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Integrating Literacy and Creative Problem-solving in Javanese Language Education: A Qualitative Study using Atlas.ti for Curriculum Innovation

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ABSTRACT

In the 21st century, reading competence and creativity in problem-solving play an important role in nurturing cognitive development and flexibility among students. This paper explores the implementation of the competences in Javanese teaching at the primary level, focussing on its implications for curriculum innovation and pedagogical strategies. Using a qualitative research approach, data was collected in semi-structured interviews with teachers, politicians, and language professionals. The data were analysed methodically using Atlas. ti, for analyse common themes and significant patterns that influence literacy-based problem-solving in Javanese learning. Findings reveal that while literacy in Javanese language instruction is acknowledged as critical, its integration with creative problem-solving remains inconsistent due to structural curriculum constraints and educators limited pedagogical resources. Additionally, technology-enhanced learning tools have been identified as pivotal in enriching students' cognitive engagement and problem-solving abilities. This study underscores the need for adaptive curriculum models that support contextualised language learning, as well as professional development programmes for teachers to foster innovative instructional techniques. By bridging language literacy and problem-solving frameworks, this research contributes to the broader discourse on transformative education, offering strategic recommendations for policy formulation and pedagogical advancements. The findings serve as a foundation for enhancing Javanese language education, ensuring it remains relevant and effective in nurturing critical thinkers in a rapidly evolving academic and sociocultural landscape.

Keywords: Atlasti, creative problem-solving, curriculum innovation, Javanese language education, literacy, pedagogical strategies

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INTRODUCTION

In the era of 21st century education, literacy and creative problem-solving skills are the main foundations in shaping individuals who can think critically, adapt, and innovate. Global education organisations such as the OECD and UNESCO emphasise that learning should not only focus on academic comprehension, but also encourage reflective, creative, and solution-based thinking skills (Adeoye, 2023; Ismuni et al., 2024). During the transformation of the education system that is increasingly technology-based, the integration of these two competencies is becoming increasingly important, especially in learning regional languages, such as Javanese (Barkah, 2024; Maruti et al., 2025).

Javanese, as one of the largest regional languages in Indonesia, faces serious challenges in its sustainability in the digital era (Subrata, 2022). Younger generations are increasingly using this language in everyday conversation, and the education system has not fully developed learning strategies that can link linguistic literacy with creative thinking and problem-solving skills. In fact, Javanese language literacy is not only the ability to read and write, but also reflects cultural understanding, life philosophy, and local values that can enrich students' critical thinking skills (Rapti et al., 2025; Yu & Zadorozhnyy, 2022).

In the context of primary education, the integration of literacy and creative problem-solving skills still faces several challenges: a curriculum that tends to prioritise memorisation over exploration (Bhardwaj et al., 2025). Teachers' readiness to adapt problem-solving-based learning methods is still limited, as well as the lack of technological support to increase the effectiveness of regional language learning (Kaban et al., 2024; Puyol-Cortez, 2023). Several previous studies have highlighted the importance of literacy in improving students' critical thinking and creativity. For example, research by Hsia et al. (2021) found that problem-solving-based approaches can enhance student innovation, while Olaofe and Wibowo (2025) showed that project-based learning models can improve their thinking flexibility (Ningsih et al., 2020). However, most studies are still limited to general education and lack exploration of how this method can be applied in regional language learning (Law, 2024; Parraga et al., 2024).

While the integration of literacy and creative problem-solving has been widely promoted within 21st-century education discourse, it is important to recognise that this approach is not inherently superior to all instructional models. Alternative perspectives, including content-centred instruction, cognitive load theory, and traditional literacy development models, emphasise the importance of structured input, repetition, and form-focussed learning, particularly in early language education. In the context of regional languages such as Javanese, which possess complex linguistic forms and strong cultural norms, these conventional approaches continue to play a crucial role. Therefore, this study does not position creative

problem-solving as a replacement for traditional literacy instruction, but rather as a complementary pedagogical strategy that can be selectively integrated to enhance learner engagement, cultural relevance, and curriculum innovation in primary education.

From this research gap, a fundamental question arises regarding how literacy and creative problem-solving can be effectively integrated in Javanese language learning at the elementary level, and how technology can support this process. Unlike previous studies that focus on general literacy or problem-solving skills, this study specifically examines their integration in Javanese language education using qualitative data visualisation through Atlas.ti. This study aims to explore the integration of literacy and creative problem-solving skills in Javanese language learning in elementary schools using a qualitative approach supported by Atlas.ti as an analytic tool.

An analysis of previous research articles shows that project-based and technology-based approaches have been shown to improve literacy and problem-solving skills (Widyadhari et al., 2024; Zin & Wan Adnan, 2024). However, some weaknesses are still found, such as the lack of exploration of regional language education and the lack of studies using technology-based analysis, such as Atlas.ti, and the lack of research linking pedagogical innovation with national education policies (Deroncele-Acosta & Ellis, 2024).

From this research gap, a fundamental question arises: how can the integration of literacy and creative problem-solving be effectively applied in Javanese language learning in elementary schools, as well as how technology can help improve students' critical thinking skills? To answer this question, this study focusses on using a qualitative approach with Atlas.ti based analysis, thus allowing an in-depth exploration of learning patterns, implementation challenges, and curriculum innovation recommendations (Morales et al., 2024; Ñañez-Silva et al., 2024).

This research has novelty in several aspects. First, it is one of the first studies to link Javanese language learning with creative problem-solving in a technology-based pedagogical framework. Second, the use of Atlas.ti as an analysis tool provides a new perspective in understanding how regional language literacy can be developed through innovative problem-solving methods. Third, this research not only contributes to the development of educational theory but also offers concrete recommendations for policymakers and educators to strengthen Javanese language learning in primary education.

This study aims to explore the integration of literacy and creative problem-solving skills in Javanese language learning in elementary schools with a qualitative approach using Atlas.ti as an analysis tool. Specifically, this study seeks to identify effective strategies in the application of these two competencies, uncover the challenges faced by educators in the implementation of literacy-based curriculum and problem-solving, and provide innovative

recommendations for curriculum and education policy development to ensure that Javanese language learning remains relevant and adaptive to the demands of the 21st century (Pacheco-Velazquez et al., 2024).

LITERATURE REVIEW

Theoretical Foundations of Literacy and Creative Problem-solving

Literacy and creative problem-solving are fundamental competencies in 21st century education, shaping students' ability to engage critically with information and develop innovative solutions to complex challenges. The Constructivist Learning Theory (Isti'anah et al., 2023), Piaget (1950), and Sociocultural Theory (Mahmoodi-Shahrebabaki, 2019) emphasise that literacy is not merely the ability to read and write but involves higher thinking skills, including problem-solving and critical reasoning. Additionally, the Creative Problem-solving (CPS) Model (Borko et al., 2021; Giacomazzi et al., 2022) outlines a structured approach to fostering creativity through iterative problem analysis, idea generation, and solution implementation.

Literacy and Problem-solving in Basic Education

Recent studies highlight the increasing importance of integrating literacy with problem-solving skills in basic education to enhance students' cognitive flexibility and adaptability (Bayley, 2024; Calafato & Hunstadbråten, 2025; Kiettikunwong et al., 2025). Research indicates that literacy-based problem-solving approaches improve students' ability to analyse information critically and apply knowledge in real-world contexts (Promma et al., 2025; Rachmadyanti, 2023). Furthermore, pedagogical strategies such as Project-based Learning (PBL) and Inquiry-based Learning (IBL) have been found to significantly enhance literacy and problem-solving competencies among elementary students (Akaygun & Adadan, 2023; Allsop et al., 2022; Bayley, 2024; Lethulur et al., 2025; Sam, 2024).

The Role of Technology in Literacy and Problem-solving

The integration of technology in literacy education has transformed traditional pedagogical approaches, enabling more interactive and personalised learning experiences (Genc & Rabia, 2024; Hendratno., 2025). Digital tools such as Atlas.ti facilitate qualitative analysis of literacy development and problem-solving strategies, providing educators with insights into students' cognitive processes (Mena-Guacas et al., 2025; Vieira et al., 2025; Zou et al., 2025). Additionally, studies suggest that technology-enhanced learning environments foster collaboration and critical thinking, essential for developing problem-solving skills in basic education (Hennessy et al., 2022; Mustadi et al., 2024; Yin et al., 2024).

Challenges and Research Gaps

Despite the growing emphasis on literacy and problem-solving integration, several challenges persist, including rigid curricula,

limited teacher training, and inadequate technological infrastructure (Alejandro et al., 2024; Avelino & Ismail, 2022; Kazu & Kurtoğlu, 2022). Moreover, while existing studies explore literacy and problem-solving in general education, research specifically focussing on language literacy in regional languages such as Javanese remains scarce (Chu et al., 2024; Hidayatullah et al., 2025; Istiq'faroh et al., 2025; Krissandi et al., 2023). Addressing these gaps requires further investigation into culturally responsive pedagogical models and adaptive curriculum frameworks (Abdalla & Moussa, 2024; Berlian & Huda, 2022; Chu et al., 2024).

Implications for Curriculum and Pedagogical Innovation

The findings from recent studies underscore the need for curriculum innovation that integrates literacy and problem-solving skills through technology-enhanced learning and contextualised language instruction (Grimus, 2020; Maruti et al., 2024; Zuliana et al., 2023). Policymakers and educators must prioritise teacher training programmes that equip instructors with the necessary skills to implement problem-solving-based literacy instruction effectively (Kohnke et al., 2025; Mahara, 2024; Napitupulu et al., 2024). Additionally, leveraging qualitative analysis tools like Atlas.ti can provide deeper insights into student learning patterns, informing evidence-based curriculum development (Han et al., 2021; Järvelä et al., 2023; Valtonen et al., 2025).

This literature review highlights the theoretical and empirical foundations of literacy and creative problem-solving in basic education, emphasising the role of technology and pedagogical innovation (Arrahmi & Praheto, 2024; Henriksen et al., 2021; Li & Yu, 2025). While existing research provides valuable insights, further studies are needed to explore regional language literacy, particularly in Javanese language education, and its intersection with problem-solving competencies. Addressing these gaps will contribute to the development of more inclusive and effective educational frameworks that align with the demands of 21st century learning.

METHODOLOGY

Research Design

This study employed a qualitative design within an interpretive paradigm to explore how literacy competencies and creative problem-solving skills are integrated into Javanese language education at the elementary level. The approach emphasised depth of understanding through multiple perspectives and data sources.

Participants

Participants were purposively selected to ensure relevance to the research objectives. They included 10 elementary school teachers, 5 principals, 3 educational observers, 3 literacy activists, and 3 policymakers from Surabaya and Sidoarjo. This diverse composition represented perspectives across classroom practice, school leadership, academic expertise, community engagement, and policy frameworks shown in Table 1.

Table 1
Research participants

Participant Group	Number	Selection Criteria	Contribution to Study
Elementary school teachers	10	Actively teaching the Javanese language; involved in literacy- and problem-solving-based pedagogy	Provide firsthand experiences of classroom implementation and challenges
School principals	5	Implementing policies/ programmes on literacy and critical thinking in the Javanese language	Offer insights into school-level policy and curriculum innovation
Educational observers	3	Academics with publications/ research on local language education and instructional innovation	Provide analytical and research-based perspectives
Literacy activists	3	Active in Javanese literacy movements (training, publications, community activities)	Contribute community-based perspectives on literacy practices
Policy makers	3	Officials/staff from Surabaya and Sidoarjo Education Offices	Share policy-level perspectives on support or constraints to innovation

Data Collection

Data were gathered through semi-structured interviews, classroom observations, and document analysis. Interviews captured participants' experiences and perspectives, while observations offered real-time insights into classroom practices. Documents, such as curricular, teaching modules, and policies, provided contextual grounding. This combination of methods supported triangulation and enhanced the validity of findings.

Data Analysis

Data were analysed using thematic analysis supported by Atlas.ti software as an analytic tool. The analysis followed an inductive process that moved from familiarisation with the data to initial coding, category development, and theme interpretation. First, all interview transcripts, observation notes, and documents were read repeatedly to gain an overall understanding of the data. Initial open codes were then generated inductively based on recurring patterns and meaningful units across the data sources. These codes were subsequently compared and refined before being grouped into broader analytical categories. The categories were further synthesised into overarching themes representing patterns in the integration of literacy and creative problem-solving in Javanese language learning. Throughout this process, Atlas.ti was used to assist in organising data, managing codes, and visualising relationships among themes; however, all

analytical decisions and interpretations were conducted by the researchers. Triangulation across data sources, member checking, and peer debriefing were applied to enhance the credibility and dependability of the findings.

Trustworthiness

Rigor was ensured through credibility (triangulation, member checking), transferability (thick description), dependability (audit trail, peer debriefing), and confirmability (reflexivity, documentation of analytic decisions). These strategies are aligned with internationally recognised criteria for qualitative research.

RESULTS

The findings presented in this section are based on the researchers' thematic interpretation of interview transcripts, classroom observations, and document analysis. Atlas.ti was used as a qualitative data management and visualisation tool to support the organisation of codes, categories, and themes. All analytical decisions, interpretations, and conclusions were made by the researchers through a systematic thematic analysis process.

Integration of Literacy and Creative Problem Solving in Javanese Language Learning

The thematic analysis indicates the distribution of key categories related to literacy and creative problem-solving in Javanese language education, as illustrated in Figure 1.

Data analysis shows that most teachers have recognised the importance of integrating literacy and creative problem-solving in Javanese language learning, particularly in relation to students' engagement with Javanese texts and cultural content. However, instructional practices were still largely characterised by memorisation-oriented approaches rather than problem-solving-based exploration. The instructional strategies identified included interactive discussions, reflective

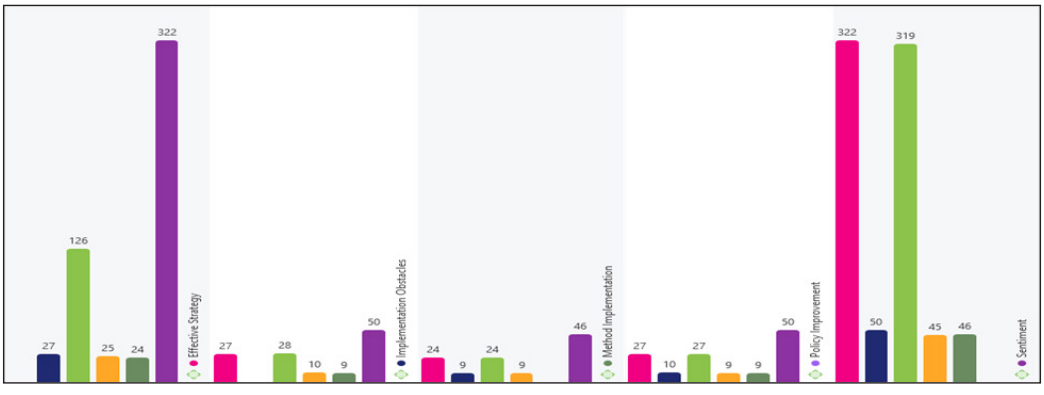

Figure 1. Coding results of literacy and creative problem-solving integration in Javanese language learning using Atlas.ti

use of folklore, and case-based problem-solving exercises derived from Javanese texts. Teachers reported observable changes in student participation and engagement when problem-solving-oriented activities were introduced in the classroom.

Challenges in the Implementation of Literacy-based Curriculum and Problem Solving

Analysis of interview data from teachers, principals, and education supervisors revealed several key challenges in the implementation of literacy-based instruction and creative problem-solving in Javanese language education. These challenges included curriculum structures that remained strongly oriented toward academic targets and memorisation, which limited opportunities for exploration-based learning. In addition, variations in teachers' readiness to apply problem-solving-oriented instructional strategies were identified, particularly in relation to Javanese language literacy. Participants also reported limited availability of resources and insufficient technological support to facilitate the integration of digital literacy and creative problem-solving practices. These challenges were thematically interconnected and are summarised in Figure 2.

Figure 2 illustrates a concept map of the systemic challenges identified in the data. The visualisation indicates that major obstacles included limited technological resources, rigid curriculum structures, lack of contextual alignment between curriculum content and classroom practices, and uneven levels of teacher readiness. The map also reflects issues related to institutional and policy support, as well as constraints in student involvement and school-community collaboration. Together, these themes demonstrate the complexity of implementing literacy-based and creative problem-solving approaches in Javanese language learning.

Despite these challenges, the data also revealed that some schools had initiated alternative instructional practices, including project-based activities such as the analysis of Javanese literary texts combined with problem-solving reflections. Teachers who applied problem-solving-oriented strategies reported observable differences in student participation and students' ability to relate language concepts to everyday contexts. These variations in practice indicate differing levels of adoption across schools. This mapping illustrates how categories such as sentiment, student involvement, support, and instructional strategies are related and collectively shape curriculum innovation, as shown in Figure 3.

Figure 3 presents a network visualisation generated through Atlas.ti to illustrate thematic relationships identified in the data. The network shows connections among themes such as student involvement, instructional strategies, institutional support, and sentiment. This visualisation supports the thematic findings by illustrating how these elements are related within the context of literacy and creative problem-solving integration in Javanese language education.

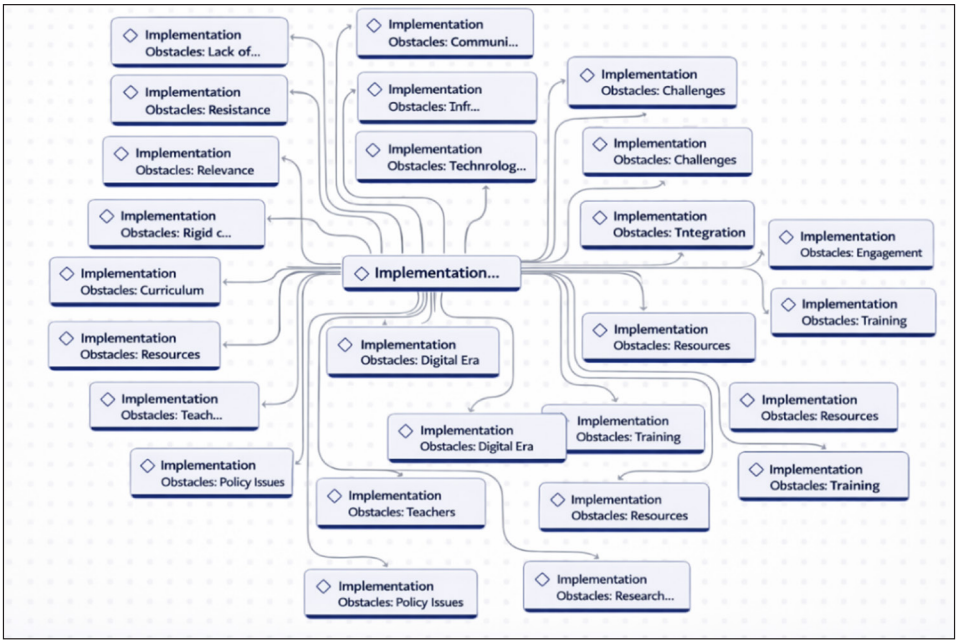

Figure 2. Concept map of implementation obstacles in integrating literacy and creative problem-solving in Javanese language education

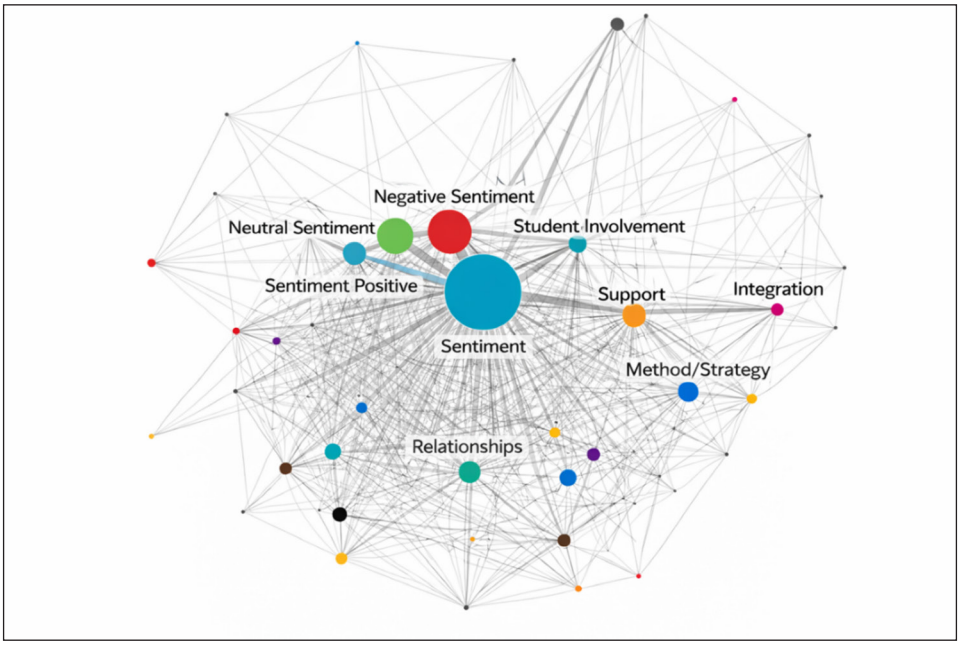

Figure 3. Network view of thematic relationships in integrating literacy and creative problem-solving in Javanese language education

Systemic Relationships among Literacy, Student Response, and Instructional Contexts

To better understand the systemic interaction among literacy, student engagement, teaching challenges, and the use of technology, the analysis employs a Sankey diagramme. This visualisation maps how different categories contribute to curriculum design and pedagogical outcomes, as shown in Figure 4. The Sankey diagramme is used as a descriptive visualisation to illustrate thematic distributions and relationships identified in the data. It is not intended to represent causal or dynamic effects, but rather to support a systemic interpretation of how different themes are connected within the context of curriculum implementation.

At the core of this visualisation is the interaction between "Literacy Understanding" and "Student Response." The connections indicate that students' comprehension of literacy is directly influenced by their engagement with creative problem-solving methodologies. The diagram shows patterned connections between literacy understanding and student response within the dataset. These connections reflect how participants described student engagement when creative problem-solving activities were present in instructional practices.

The sentiment nodes, categorised as negative, neutral, and positive, represent participants expressed perceptions of the integration process as identified through the coding. These categories summarise how participants described their experiences related to literacy integration, without implying evaluative judgments or causal effects. The distribution of positive sentiment reflects participants' favourable perceptions of the integration process, as expressed in the coded data, particularly in relation to

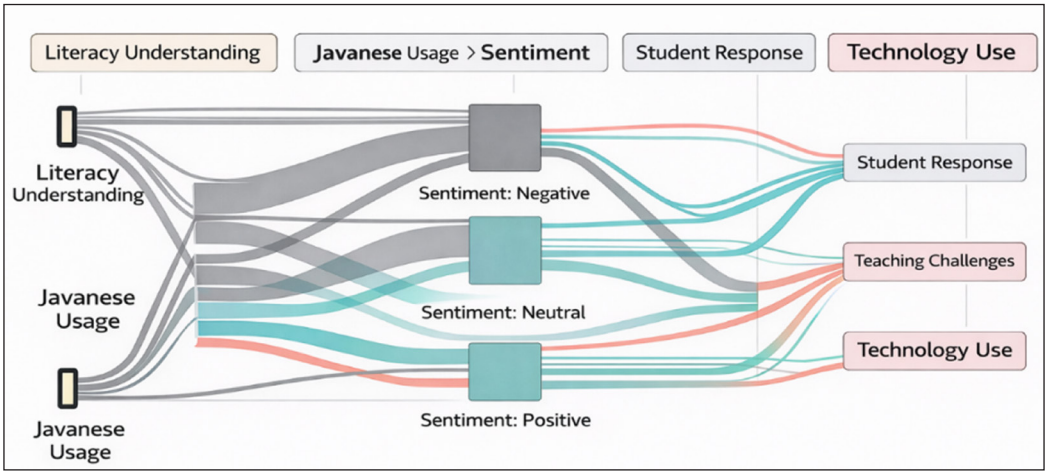

Figure 4. Sankey diagramme illustrating systemic interactions of literacy, sentiment, student response, teaching challenges, and technology use in Javanese language education

classroom engagement and instructional experiences. Negative sentiment reflects participants' reported challenges during implementation, including references to limited resources and constraints in teacher preparation.

"Technology Use" emerges as a significant factor in this framework, linking both literacy understanding and teaching challenges. The integration of technology in the classroom can facilitate innovative teaching practices, enabling students to engage with literacy in dynamic and interactive ways. However, the associated challenges such as access to technology or the need for professional development underscore the importance of addressing these barriers to maximise the potential benefits of technology-enhanced learning.

Lastly, the node "Teaching Challenges" encapsulates the difficulties educators encounter when attempting to integrate literacy with problem-solving methods. These challenges may include curriculum constraints, varying student abilities, and the need for ongoing support and training. Addressing these challenges is crucial for the successful implementation of integrated literacy programmes. In summary, the image reflects the intricate relationships between literacy understanding, student responses, technology use, and the challenges faced in teaching. This visualisation summarises the interrelated themes identified in the data, highlighting how literacy practices, student responses, technology use, and instructional challenges are represented within the dataset.

Systemic Relationships among Educational Components Identified through Sankey Visualisation

To provide a comprehensive overview of how various educational components interact in the integration of literacy and creative problem-solving, a Sankey-based visualisation was employed. This diagram captures the systemic relationships among student response, school support, teacher strategies, and policy frameworks, leading to curriculum design and implementation outcomes, as presented in Figure 5.

The Sankey visualisation presents a systemic mapping of the relationships among key components in Javanese language learning at the elementary level, with particular attention to the integration of literacy and creative problem-solving. The diagramme illustrates how coded categories such as student response, school support, student engagement, teacher strategies, and policy-related themes are interconnected within the dataset. The thickness of the flow lines represents the relative frequency of coded references, indicating the prominence of each category in relation to curriculum design, instructional strategies, implementation barriers, and levels of integration. This visualisation supports the descriptive presentation of thematic distributions and relationships identified through the qualitative analysis.

In this study, Atlas.ti was used to facilitate the organisation and visualisation of thematic categories and their interconnections. The Sankey diagramme serves as a data-driven representation of how themes were

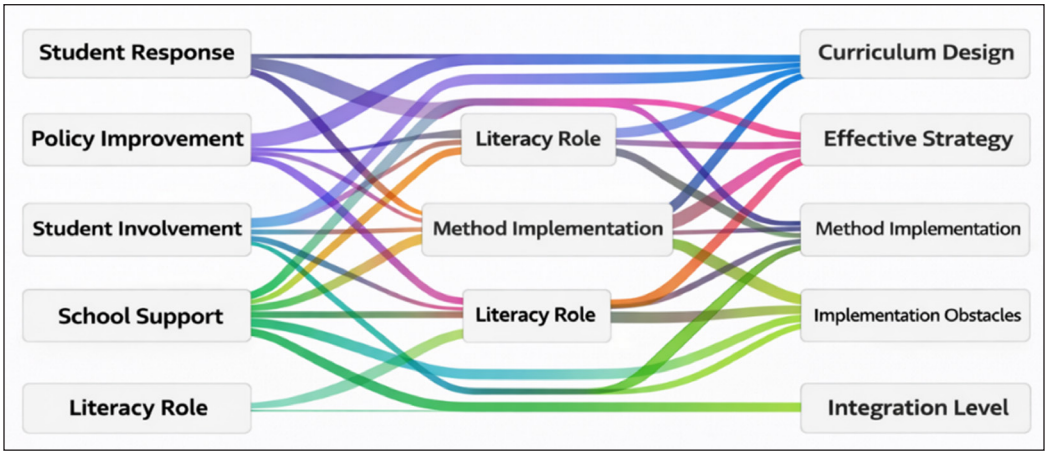

Figure 5. Sankey diagramme of systemic interactions among student response, school support, policy improvement, and curriculum outcomes in Javanese language education

distributed across participant groups and analytical categories, providing an overview of the structural relationships identified in the coding process. The distribution of coded categories and respondent contributions is presented in Table 2.

The following table presents the thematic distribution of coded data across different educational stakeholders, including teachers, observers, supervisors, principals, and practitioners. It shows how each group contributed to categories such as curriculum design, effective strategies, integration level, policy recommendations, and sentiment, as summarised in Table 3.

The data describe the results of thematic analysis from various educational stakeholders, including Teachers, Observers, Supervisors, Principals, and Practitioners, with a total of 1,861 coded citations. Teachers and Observers contributed the highest number of coded references across most themes. In the category of Curriculum Design, Teachers (Gr=24) and Observers (Gr=26) accounted for the largest proportion of coded data. The sub-theme Curriculum Design: Exploration showed a relatively even distribution of coded references across stakeholder groups.

The category Effective Strategy also contained a high number of coded references, including the sub-theme Innovative Approaches, which appeared across all respondent groups. Integration Level emerged as the category with the highest number of citations (Gr=112), including the sub-theme Significant Integration, which was represented across all stakeholder groups.

In contrast, the categories Implementation Obstacles and Policy Improvement were coded primarily in data from Teachers and Observers. The category Policy Recommendations, including the sub-theme Resource Allocation, contained coded references from all respondent

Table 2
Distribution of coded categories and respondents' contributions in the integration of literacy and creative problem-solving in Javanese language education

Category/Respondent	Curriculum design, Gr=111	Effective strategy, Gr=109	Implementation Obstacles, Gr=16	Integration level, Gr=112	Literacy role, Gr=13	Method implementation, Gr=14	Policy improvement, Gr=16	Policy Recommendations Gr=106	School support, Gr=12	Sentiment, Gr=144	Student involvement, Gr=11	Student response, Gr=15
Curriculum design, Gr=111	0	125	27	126	24	25	28	120	23	163	21	26
Effective strategy, Gr=109	125	0	27	126	25	24	27	120	23	161	21	26
Implementation obstacles, Gr=16	27	27	0	28	10	9	10	25	9	34	9	10
Integration level, Gr=112	126	126	28	0	25	24	27	121	23	164	21	28
Literacy role, Gr=13	24	25	10	25	0	9	9	22	9	27	9	10
Method implementation, Gr=14	25	24	9	24	9	0	9	22	9	29	10	10
Policy improvement, Gr=16	28	27	10	27	9	9	0	25	9	34	9	9
Policy recommendations, Gr=106	120	120	25	121	22	22	25	0	21	158	19	24
School support, Gr=12	23	23	9	23	9	9	9	21	0	25	9	10
Sentiment, Gr=144	163	161	34	164	27	29	34	158	25	0	23	31
Student involvement, Gr=11	21	21	9	21	9	10	9	19	9	23	0	10
Student response, Gr=15	26	26	10	28	10	10	9	24	10	31	10	0

Table 3
Thematic distribution of coded categories and stakeholder contributions in the integration of literacy and creative problem-solving in Javanese language education

Category/Respondent	Teacher, Gr=65	Observer, Gr=59	Supervisor, Gr=53	Principal, Gr=56	Practitioners, Gr=57	Total
Curriculum Design, Gr=111	24	26	20	20	21	111
Curriculum Design: Exploration, Gr=103	22	20	20	20	21	103
Effective Strategy, Gr=109	24	24	20	20	21	109
Effective Strategy: Innovative Approaches, Gr=103	21	21	20	20	21	103
Implementation Obstacles, Gr=16	6	10	0	0	0	16
Integration Level, Gr=112	25	26	20	20	21	112
Integration Level: Significant Integration, r=103	22	20	20	20	21	103
Policy Improvement, Gr=16	6	10	0	0	0	16
Policy Recommendations, Gr=106	23	22	20	20	21	106
Policy Recommendations: Allocation, Gr=103	22	20	20	20	21	103
Sentiment, Gr=290	65	59	53	56	57	290
Sentiment: Negative, Gr=56	17	10	8	12	9	56
Sentiment: Neutral, Gr=108	18	26	21	19	24	108
Sentiment: Positive, Gr=132	32	27	24	25	24	132
Student Response, Gr=14	6	8	0	0	0	14
Total	515	526	266	272	282	1861

groups. Sentiment analysis showed that positive sentiment (Gr=132) occurred more frequently than neutral (Gr=108) and negative sentiment (Gr=56). The category Student Response appeared only in coded data from Teachers and Observers. Overall, the tables summarise the distribution of coded themes and stakeholder contributions identified in the dataset.

DISCUSSION

As has been revealed in various previous studies by Wulandari and Tümen Akyıldız, Seçil, the integration of literacy with critical thinking skills, such as creative problem solving, is an effective pedagogical strategy in regional language learning to build 21st-century competencies (Akyıldız & Şahin, 2024; Wulandari, 2021). The results of this study show that teachers have realised the urgency of this approach, although the dominant practice is still centred on memorisation rather than context-based exploration. The approaches used, such as interactive discussions and the use of reflective folklore, have been shown to improve students' critical thinking skills and deep understanding of Javanese texts (Darwin & Saputra, 2024; Yulianto et al., 2023).

These findings are consistent with Murti's and Kadir's study, which shows that problem-solving-based learning encourages higher cognitive engagement and stronger meanings of local cultures (Kadir et al., 2020; Murti et al., 2024). However, these results have not previously been comprehensively explained in the context of the use of technology and data visualisation to support Javanese curriculum innovation. The lack of use of digital projects and learning analytics technologies, such as Atlas. The report shows that there is a gap between the potential for innovation and the reality of implementation in the field.

The explanation of these findings reflects that despite pedagogical awareness, structural limitations such as rigid curriculum, diverse teacher readiness, and low support for digital literacy also hinder the optimisation of innovative approaches. Therefore, the interpretation of these findings needs to be done carefully, considering that the adoption of new methods does not solely depend on micro actors (teachers and students), but also on macro conditions such as policies and institutional resources.

The important implications of these findings lead to the need to reformulate regional language education policies that are more adaptive, data-based, and provide space for the integration of creative learning strategies and technology (Nykyporets, 2023; Saddhono & Rohmadi, 2014). Sankey-based visualisation and thematic analysis through Atlas.ti not only strengthen the legitimacy of the findings but also become a reflective instrument in designing more transformative and contextual policy interventions to support the preservation of local culture through Education (Wang, 2024).

CONCLUSION

This study explored the integration of literacy and creative problem-solving skills within Javanese language education in primary schools, analysing its implications for curriculum innovation and pedagogical strategies. Findings indicate that while educators recognise the importance of these competencies, their implementation remains inconsistent due to rigid curriculum structures and limited pedagogical resources. The study also highlights the transformative potential of technology-enhanced learning, particularly through Atlas.ti, in refining instructional approaches and evaluating student engagement in literacy-based problem-solving tasks.

This research contributes to the ongoing discourse on educational innovation, particularly in regional language education. By integrating qualitative analysis tools, such as Atlas.ti, with literacy and problem-solving frameworks, the study presents a novel approach to enhancing students' cognitive development. Additionally, findings offer empirical insights into how pedagogical strategies can be refined to support culturally responsive education, bridging the gap between traditional literacy instruction and 21st century learning demands.

The study underscores the necessity of curriculum adaptation, ensuring flexibility in literacy instruction and fostering contextualised learning experiences that incorporate problem-solving tasks. Furthermore, policymakers should consider teacher training initiatives that emphasise the application of interactive and technology-driven teaching methodologies to enhance the effectiveness of language instruction. The findings advocate for greater investment in digital tools to support educators in analysing students' learning behaviours and shaping evidence-based curriculum development.

While this study provides valuable insights, its scope is limited to primary schools in Surabaya and Sidoarjo, necessitating further research to examine broader regional trends and comparative analysis across different linguistic contexts. Future studies should explore longitudinal approaches to assess the sustained impact of literacy-based problem-solving models and evaluate digital literacy integration within primary education frameworks. Additionally, cross-disciplinary perspectives, incorporating educational psychology and cognitive science, could further enrich understanding of problem-solving and literacy acquisition.

This study reinforces the critical role of literacy and creative problem-solving in preparing students for an increasingly complex academic and sociocultural landscape. By advocating for innovative, culturally grounded, and technology-enhanced learning frameworks, this research provides actionable recommendations for educators, curriculum developers, and policymakers seeking to advance regional language education within the broader spectrum of transformative learning models.

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