# Needs Analysis: Developing Scratch Media with Sumedang Local Wisdom to Enhance Students' Computational Thinking

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## *Abstrak*

*Transformasi digital menuntut penguasaan berpikir komputasional (computational thinking/CT) sebagai fondasi utama pendidikan matematika. Namun, keterampilan penalaran logis siswa di Kabupaten Sumedang masih rendah karena pembelajaran belum mengoptimalkan kearifan lokal. Penelitian ini bertujuan menganalisis profil awal kemampuan CT siswa pada aspek dekomposisi, pengenalan pola, abstraksi, dan algoritma, serta mengidentifikasi kebutuhan terhadap media interaktif berbasis Scratch. Menggunakan model pengembangan ADDIE yang dibatasi pada tahap analisis, penelitian ini melibatkan 32 siswa kelas VIII dan tiga guru matematika di sebuah SMP Negeri di Sumedang. Data dihimpun melalui tes CT, kuesioner, wawancara, dan dokumentasi. Temuan menunjukkan kemampuan CT siswa masih rendah, terutama pada aspek abstraksi (18,98%) dan algoritma (16,01%). Hasil analisis kebutuhan menunjukkan tingkat urgensi yang sangat tinggi (83%) bagi pengembangan media berbasis Scratch terintegrasi kearifan lokal Sumedang sebagai sarana penguatan penalaran komputasional dan motivasi belajar siswa.*
***Kata Kunci**: Berpikir Komputasional; Media Pembelajaran; Scratch; Kearifan Lokal; Model ADDIE.*

## Abstract

Digital transformation necessitates the mastery of computational thinking (CT) as a fundamental pillar of mathematics education. However, students' logical reasoning skills in Sumedang Regency remain underdeveloped, largely because instructional methods have yet to optimize the use of local wisdom. This study aims to analyze the initial CT profiles of students, focusing on decomposition, pattern recognition, abstraction, and algorithms, and to identify the necessity for Scratch-based interactive learning media. Adopting the ADDIE development model, limited to the analysis phase, the study involved 32 eighth-grade students and three mathematics teachers at a public junior high school in Sumedang. Data were gathered through CT competency tests, questionnaires, interviews, and documentation. The findings reveal that students' CT skills are low, particularly in abstraction (18.98%) and algorithms (16.01%). Furthermore, the needs analysis indicates a high level of urgency (83%) for developing Scratch-based media integrated with Sumedang's local wisdom as a cognitive tool to strengthen computational reasoning and enhance student motivation.
**Keywords**: needs analysis; computational thinking; local wisdom; mathematics; Scratch.

## I. Introduction

The rapid digital transformation in the globalization era demands comprehensive mastery of technological literacy for every individual (Grover & Pea, 2028; Aminah, 2021). This condition drives educational institutions to reorient their curricula through the integration of 21st-century competencies, one of which is computational thinking (CT) as an essential intellectual foundation (Stewart et al., 2017; Salwadila et al, 2024). CT is not merely understood as a technical skill, but rather as a methodology for problem-solving in a logical, systematic, critical, and efficient manner through a computational approach that prepares students to face future technological dynamics (Setyaningrum et al., 2024).

In the context of mathematics education at Junior High School (SMP) level, the learning focus is no longer limited to arithmetic abilities, but also encompasses the development of thinking approaches to analyze problems, formulate solutions, and conduct critical evaluations. CT is relevant for integration into mathematics through four main pillars: decomposition, pattern recognition, abstraction, and algorithm design, which support the resolution of complex mathematical problems (Angeli & Giannakos, 2020; Supiarmoet al., 2021, Wing (2017) emphasizes that CT is the ability to present problems and solutions in algorithmic form so they can be reused by others or computers to solve similar problems.

As an important 21st-century skill, CT plays a role in solving complex issues, facilitating data-driven decision making, and strengthening critical and creative thinking (Irawati & Hadi, 2025). The relevance of CT is also reinforced through the OECD framework in PISA, which positions it as part of contemporary mathematical literacy. Several empirical findings indicate that CT mastery correlates with academic achievement; students with strong CT tend to demonstrate more optimal learning performance.

However, various studies report that students CT abilities remain low (Fitriarosah, 2023; Ye et al., 2023; Zhu, 2023). This condition reveals a gap between curriculum expectations and student competency achievements in Indonesia. Mathematical achievement data (such as mathematics TKA scores) indicates that junior high school students' mastery of logical reasoning and algorithmic thinking remains concerning. Consistently, PISA 2022 reported Indonesian students’ mathematical literacy score of 366, lower than the OECD average of 472. This low performance is related to learning processes that have not adequately provided dynamic interaction, directed cognitive structures, and real-world relevance (Hwa et al., 2022). Without adaptive media, CT pillars such as abstraction and pattern recognition risk remaining as technical terms that are difficult to implement (Lei et al., 2020; Suhendar & Rosita, 2024).

Similar gaps are also observed in several junior high schools in Sumedang Regency. Initial observations show that students tend to view mathematics as a collection of formulas that are difficult to visualize, and experience difficulties when faced with non-routine problems requiring problem decomposition (Nurlaelah et al., 2025). On the other hand, the potential of Sumedang

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local wisdom, such as the geometric structure of Batik Kasumedangan, the architecture of historical sites, and the production patterns of Tahu Sumedang (Sumedang tofu), has not been optimally utilized as a learning context. Yet, the integration of local wisdom has the potential to enhance students' cognitive engagement and intrinsic motivation (Umbra, Ramadhani & Prahmana, 2024). Furthermore, digital devices in schools tend to be used as static presentation tools, not yet as interactive media that challenge reasoning and promote CT practice (Hidayati & Prahmana, 2022).

One relevant media alternative for strengthening CT is Scratch. Scratch enables abstract concepts to be visualized into objects that can be manipulated through a drag-and-drop system, allowing students to focus their attention on problem-solving logic without being burdened by complex programming syntax. Several studies show that Scratch is effective for developing mathematical ideas while strengthening students' CT (Aminah et al., 2022; Martínez et al., 2020).

To make learning more meaningful, the integration of local wisdom is needed as a real-world context. Sumedang local wisdom can function as a cognitive bridge for designing contextual problems that are solved systematically through programming logic in Scratch. Scratch was selected for its capacity to facilitate logical construction without the constraints of complex syntax, while the integration of local wisdom aligns cultural schemata with mathematical abstraction to foster meaningful learning. (Ramdhani & Pujiastusti, 2025)

This synergy of technology and culture is expected to increase learning interest while constructing students computational reasoning more authentically (Aminah, 2023; Satria et al., 2022). Although the integration of local wisdom has been widely studied, research is still dominated by conventional media; studies on the digitalization of culture into interactive programming platforms remain limited. Referring to the concept of Culturally Responsive Computing (Habib et al, 2022), technology should not only serve as a learning tool, but also reflect students' cultural identity. In the Indonesian context, exploration of CT based on Sumedang's local wisdom, including modeling the production process of Tahu Sumedang as the basis for algorithm development in Scratch, is still rarely discussed (Calao et al., 2021).

Based on the above description, this research focuses on analyzing the needs for developing Scratch media based on Sumedang local wisdom to enhance students' CT. This research aims to: (1) analyze the initial profile of junior high school students CT abilities in the indicators of decomposition, pattern recognition, abstraction, and algorithms; and (2) identify teachers' and students' needs for interactive mathematics learning media (Scratch) based on local culture that bridges the understanding of abstract mathematical concepts with CT abilities in a contextual manner.

## II. Method

This research is part of Research and Development (R&D) using the ADDIE model

(Analysis, Design, Development, Implementation, Evaluation) (Sugiyono, 2007; Hamzah, 2019). However, the scope of this study is confined to the analysis phase, specifically aimed at evaluating the developmental requirements for Scratch-based media integrated with Sumedang local wisdom to enhance students' computational thinking. Sample consisting of 32 eighth-grade students and three teachers for interviews was selected through purposive sampling, based on the criteria of a school possessing adequate computer laboratory facilities yet exhibiting low utilization of interactive media, as well as students being in the formal operational cognitive transition phase to measure the effectiveness of local wisdom-based Scratch media with the following criteria: students have studied the SPLDV (System of Linear Equations in Two Variables) material, the school has internet access, and teachers have implemented the Merdeka Curriculum. The research focuses on SPLDV material with Tahu Sumedang local wisdom.

Data collection was conducted through: a CT ability test in the form of one essay question based on CT indicators (decomposition, pattern recognition, abstraction, and algorithms) that has been adapted to the context of Sumedang's local wisdom in SPLDV material; a needs analysis questionnaire using a Likert scale of 1–4 to measure students' needs for Scratch media (logic); an interview guide used with teachers to explore obstacles in teaching CT and integrating local culture; and a documentation study sheet to analyze the alignment of curriculum material with Scratch features (logic). All research instruments in this study were validated by two experts through an expert judgment procedure. The evaluation results indicate that all instruments meet the criteria for content and construct validity, thus being declared feasible for use in the data collection process.

Table 1.
Computational Thinking Indicators and Competency Indicators according to Shute et al. (2017)

| CT Indicators | Competency Indicators |
|---|---|
| Decomposition | Students can identify and explain information related to the given problem. |
| Pattern Recognition | Students can find similar or different patterns used in solving problems. |
| Abstraction | Students can eliminate irrelevant elements in the problem-solving plan to reach conclusions. |
| Algorithms | Students can explain logical and systematic steps to find solutions to the given problems. |

The test data were analyzed using descriptive statistics, followed by a descriptive qualitative analysis based on the instruments employed. Data were analyzed descriptively and quantitatively to determine the mean score and mastery percentage for each CT indicator. The categories of students' CT abilities in this study were grouped into three levels: high, moderate, and low, with the following criteria:

Table 2.
*Computational Thinking Ability Category Criteria*

| Category | Value Range |
|---|---|
| *High* | $X \geq (\bar{x} + SD)$ |
| *Moderate* | $(\bar{x} - SD) < X < (\bar{x} + SD)$ |
| *Low* | $X \leq (\bar{x} - SD)$ |

*X = student scores;* $\bar{x}$*= average student scores; SD = the standard deviation*

(Hartawan, et al. 2024)

Questionnaire data analysis was calculated using percentage technique to determine the urgency level of media development. The formula used is as follows:

$$P = \left(\frac{f}{N}\right) \times 100\%$$

notes:
P = percentage of achievement
f = total score obtained from respondents or research subjects
N = maximum score (number of respondents multiplied by the highest instrument score)

The questionnaire results are then categorized as follows (Riduwan, 2015).

Table 3.
Score Interpretation Criteria

| Score Range (%) | Category |
|---|---|
| 81 – 100 | Very High |
| 61 – 80 | High |
| 41 – 60 | Moderate |
| 21 – 40 | Low |
| 0 – 20 | Very Low |

Interview and documentation data were analyzed using the Miles, Huberman, and Saldana (2019) framework, comprising data reduction to code media requirement themes, data display through narrative descriptions and categorization tables, and conclusion drawing validated via technical triangulation. This process ensures that the identification of students' Computational Thinking (CT) needs is systematically documented and credible

Interview data were used to strengthen the justification for feature requirements in the Scratch media. Meanwhile, cultural content analysis through documentation study was presented descriptively to determine the alignment between Sumedang's local wisdom and mathematical concepts to be developed in the Scratch program.

## III. RESULT AND DISCUSSION

### 1. Initial Profile of Students' Computational Thinking (CT) Abilities

Literature review shows that the significance of CT lies in the shift of cognitive focus: the main emphasis is no longer solely on the final results of problem-solving, but rather on the methodological construction of how problems are solved (Grover & Pea, 2013). This ability equips students with systematic and algorithmic thinking patterns that serve as a foundation for facing the complexity of challenges in the digital era (Angeli & Giannakos, 2020). By mastering CT, students not only learn to use digital devices, but also develop mental processes that enable them to formulate solutions more innovatively and efficiently (Shute et al., 2017).

Based on the results of the CT ability test on SPLDV material based on Tahu Sumedang local wisdom, an overview of students' achievement on the four CT indicators was obtained.

Table 4.
Descriptive Statistics Results of CT Ability

| Lowest Score | Highest Score | Average | Standard Deviation |
|---|---|---|---|
| 15 | 75 | 30,50 | 10,10 |

These findings indicate that students' CT abilities are still varied, but tend to be at a moderate achievement level when viewed from the average score.

Table 5.
Categories of Students' CT Abilities

| *Category* | *Value Range* | Number of Students | Percentage |
|---|---|---|---|
| *High* | $X \geq (\bar{x} + SD)$ | 5 | 15,6% |
| *Moderate* | $(\bar{x} - SD) < X < (\bar{x} + SD)$ | 21 | 65,63% |
| *Low* | $X \leq (\bar{x} - SD)$ | 6 | 18,87% |

This distribution shows that the majority of students already possess basic CT skills; however, they have not yet achieved strong and consistent mastery across all indicators. Meanwhile, the data on the average achievement for each CT indicator among students are presented in the following Table 6.

Table 6.
Results of Students' Computational Thinking (CT) Achievement for Each Indicator

| CT Indicator | Description of Activities in the Problem | Achievement Percentage (%) | Category |
|---|---|---|---|
| Decomposition | Breaking down the components of tofu production costs (raw materials, labor) into mathematical variables (x and y). | 40,60 | Moderate |
| Pattern Recognition | Identifying recurring relationships between the quantity of tofu produced and total revenue. | 27,34 | Moderate |
| Abstraction | Simplifying a contextual problem into a system of linear equations with two variables by removing irrelevant information. | 18,98 | Low |
| Algorithms | Formulating systematic steps (elimination/substitution methods) to determine the unit price solution. | 16,01 | Low |

The following are the results of students' responses and interviews.


Figure 1. Example of Students' Responses on Decomposition.

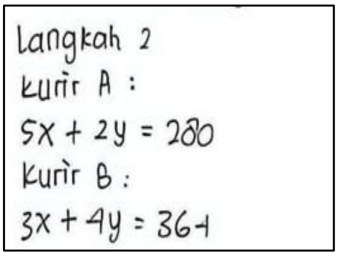


Figure 2. Example of Students' Responses on Pattern Recognition.

The results of the analysis indicate that the decomposition indicator falls into the moderate category. The research subjects were reasonably able to break down complex problems, such as production costs, into elements that could be represented as mathematical variables (x and y). This finding suggests that students possess a fairly strong initial ability to systematically map problem components.

For the pattern recognition indicator, the subjects began to identify recurring relationships between production quantity and revenue. Although this indicator also falls within the moderate category, its percentage is lower than that of decomposition, indicating that students still experience difficulties in consistently formulating patterns or trends. This phenomenon is consistent with previous studies emphasizing that the development of computational thinking requires repeated practice through engagement in real-world problem-solving activities (Wing, 2017; Marethi et al., 2024; Irawati & Hadi, 2025).

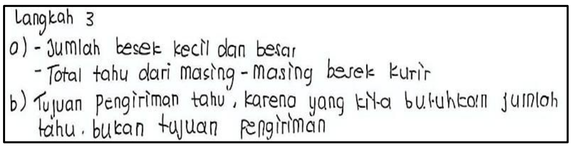


Figure 3. Example of Students' Responses on Abstraction.

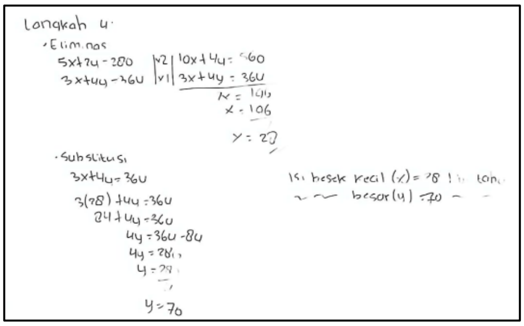

Figure 4. Example of Students' Responses on Algorithm.

For the abstraction indicator, students' ability to filter essential information remains very limited. The subjects experienced difficulties in eliminating irrelevant information, which prevented them from constructing simpler and more representative mathematical models. This low level of achievement hindered the problem generalization process.

Meanwhile, the algorithmic thinking indicator showed the lowest achievement. The subjects faced significant obstacles in organizing solution steps systematically, such as determining the appropriate sequence of elimination or substitution methods to arrive at the final solution. These findings are consistent with previous studies by Shute et al. (2017), Wahyuni and Antoro (2025), which emphasize that major challenges in computational thinking often arise when students are unable to decompose and manage problem complexity in a structured manner. This phenomenon is further supported by interview results with teachers, revealing that current instructional practices tend to be procedural and teacher-centered, thereby limiting the stimulation of students' algorithmic thinking skills to independently and efficiently design solutions (Grover & Pea, 2013).

Interviews were also conducted with students who experienced difficulties in responding to the decomposition and pattern recognition indicators.

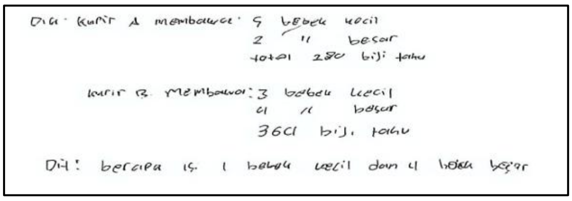


Figure 5. Example of Students' Responses Showing Inability to Complete Decomposition.

Teacher: "What made it difficult for you to determine the variables *x* and *y*?" Student: "I was confused about what should be represented as variables. There were many terms in the problem, such as *besek*, tofu, and courier. I thought the variables were Courier A and Courier B." Teacher: "Why didn't you form an equation based on the number of *besek*?" Student: "I don't know how to relate the number of *besek* to the total amount of tofu in a single mathematical expression. I only added up all the tofu quantities written in the notes."

Based on this interview excerpt, the student demonstrated low-level difficulty. The student failed to perform decomposition because they were unable to separate cost or quantity elements into mathematical variables. The student also failed to demonstrate pattern recognition, as they did not recognize that each courier represented a similar system of equations.

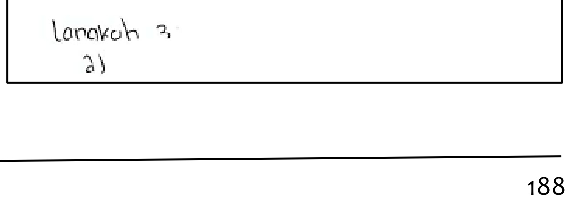

Figure 6. Example of Students' Responses Showing Inability to Complete Abstraction.

Teacher: "At Step 3, why did you have difficulty determining which information could be ignored?" Student: "I was confused about distinguishing between the narrative part and the mathematical part. In the problem, there was a story about the Sumedang city center, woven bamboo *besek*, and air circulation. I considered all of them important because they explain why tofu must use *besek*. I was afraid that if I did not include them in my answer, my score would be reduced."

Difficulty Analysis: The interview findings indicate that the student was not yet able to appropriately filter information. The student tended to regard contextual details such as the function of *besek* in maintaining the crispness of tofu as key information, even though these details did not affect the construction of the system of linear equations in two variables (SPLDV). As a result, the student experienced difficulty simplifying the problem into a relevant mathematical representation, which hindered the abstraction process and potentially affected the subsequent stage of algorithmic solution construction.

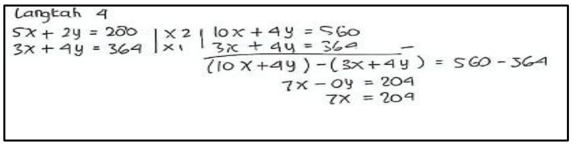


Figure 7. Example of Students' Responses Showing Inability to Complete Algorithmic Thinking.

Teacher: "You already identified variables *x* and *y*. Why did your solution process stop midway?" Student: "I know that I should use the elimination method, but I don't know the correct order. I was confused about which numbers should be multiplied first to obtain the value of *x* or *y*. When I tried, the numbers became very large, and I lost track of the next steps. I didn't have a written plan, so I just started calculating, and eventually I became confused."

Difficulty Analysis: Analysis of student work reveals algorithmic failures in applying the elimination method to systems of linear equations in two variables (SPLDV). Although students attempted to equalize coefficients, they failed to proceed with the variable elimination procedure and tended to only perform arithmetic summation of constants. Findings in Figure 7 indicate that students lack an understanding of the fundamental logic and primary objective of equalizing coefficients, causing the solution process to stall before completion. These failures suggest that the obstacles are not merely technical; rather, they stem from a weak grasp of prerequisite materials, such as basic algebraic operations and the concept of coefficients. Consequently, students lose direction in symbolic procedures and tend to treat equations arithmetically without considering their algebraic structure.

The analysis of students' computational thinking (CT) abilities reveals a significant imbalance across indicators, with the lowest achievement observed in abstraction and algorithmic thinking. Although students demonstrated relatively adequate initial ability in the decomposition indicator consistent with Wing (2017), Musthofa et al. (2025), and Herlina et al. (2025), who emphasize that mapping problem components is a fundamental step students remained trapped in ambiguity when determining variables. Interview findings revealed that students failed to distinguish mathematical entities from the narrative context, such as confusing quantities with courier identities. This aligns with the arguments of Shute et al. (2017) and Wing (2017), who assert that major barriers to CT emerge when students are unable to decompose complex problems into manageable technical units.

More pronounced difficulties were observed in the pattern recognition and abstraction indicators. Students were unable to formulate consistent trends in the relationship between production and revenue. The low abstraction scores characterized by students' inability to discard irrelevant information (e.g., historical details of *besek* or air circulation) indicate that students have not yet developed modeling-oriented thinking. Angeli and Giannakos (2019) emphasize that a key challenge in CT education lies in bridging students' ability to filter data or information into mathematical models. Students' fear that omitting parts of the narrative would reduce their scores reflects a conventional procedural mindset that is not yet accustomed to the cognitive efficiency required in CT (Hartawan, 2025).

The algorithmic thinking indicator represents the most critical condition. Although some students theoretically understood the elimination method, they lost procedural strategy when confronted with large numbers in the absence of a written plan. This phenomenon is reinforced by Grover and Pea (2018), who argue that one-directional, procedural instruction in schools often fails to stimulate students' algorithmic thinking for generating independent and efficient solutions. This inability to construct systematic solution steps has direct implications for students' low academic achievement in mathematics, as identified in PISA reports (OECD, 2023) and national statistics (Kemendikdasmen, 2025).

## 2. Needs Analysis for Scratch and Local Wisdom Based Content

Based on these gaps, a learning intervention is required that not only trains logical reasoning but is also contextual in nature. The development of learning media using Scratch is considered a strategic solution to address barriers in the abstraction and algorithmic thinking indicators. Through block-based visual programming, students are encouraged to think algorithmically; when the sequence of blocks is incorrect, the program will not run (Rodriguez et al., 2025; Rio et al., 2025; Tan et al., 2022; Widyaskumara, 2025). This condition provides instant feedback that students typically do not receive through traditional paper-and-pencil methods.

Research by Jiang and Li (2021) demonstrates that the use of Scratch significantly improves elementary school students' scores on the Computational Thinking Skills Scale (CTSS), particularly in the dimensions of algorithmic thinking, creativity, and problem-solving. There is a strong correlation between computational thinking (CT) ability and programming proficiency, where Scratch as a visual-based language encourages students to systematically organize logical steps. This aligns with the findings of Yünkül et al. (2017), who concluded that even within a short duration, Scratch instruction effectively enhances higher order thinking skills, including creativity, cooperation, and critical thinking. Scratch, as a block-based programming language, facilitates students' abstraction abilities by reducing syntactic complexity, thereby shifting the focus toward programming logic and the representation of ideas (Jiang and Li., 2021) Consequently, the integration of Scratch proves to be a robust approach to developing students' CT abilities and complex thinking skills.

The integration of local wisdom such as the context of Sumedang tofu and the use of *besek* within Scratch based media serves as a cognitive bridge. The use of ethnomathematics in real-world problem contexts has been shown to effectively enhance students learning motivation (Muhtadi et al., 2017; Sarwoedi et al., 2018; Nursanti et al., 2024; Palayukan, 2024; Krisanti, 2024; Maangdhuroh, 2025). By visualizing local production problems within a digital environment, students can practice abstraction in a more natural and meaningful way.

The following section presents data from a needs assessment questionnaire on local wisdom-based learning media completed by both students and teachers.

Table 7.
Results of the Needs Analysis from 32 Student Respondents

| No. | Questionnaire Indicator | Average Score (%) | Category |
|---|---|---|---|
| 1 | Preference for learning through computer applications/games and digital devices | 86% | Very High |
| 2 | Interest in block-based programming (coding) challenges and CT logic | 80% | High |
| 3 | Motivation toward technology-based media and interactive animations | 87% | Very High |
| 4 | Relevance of local Sumedang culture in mathematics content | 80% | High |
| 5 | Digital literacy and device accessibility (independent/lab-based) | 78% | High |
| 6 | Need for independently accessible online learning media | 82% | Very High |
| Overall Average | Need for Scratch-Based Learning Media Integrated with Local Wisdom | 83% | Very High |

The results of the needs analysis provide strong evidence that students require a transformation of learning media from conventional formats to interactive digital media. The high percentages observed in indicators related to preferences for game-based applications and the need for independent learning media indicate that students’ learning styles have shifted toward digital environments. This finding is consistent with Angeli and Giannakos (2020) and Maulah et al. (2025), who argue that one of the key challenges of 21st-century education is providing learning environments that facilitate computational thinking (CT) through digital tools that are familiar to students’ everyday lives.

Students’ interest in block-based programming reached 82%, indicating their psychological readiness to adopt platforms such as Scratch. The use of Scratch enables students not only to become content consumers but also producers of logic. According to Rodriguez et al. (2025), this approach is effective in enhancing students' understanding of abstract mathematical concepts at both primary and secondary education levels. The integration of basic programming logic into mathematical problem-solving can also help students overcome difficulties in algorithmic thinking, which has long been a weakness in one-directional, procedural learning approaches (Nayazik et al, 2025).

Furthermore, students' emotional attachment to Sumedang local wisdom, such as Batik, Gedung Negara, Kuda Renggong, and the production of Sumedang tofu reached 85%, underscoring the importance of a local wisdom–based approach in mathematics learning content. Students tend to feel disconnected from problem examples that lack contextual relevance. A systematic review by Ye et al. (2023) emphasizes that the integration of CT into K–12 mathematics learning is more impactful when it is linked to culturally meaningful local contexts. The use of local content in Scratch functions not merely as a 'wrapper' for instructional material but as a cognitive bridge that helps students construct mathematical models (abstraction) through objects that are closely related to their lived experiences (Hwa et al., 2022; Aminah et al., 2021; Hidayati & Prahmana, 2022). Thus, the development of Scratch-based learning media integrated with Sumedang local wisdom is not merely a technological innovation but an urgent necessity to simultaneously enhance relevance, motivation, and students' computational thinking abilities.

The needs analysis for Scratch-based learning media was also obtained through interviews with three mathematics teachers from Grades VII, VIII, and IX. The interview results are presented in the following table.

Table 8.
Results of Interviews with Three Mathematics Teachers

| Analysis Aspect | Key Interview Findings | Synthesis of Media Needs |
|---|---|---|
| CT Under standing | Teachers are familiar with the term CT; however, it has not yet been explicitly integrated into lesson plans. Implementation remains incidental, without explicit labeling of CT components (e.g., decomposition, etc.). | Learning media are needed to structurally guide CT stages (from Decompositi on to Algorithmic Thinking) so that CT is systematicall y integrated into instruction. |
| Algorithmi c Skills | Students show weaknesses in consistency and efficiency of solution steps. They are able to perform calculations but fail to explain the logical sequence and the rationale behind each step. | The media should provide features that support the construction of systematic procedures (e.g., block-based coding) to train logical sequencing. |
| Use of Technology | Instruction is dominated by one-way, static media. There has been no attempt to integrate interactive platforms such as Scratch. | Development of interactive learning media that support independent exploration and two-way interaction is required. |

| Analysis Aspect | Key Interview Findings | Synthesis of Media Needs |
|---|---|---|
| Potential of Scratch | Scratch is believed to be effective for developing logical thinking; however, teachers are concerned about the complexity of its procedures if not supported by user-friendly tools. | Scratch-based media should be designed with a simple interface and clear instructional scaffolding. |
| Local Integration | Local context is considered essential for grounding abstract concepts. The use of Sumedang contexts is believed to accelerate students' psychological engagement. | Visual assets (e.g., Batik, tofu, Menara Loji) should be used as problem contexts within the media. |
| Infrastructure | Facilities (Chromebooks/labs) are available; however, internet stability and students' independent device operation remain challenges. | The media should be lightweight, web-based, and support easy independent access. |

The interview results revealed a significant gap between the availability of digital infrastructure and students' algorithmic abilities in schools. The finding that students are often able to calculate but fail to explain the logical sequence of solutions confirms Shute et al.'s (2017) statement that the main obstacle in computational thinking (CT) is not the end result, but rather the ability to break down problems (decomposition) and develop solution strategies (algorithms). This is in line with the conditions in the field, namely that existing learning instruments have not been able to systematically stimulate students' procedural abilities (Suhendar & Rosita, 2024). The lack of CT integration in lesson plans, as expressed by teachers, also reinforces the findings of the literature review by Hwa et al. (2022) that the application of CT in mathematics is still often implicit and requires more structured task design.

The urgency of developing Scratch-based media is based on the need for instant feedback that can help improve students' logical thinking. As emphasized by Calao et al. (2021), visual programming environments such as Scratch are effective for secondary school students to visualize abstract algorithms in a more concrete way (Satria et al., 2022). The use of this media is also relevant to address the challenge of low mathematics literacy scores on PISA (OECD, 2023), especially in the aspect of problem modeling, which is a crucial competency. Furthermore, the integration of the local wisdom of Sumedang in the media is not merely an aesthetic element, but a cognitive strategy in line with the ethnomathematics approach (Muhtadi et al., 2017). By linking the material to sociocultural objects familiar to students, abstraction barriers can be minimized, making the process of mathematical generalization easier to understand (Ye et al., 2023; Umbara et al., 2025). Overall, the synergy between technology and local wisdom is expected to reduce learning anxiety while improving academic achievement through the strengthening of computational thinking (Zhu et al., 2023).

## IV. Conclusion

Based on the results of research and discussion, an analysis of needs from various aspects shows that the development of Scratch-based learning media based on Sumedang local wisdom to improve computational thinking (CT) skills is very important and feasible. This study concludes that there is a high urgency for the development of Scratch-based learning media that integrates Sumedang's local wisdom to mitigate the low CT abilities of junior high school students, especially in the indicators of abstraction and algorithms. The results of the needs analysis also show that students and teachers need a transformation of learning media from conventional forms to interactive digital media in order to bridge abstract mathematical concepts with authentic real-world contexts. Scratch is positioned as a strategic instrument for training algorithmic reasoning through visual programming, while local wisdom content, such as Batik and Sumedang Tofu production, acts as a cognitive bridge to increase relevance and learning motivation. The synergy between digital technology and local cultural elements is expected to not only improve mathematics literacy achievements in accordance with PISA standards, but also construct students' cognitive processes in solving problems systematically, logically, and meaningfully.

This study is limited to the analysis phase of the ADDIE model and restricted to a single school, thus excluding product development and broader effectiveness testing. Future research should complete the remaining development stages through to evaluation and conduct experimental studies to measure the impact of local wisdom-based Scratch media on enhancing students' computational thinking skills.

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