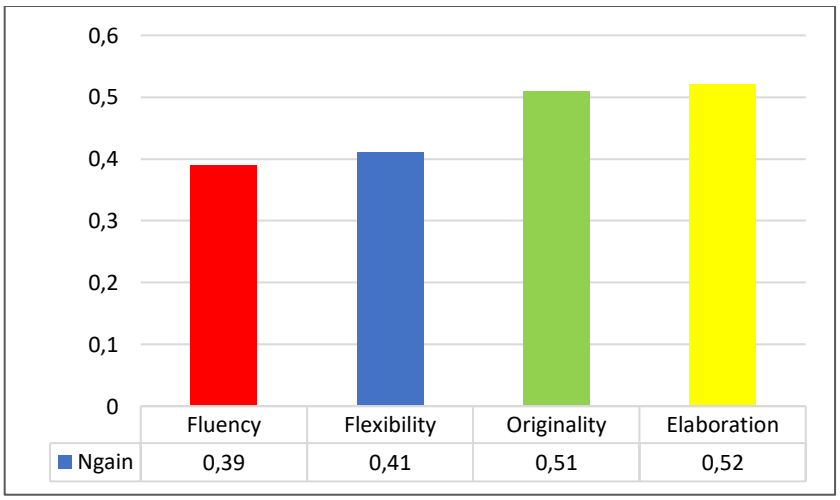

Figure 5. N-gain in Creative Thinking Ability per Indicator

Based on Table 7 and Figure 5, all indicators of creative thinking skills increased after learning using Vlog media based on the local wisdom of Kampung Semanggi Surabaya. The highest N-gain values were found in the elaboration and originality indicators, indicating that students were able to develop ideas in greater detail

and produce more original ideas through project activities. Meanwhile, the fluency and flexibility indicators also increased in the moderate category, indicating that students were increasingly able to generate diverse ideas and consider multiple solutions to the problems given. Overall, the average N-gain value of 0.36 was in the moderate range, indicating that the use of Vlog media based on the local wisdom of Kampung Semanggi Surabaya, with the Project-Based Learning model, was quite effective in improving students' creative thinking skills. The standard deviation values (Table 7) for each indicator show variations in students' abilities after learning. The fluency indicator has a relatively small standard deviation of 1.18, suggesting that improvements in students' abilities on this indicator are evenly distributed. Meanwhile, the originality and elaboration indicators have larger standard deviations, namely 7.24 and 8.35, which show that students' abilities in generating original ideas and developing ideas still vary.

DISCUSSION

Validity

The results of the validation of the developed learning tools are shown in Figure 1. The bar chart of the learning tool validation results shows that each tool (teaching module, Vlog media, worksheets, and assessment instruments) obtained a very high level of validity. This diagram illustrates that the teaching modules, Vlog media, and worksheets obtained scores close to 5 on a scale of 5, indicating that all tools were well designed, met the necessary validity criteria, and were relevant to the learning objectives. Plomp & Nieveen (2020) state that valid learning tools are the basis for creating effective, structured learning experiences, which aligns with the findings of this research.

The validation results show that the developed teaching modules have a very high level of validity. This indicates that the teaching modules have been designed in accordance with PjBL-based learning principles, contain clear learning objectives, and integrate the local wisdom of Kampung Semanggi Surabaya in a manner relevant to the ecosystem material. Valid teaching modules play an important role in helping teachers implement structured and meaningful learning (Plomp & Nieveen, 2020).

The Vlog learning media, which was categorized as highly valid, shows that locally context-based audiovisual media is effective for biology learning. Vlog media can present ecosystem phenomena in a real and contextual way, making it easier for students to understand biotic and abiotic interactions. This finding aligns with the research by Rohmatin and Wisanti (2023) and Oviana et al. (2024), which found that contextual video media can increase student engagement and motivation to learn.

Valid PjBL-based LKPD shows that this tool can facilitate students in systematically carrying out project-based learning. LKPD not only serves as a guide for activities but also as a means to train creative thinking skills through idea exploration, problem-solving, and product development. This aligns with the research by Wahyuni and Rahayu (2021), which found that PjBL is effective in developing students' creativity and higher-order thinking skills.

The highly valid pretest and posttest assessment instruments are suitable for measuring students' creative thinking skills. The suitability of the indicators, question construction, and language used support the validity of the instruments in measuring fluency, flexibility, originality, and elaboration according to Torrance's (2008) theory. Valid instruments are an important prerequisite for obtaining accurate and accountable learning outcome data. Overall, the validation results show that integrating local wisdom from Kampung Semanggi Surabaya, the PjBL model, and vlog media into biology learning tools is an appropriate and relevant approach for training high school students' creative thinking skills.

Practicality

The practicality of Vlog media, based on the local wisdom of Kampung Semanggi Surabaya, was reviewed through the implementation of learning activities across three meetings. The observation results showed that all stages of learning were implemented well, with an average implementation of 97.7%, which

falls within the very practical category. The high implementation rate indicates that the developed media is easy to use for both teachers and students and can support the implementation of the designed learning model.

The practicality of a learning medium can be seen in its ease of use in learning activities and its suitability to the planned learning steps. In this study, Vlog media helped students better understand the material by presenting real phenomena in their surroundings through video presentations. The use of digital media in learning has been shown to increase student engagement, as the visual and interactive presentation of information can attract attention and facilitate understanding of concepts (Musthofa et al., 2025).

In the first meeting, students showed enthusiasm for accessing Vlog media via QR Codes and for watching the displayed videos. The use of technology in project-based learning can increase student engagement by actively involving students in learning activities that leverage various digital learning resources (Ahmed, 2024).

Furthermore, during the group discussion stage, students worked together to determine the project and plan the steps to complete it. This shows that the Project-Based Learning (PjBL) model can encourage students to be actively involved in learning by directly participating in problem-solving activities related to real life (Wahrini, 2024).

In the second meeting, students carried out a clover cultivation project using the aquaponics concept and documented the activities for a vlog. Project activities that involve direct experience can increase students' creativity, collaboration skills, and conceptual understanding by providing real-world learning experiences (Widodo, 2024). In addition, teachers act as facilitators, monitoring and guiding the project. Teacher assistance in project-based learning is very important to ensure that project activities align with learning objectives and to help students overcome difficulties encountered during the learning process (Prasasti et al., 2024).

In the third meeting, students presented their project results, showed the Vlogs they had made, and reflected on the learning process. Presentation and reflection activities in project-based learning can increase student engagement and sense of responsibility for their learning outcomes (Salsadilla et al., 2025).

Overall, the study's results indicate that the Vlog media based on the local wisdom of Kampung Semanggi Surabaya, using the Project-Based Learning (PjBL) model, has a very high level of practicality. This media is not only easy to use for learning but also enhances student engagement and supports a more active, meaningful learning process.

Effectiveness

The research results are based on Table 7. Recapitulation of N-gain Creative Thinking Ability per Indicator shows that students' average creative thinking ability increased after participating in learning using Vlog media based on the local wisdom of Kampung Semanggi Surabaya, using the Project-Based Learning (PBL) model. The average pretest score of 49.36 increased to 67.64 on the posttest. This increase indicates that the applied learning had a positive impact on students' creative thinking skills (Hake, 1999). The N-gain value of 0.36 falls within the moderate range, indicating that Vlog media is quite effective at improving creative thinking skills. However, the increase has not reached the high category. This finding aligns with the research by Rahayu et al. (2021), which found that project-based learning combined with contextual media tends to increase creative thinking skills in the moderate category because it requires a process of adaptation and habituation of higher-level thinking.

This improvement in creative thinking skills is supported by the characteristics of Vlog media, which present contextual problems based on local wisdom, so that students not only receive information passively but are also actively involved in analyzing problems, designing solutions, and producing project products. According to Wisanti et al. (2022), biology learning that integrates local wisdom can increase students' cognitive engagement because the material is more closely aligned with real life. When reviewed based on creative thinking indicators, all indicators showed moderate improvement. The originality and elaboration indicators had the highest N-gain values, at 0.51 and 0.52, respectively. This indicates that students are better trained in developing detailed ideas and generating relatively new ideas through project activities that require product creativity. This finding aligns with Purnomo et al. (2020), who stated that the PjBL model is effective

in training elaboration and originality skills because students are given the freedom to design and refine products.

Meanwhile, the fluency and flexibility indicators also experienced moderate improvement. This improvement shows that students are beginning to generate more ideas and consider various alternative solutions when solving problems, although they still need continuous practice. This aligns with the findings of Santos et al. (2021), who stated that fluency and flexibility skills develop gradually through repeated problem-based learning experiences. Overall, these results indicate that the Vlog media based on the local wisdom of Kampung Semanggi Surabaya, using the PjBL model, is quite effective in improving students' creative thinking skills. The moderate improvement indicates that the media have functioned well, but their effectiveness can still be improved through long-term use or by strengthening scaffolding for creativity in learning.

CONCLUSION

Based on the results of the research and development, it can be concluded that the Vlog learning tool, based on the local wisdom of Kampung Semanggi Surabaya, oriented towards Project-Based Learning (PBL) on ecosystem material, is highly valid, highly practical, and moderately effective in improving the creative thinking skills of high school students. All components of the learning tool, including the teaching module (93.50%), Vlog media (88.50%), LKPD (89.00%), and pretest-posttest instruments (88.25%), are categorized as highly valid, indicating that they meet the aspects of content feasibility, presentation, language, and alignment with PjBL syntax and creative thinking indicators. The practicality of the learning tool is reflected in the very high implementation rate (97.7%) across three meetings, demonstrating that the learning process can be carried out systematically and effectively while increasing student engagement. Furthermore, the use of Vlog media based on local wisdom in PjBL learning has a positive and measurable effect on students' creative thinking skills, as indicated by the increase in average scores from 49.36 (pretest) to 67.64 (posttest) and an N-gain value of 0.36 (moderate category), with improvements observed across all indicators, particularly in originality and elaboration. Therefore, this learning tool can be explicitly described as an effective instructional innovation that integrates digital technology, local wisdom, and project-based learning to enhance students' creative thinking skills in biology.

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