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Culturally Responsive Teaching for Academic Writing: A Local-Context Pedagogical Approach to Enhance Indonesian Secondary Students' Scientific Writing Competence

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Abstract. Students experience difficulties writing scientific papers; therefore, innovative learning approaches are needed to address students' low interest and limited skills, which stem from the lack of learning models that integrate CRT with the local cultural context. This study aims to implement an innovative approach to scientific writing that incorporates local cultural knowledge through CRT to strengthen students' holistic competencies in Central Java. Using a descriptive qualitative design, data were collected through classroom observations, interviews, and analysis of students' manuscripts, involving 212 purposively selected participants. The data analysis technique used in this study is interactive data analysis. The findings reveal three key outcomes. First, integrating local culture into writing instruction encouraged deeper reflection, critical engagement, and higher motivation. Second, CRT-based strategies enhanced students' academic self-efficacy, making them more confident in articulating ideas rooted in their cultural experiences. Third, students' perception of scientific writing shifted from a formal requirement to a meaningful practice for societal contribution and cultural preservation. Conceptually, this study offers a novel approach by applying CRT in Indonesian secondary education to connect cultural knowledge with scientific writing. The study demonstrates that such integration not only improves scientific writing abilities but also strengthens students' cultural awareness and identity.

Keywords: academic writing pedagogy; CRT; local culture; scientific writing; Indonesian High School

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1. Introduction

Indonesian language instruction at the senior high school level is designed to equip students with advanced academic literacy, particularly scientific writing skills, which serve as key indicators of functional literacy in the twenty-first century. These skills are essential for preparing students to face global challenges and respond to the rapid development of knowledge in the modern era (Yuliarti & Mulyono, 2024). Many Indonesian high school students continue to struggle with fundamental aspects of writing, including idea development, content organization, word choice, sentence structure, and writing mechanics (Utami et al., 2023). One contributing factor is that writing instruction tends to be product-oriented rather than process-oriented (Eliwarti & Aruan, 2018; Siregar et al., 2024).

Many research works show that there is a big gap between the goals of the curriculum and the implementation in the classroom. Indonesian senior high school students have been continually facing great problems in writing scientific articles, such as developing ideas, organizing content, and using the right language (Utami et al., 2023). One contributing factor is the prevalence of product-oriented instruction, which emphasizes the final written output while providing little space for scientific reasoning, idea exploration, and reflection on social and cultural contexts (Eliwarti & Aruan, 2018; Siregar et al., 2024). This situation makes scientific writing instruction feel abstract, less meaningful, and detached from students' real-life experiences (Sultan et al., 2023). Findings from interviews at schools in Karanganyar Regency, Central Java, Indonesia, found that teachers still rarely teach scientific writing skills.

Within contemporary pedagogical frameworks, scientific writing should be understood as a social practice embedded in cultural contexts, rather than merely a technical linguistic activity (Hyland & Shaw, 2016; Paltridge, 2004). Writing reflects ways of thinking and the values upheld within particular cultural communities. Consequently, writing instruction needs to position students' cultural identities as epistemic resources and reflective material for constructing scientific arguments. Such an approach enables students not only to write with structural accuracy but also to think critically within their own socio-cultural frames of reference.

The integration of local wisdom into Indonesian language instruction has been shown to enhance students' motivation, conceptual understanding, and learning outcomes (Fitriadi et al., 2024; Sukmawati et al., 2024). Nevertheless, its implementation in classroom practice remains limited. Much of the writing instruction still centers on reproducing academic texts without linking them to students' lived cultural realities (Al Farisi et al., 2024; Yulianeta et al., 2022). As a result, students tend to view scientific writing not as an opportunity to reflect on their socio-cultural environment but merely as a cognitive task. Local wisdom is a tradition that exists in Indonesian society. A habit or tardisi has its own values either social, religious, economic or other values, therefore it needs communication to spread it (Asrial et al., 2022). Knowledge of local wisdom is also relatively low, partly because formal instruction on regional cultures remains limited (Misriani et al., 2023).

Instructional materials grounded in local culture such as folktales, folklore, and community cultural practices have been found effective in strengthening literacy skills, reinforcing cultural identity, fostering pride in one's heritage, cultivating a sense of belonging, and preventing cultural alienation in an era of globalization (Asmayawati et al., 2024; Budiyono & Husni, 2023; Pamungkas et al., 2023; Songsirisak et al., 2024). In addition, culturally responsive teaching (CRT) approaches have been shown to increase student engagement and enhance the relevance of instruction (Rahmawati et al., 2023). Despite these advantages, integrating local cultural contexts into the teaching of scientific writing remains rarely implemented systematically and has not been widely examined in an implementation-oriented manner at the senior secondary level (Suarta et al., 2022; Zahro et al., 2025).

Drawing on this theoretical and practical gap, the present study introduces a local-context instructional model in scientific writing that incorporates local cultural contexts through a Culturally Responsive Teaching (CRT) approach. This pedagogical model does more than use local culture as a writing topic; it positions local cultural knowledge as an epistemic resource and a reflective lens through which students build scientific arguments. By integrating students' cultural backgrounds into the writing process, this approach bridges the disconnect between abstract academic conventions and students lived experiences, thereby explicitly linking cultural integration with the enhancement of students' scientific writing competence and contextual scientific literacy.

In this way, the study proposes a new perspective that situates writing instruction as both an academic and socio-cultural practice. The primary objective of this research is to implement and evaluate this CRT-based instructional model in Indonesian secondary schools. To capture specific changes in student behavior, learning outcomes, and teacher practice, this study outlines the following specific objectives:

1. To examine how the integration of local cultural contexts influences students' ability to construct scientific arguments and organize academic texts.
2. To analyze changes in students' academic self-efficacy and active engagement when scientific writing instruction is explicitly connected to their cultural backgrounds.
3. To explore the pedagogical experiences and practical challenges faced by teachers and students during the implementation of this culturally responsive approach.

To achieve these objectives, the present study seeks to address the following specific research questions: In what ways does the integration of local wisdom influence students' academic self-efficacy and engagement during the scientific writing process?

Practically, this study extends the application of CRT in scientific writing instruction at the senior high school level. It also provides a contextualized instructional model that can assist teachers in designing learning experiences aligned with students' cultural contexts.

2. Literature Review

2.1 Scientific Writing

Scientific writing requires proficiency in productive skills and sustained practice (Akhtar et al., 2019). The purpose of publishing scientific articles is to communicate ideas, reflections, or research findings through various scholarly platforms, such as academic journals, newspapers, research dissemination forums, and seminars (Sari et al., 2021). Logical scientific writing refers to work that presents data, arguments, and reasoning that can be accepted through rational analysis (Ismillayli et al., 2020).

Scientific writing is characterized by a high degree of formality, informational density, and objectivity in presenting ideas. This genre demands logical organization, precise language use, and adherence to grammatical norms and scholarly conventions. Its principal features include formality, an appropriate level of abstraction, argumentative rigor, and structural coherence that support the integration of ideas (Wang, 2021; Paltridge, 2004). Effective scientific writing relies on systematic reasoning, rigorous analysis, and credible evidence to support claims.

Scientific writers are expected to synthesize information from multiple sources, construct logically sound arguments, and respond critically to opposing perspectives (Dhobi, 2024; Teng & Yue, 2023). A scientific paper can be considered of high quality when it follows several key stages: (1) understanding linguistic aspects by reviewing relevant literature on the chosen topic; (2) conducting observations or research; (3) analyzing data obtained from reading and fieldwork; and (4) organizing ideas systematically in written form (Karim, 2023).

2.2 Strategies and Support for Scientific Writing

Effective scientific writing involves stages of planning, drafting, revising, and ongoing reflection on one's writing practices. A writer's success is shaped by self-awareness, a clear understanding of writing purposes, awareness of the target audience, and the broader academic context in which the writing is situated (Cameron et al., 2009; Liu, 2023).

Beyond individual factors, instructional and institutional support also play a crucial role in developing academic writing competence (Kusmanto et al., 2024). Guided writing mentorship, peer collaboration, and explicit instruction on writing strategies have been shown to help learners overcome various challenges and improve their scientific writing proficiency over time (Gopee & Deane, 2013).

2.3 Culturally Responsive Teaching (CRT)

CRT centers students' cultural knowledge, experiences, and identities as valuable learning assets. Teachers applying CRT adopt culturally relevant curricula, embrace the full range of students' communicative repertoires, and challenge deficit perspectives (Gay, 2002; Wesley-Nero & Donley, 2024). Effective CRT practices encourage students to develop critical awareness of social justice issues, empowering them to challenge inequities and connect learning to real-world contexts (Hennings & Schindel, 2025; Kim et al., 2021).

Teachers who implement CRT cultivate meaningful relationships between home and school, affirm students' identities, and foster inclusive and respectful classroom communities (Copeland Solas & Kamalodeen, 2022). CRT has been associated with higher academic performance, engagement, and motivation (Haywood, 2025; Walker & Hutchison, 2021; Yu, 2022).

2.4 The Role of Local Culture in Building a Cultural Knowledge Base, Transforming Classroom Spaces, and Enhancing Self-Efficacy

Integrating local culture in instruction strengthens students' cultural knowledge base, enhances the relevance of learning, and supports the development of local identity and pride. The integration of local wisdom in educational development has become a significant concern in many countries (Ningsih et al., 2026). Teachers who draw upon local wisdom and cultural competence can promote higher cognitive, social, and interpersonal engagement and achievement (Heng & Yeh, 2022; Suarta et al., 2022). Approaches such as "think local" and funds of knowledge encourage students to connect their lived experiences and family cultural backgrounds with academic content (Esteban-Guitart et al., 2019; Pang et al., 2021).

Caring pedagogy places relationships, empathy, and attention to students' emotional needs at the center of learning. This practice creates inclusive, safe, and collaborative classrooms that foster active engagement, reflection, and a sense of belonging (Bentley & Shoffner, 2025; Christopher et al., 2020; Motta & Bennett, 2018). Caring pedagogy has also been shown to cultivate supportive and empowering learning communities (Dischinger, 2018)Validation of students' local identities through acknowledgment and appreciation of their cultural backgrounds and experiences contributes to higher self-efficacy, motivation, and learning engagement. Strong self-efficacy is positively correlated with a stable sense of identity, student engagement, and academic achievement (Geven & Zwier, 2025; Huang, 2025; Suarta et al., 2022).

3. Methodology

3.1 Data Collection and Analysis

This study employed a descriptive qualitative research design to examine the implementation of culturally grounded scientific-writing instruction through CRT. The design focuses on describing classroom practices, while the qualitative approach emphasizes participants' meaning-making processes and sociocultural interactions (Creswell & Poth, 2018).

3.2 Participants

The population of this study consisted of Indonesian language teachers who had integrated CRT into scientific writing instruction and eleventh-grade students involved in teaching scientific writing in Karanganyar Regency.

The participants consisted of:

1. Indonesian language teachers who integrated CRT principles into scientific-writing instruction, and
2. 212 eleventh-grade students took part in the learning process.

Participants were selected through purposive sampling with the following criteria: (1) teachers had prior experience teaching scientific writing; (2) schools represented the richness of local cultural traditions in Karanganyar; and (3) individuals were willing to participate actively in the research. Teachers were identified through initial observations, in-depth interviews, and analysis of lesson plans demonstrating the integration of local cultural content into writing scientific papers. To maintain anonymity and facilitate data analysis, all participants were assigned unique identification codes. Teachers are coded as "T" followed by a number (e.g., T1, T2, T3), while students are coded as "S" followed by a number (e.g., S1, S2, up to S212).

3.3 Research Procedure

The research was carried out in several interconnected stages. The first stage involved preparation and coordination, including securing research permission from the Education Office and school principals, as well as developing observation and interview protocols aligned with the research objectives. The second stage concerned the implementation of instruction, during which teachers delivered scientific writing lessons incorporating local cultural content using the CRT approach. The third stage involved data collection conducted throughout the instructional process.

Data was obtained through classroom observations, interviews with teachers and students, documentation of instructional activities, and analysis of students' written products. The final stage consisted of data analysis and reflection, where the researchers examined the qualitative data to describe the enactment of CRT principles, students' responses to the instruction, and the extent to which culturally grounded learning contributed to students' engagement and understanding in scientific writing.

3.4 Data Collection Techniques and Instruments

Data were collected through observations, interviews, documentation, and analysis of students' written artifacts.

Observations were conducted as non-participant observations, focusing on instructional practices, teacher–student interactions, and student engagement using field notes and observation checklists.

In-depth interviews were conducted with five teachers and twenty students using a semi-structured protocol. Interviews were conducted in Bahasa Indonesia, with occasional use of Javanese expressions to ensure natural responses.

3.5 Data Analysis

Data was analyzed using the interactive model of Miles and Huberman, consisting of data reduction, data display, and conclusion drawing/verification. The first phase, data reduction, involved selecting, organizing, and focusing the data relevant to the research objectives, particularly those related to the implementation of CRT in scientific writing instruction. The second phase consisted of data display, structured narrative descriptions, thematic tables, and direct quotations from interviews and field notes to illustrate emerging patterns

comprehensively. The final phase involved drawing and verifying conclusions by interpreting the analyzed data to articulate the main findings on CRT implementation strategies, student responses, and the instructional implications of local-culture-based learning for students' development in scientific writing.

3.6 Data Trustworthiness

Data trustworthiness was ensured through several qualitative validation strategies.

First, source and technique triangulation was conducted by comparing and verifying findings obtained from observations, interviews, and document analysis to ensure consistency across data sources.

Second, member checking was conducted by returning preliminary interpretations and findings to participants to confirm that the meanings generated were accurate and reflected their actual experiences.

Third, peer debriefing involved intensive discussions with fellow researchers and experts in education to review analytical procedures and minimize subjective bias in interpreting the data.

Through these strategies, the credibility, dependability, and confirmability of the data were maintained effectively.

4. Results and Findings

4.1 The Role of Karanganyar Culture in Developing Students' Cultural Knowledge Base

4.1.1. Local Wisdom Topics Address Students' Idea Gaps

An Indonesian language teacher (G1) noted:

> *"At first, the students were silent when asked to write. But after I gave an example topic such as the 'Mantenan Tebu ceremony in their own village,' ideas immediately surfaced from their personal experiences."*

A student (S5) shared:

> *"Usually, I struggle to find a topic, but when it is about Karanganyar, there is a lot I can write about. I know the Wahyu Kliyu tradition and I'm also familiar with Girilayu batik in Matesih Karanganyar."*

Classroom observations involving 211 students showed that 87% produced scientific paper outlines aligned with the local cultural context after two instructional sessions using the CRT approach. Before the intervention, most students reported difficulty identifying contextually appropriate topics and often relied on internet sources unrelated to their lived realities.

Efforts by teachers to introduce learning materials that utilize local traditions, such as *mantenan tebu* (sugarcane wedding ritual), *bersih desa* (village cleansing ceremony), and *wahyu kliyu* (gunungan apem tradition), enable students to develop an emotional connection with the research topics they are assigned. Consequently, the process of writing scientific articles becomes more accessible

and manageable for students. The inclusion of local traditions and cultural resources made the material easier for them to grasp because they could link new knowledge to their daily experiences and the environment in which they live (Fitrianto & Farisi, 2025; Pamungkas et al., 2023).

A student from Grade XI at SMA 2 Karanganyar remarked

> *"If I am asked to write a scientific article on the theme of local culture in my area, I possess a strong understanding of the subject. For instance, regarding traditions such as wayang kulit (shadow puppet theatre) and campur sari (a form of Javanese musical fusion), I can consult members of my family, as these traditions are still regularly practiced in my village".*

This interview excerpt illustrates the successful application of the Culturally Relevant Curriculum principle. When the content aligns with students' cultural backgrounds, they feel grounded in a strong Cultural Diversity Knowledge Base because they are studying phenomena they encounter in everyday life. The improvement in students' ability to generate writing ideas shows that local cultural contexts function as both cognitive and affective triggers. By learning through their cultural experiences, students perceive their knowledge as authentic and meaningful, which strengthens their confidence, engagement, and cultural identity (Sakti et al., 2024b; Sotero et al., 2020). Through the model of Cultural Knowledge Base and Relevant Curriculum (Gay, 2015), teachers make linkages between the experiences of the students with respect to culture and the concepts of scientific reasoning.

Teachers who engage in culturally based dialogues and adopt an empathic approach create a conducive atmosphere for students to reflect on their local identity and culture. The notion of Caring and High Expectations makes the students believe in the significance of studying about their local culture. The finding that integrating into local culture not only enriches lesson content but also effectively addresses the lack of initial ideas among high school students can be understood through three main dimensions: cognitive, affective, and sociocultural. This approach is often described as the use of "funds of knowledge" and "culturally responsive pedagogical knowledge," both of which emphasize students' lived experiences and cultural identities as essential learning resources (Ogodo, 2024).

Cognitively, local cultural contexts function as concrete, easily accessible prior knowledge. When students write about familiar topics they do not start with a blank slate. Their personal experiences provide data, narratives, and concepts that can be developed into academic arguments. This reduces the initial cognitive load that often triggers writer's block. In this sense, local culture serves as a cognitive anchor, enabling students to develop ideas naturally and in context. Affectively, students' personal attachment to their own culture generates a strong emotional resonance. Feelings of pride, familiarity, and responsibility toward local values stimulate intrinsic motivation to write. Students no longer complete the writing task merely as an academic requirement; instead, they are driven by a desire to document and represent a reality they understand deeply. Empirical findings

show that 87% of 211 students produced relevant scientific writing outlines after only two culture-based learning sessions. This supports the view that personal relevance strengthens cognitive engagement and fosters intellectual confidence.
From a sociocultural perspective, integrating local culture creates an epistemic bridge between community life and the school environment. Cultural experiences that are often perceived as informal become recognized as legitimate sources of scientific knowledge. Teachers who implement CRT, including a cultural knowledge base, a relevant curriculum, and caring and high expectations (Gay, 2015), help students understand that their culture possesses academic value comparable to other knowledge systems.

This validation shifts students' roles from merely receiving knowledge to becoming individuals with scientific authority over their own cultural contexts. Methodologically, the use of local cultural contexts also simplifies the research process for high-school students. Easy access to cultural informants, traditional activities, and local artifacts enables students to conduct direct observations without relying heavily on secondary sources. As a result, their scientific papers become more specific, original, and grounded. In other words, local wisdom provides an authentic and accessible research space for students.

The findings indicate that scientific-writing instruction becomes more meaningful when it begins with the exploration of local cultural contexts, such as simple field observations or interviews with community figures. This approach helps students recognize social realities in their surroundings as authentic data sources for academic writing. Teachers then play a crucial role by offering contextual prompts for instance, the social function of the *Gunungan* in *Sedekah Bumi* or the moral values embedded in Batik Girilayu so that students can connect cultural experiences with scientific frameworks.

In such classroom discussions, emphasis is put on relating the students' experiences to the academic content through reflective discussion. During evaluation, the teacher looks at not only how well scientific writing is understood by the student but also how well they can critically analyze data from the local setting. By doing this, the student shows an understanding of science and an appreciation of their culture. In addition to acquiring skills in scientific writing, the student learns that their culture too has something to contribute to scientific thought.

4.1.2. Bridging Local Culture and Academic Demands
Classroom observations indicate that students became more enthusiastic during the data collection phase because it involved interviewing local community figures or visiting historical sites in Karanganyar rather than merely searching for references online. These findings show that implementing a CRT approach grounded in local culture can effectively bridge the gap between students' everyday experiences and the demands of scientific reasoning. In the high-school context where scientific writing is often perceived as distant from students' lived realities the integration of local cultural elements reshapes this perception into a learning experience that is contextual, meaningful, and motivating.

> *"We weren't just copying theories. We interviewed our neighbors about the Nyadran ritual. It felt different like we were real researchers, not just students."* (S8)

Activities such as interviewing cultural leaders or to historical sites in Karanganyar not only enrich the empirical data but also cultivate research awareness. Students come to understand that knowledge is not drawn solely from formal literature, but also from the cultural realities they encounter in their daily lives.

This approach aligns with the Knowledge Construction principle within CRT (Gay, 2015), which emphasizes the importance of helping learners develop new understandings grounded in their own cultural frameworks. In this way, local culture serves as a cognitive scaffold student to grasp the structure of scientific reasoning without losing the authenticity of its context. From a sociocultural perspective, integrating local culture creates an epistemic bridge between community life and the school environment (Sakti et al., 2024a).

During the culturally grounded scientific-writing activities, students showed notable enthusiasm when asked to investigate the *Sedekah Bumi* tradition in their villages. They went beyond describing the ritual within it, such as collective solidarity and respect for nature. One student group reported that the event has gradually shifted toward entertainment, prompting them to highlight changes in community values. This reflective and critical stance was evident in how they constructed arguments in their research papers (Observation Data).

Observation data further reveal that direct engagement with cultural contexts encourages students to be more reflective and critical toward the social phenomena around them. When examining traditions within their own communities, students not only described the activities but also analyzed their social significance, moral values, and evolving meanings in contemporary society. Activities such as visiting traditional markets, participating in batik workshops, or taking part in local ceremonies nurtured creativity, independence, empathy, and a sense of respect for cultural diversity (Suyitno et al., 2023).

This process fosters intellectual autonomy, that is, the capacity to examine cultural phenomena through an academic lens while maintaining cultural empathy. In this regard, local culture does not hinder scientific objectivity; rather, it serves as a bridge connecting students' cultural identities to their critical thinking abilities. This principle also underscores that a CRT-based approach is not a form of "soft pedagogy," but instead strengthens higher-order thinking skills (HOTS) by situating them within meaningful contexts. A Culturally Responsive Teaching framework not only cultivates HOTS but also reinforces students' cultural identity and empathy. By encouraging learners to analyze cultural practices from a scholarly standpoint without losing cultural sensitivity, CRT positions local culture as a conduit rather than an obstacle to scientific objectivity (Brown, 2017; Sani et al., 2024).

4.2 Transforming Classrooms through Caring Pedagogy

This theme examines how shifts in teacher roles and classroom interactions shape students' learning dynamics, with a particular focus on the components of Caring and Cultural Congruity.

4.2.1 Teachers as Cultural Facilitators (Caring)

Classroom observations indicate that during scientific writing instruction, Indonesian language teachers consistently adopted a warm and inclusive pedagogical stance. Rather than enforcing rigid adherence to formal language, teachers strategically drew on local speech registers—such as *le*, *nduk*, or *nggih* to cultivate rapport and bolster students' confidence.

Teachers also began lessons with culturally grounded ice-breaking activities, for instance by inviting students to share their experiences participating in *bersih desa* or *kenduri* traditions. These strategies effectively reduced students' hesitation about writing, particularly among those who initially felt insecure about using academic language.

> *"Our teacher said that writing about our family traditions is also a form of research. That made us more enthusiastic, especially when she told us about attending Merti Desa in her own village." (S9)*

> *"Our teacher often reminded us, 'Culture is not outdated; it is a source of knowledge.' Since then, we have felt more confident writing about things close to our lives." (S20).*

The role played by the educator as a cultural mediator is similar to the aspect of Caring in Critical Race Theory (Gay, 2015). This theory indicates that the practice of caring involves more than just individual empathy. The act of caring is achieved through pedagogic practices that enable learners. Teachers who recognize and respect the linguistic and cultural backgrounds of their students help create an emotionally safe learning environment for them. The practice of caring involves more than having empathic attitudes; it involves instructional strategies as well (Kurian, 2024; Marcel, 2024). Such practices enhance student engagement, confidence, and comfort in expressing their ideas (Sadiqzade, 2024; Tai & Wong, 2023).

In the Karanganyar context, teachers' refusal to ridicule students' *medok* accents or the use of Javanese expressions represents a deliberate attempt to disrupt linguistic hierarchies that often undermine students' confidence. When teachers affirm that dialects and local terminology can serve as qualitative data in scientific writing, students perceive themselves as legitimate knowledge producers. This recognition strengthens their agency and sense of belonging within academic writing practices (Purnomo et al., 2026). Empirical studies likewise suggest that teachers who honor students' cultural and linguistic identities are more likely to create emotionally safe classrooms in which learners feel accepted, respected, and protected from discriminatory attitudes (Hasan et al., 2023; Zhang, 2024).

4.2.2 Application of Cultural Congruity in Classroom Discussions

Norms of politeness in language can be implemented by educators through learning interactions (Kusmanto & Widodo, 2022). Classroom observations reveal that teachers deliberately incorporated Javanese norms of polite speech into every group discussion session. When disagreements emerged, students were encouraged to use courteous local expressions such as *"miturut kulo…"* ("According to me...') or *"menawi saged dipun tambahaken…"* ("If you can add more...) even when the discussion itself was conducted in formal Indonesian.

Teachers also adapted the Javanese musyawarah mufakat tradition as a model for academic decision-making. In several classes at SMA 2 Karanganyar, SMA Tawangmangu, SMA Muhammadiyah 1 Karanganyar, and SMA Muhammadiyah 5 Jaten, group work was organized in the format of a *gotong royong*, where each student presented their research idea in turn, followed by responses from peers using local etiquette.

> *"We learned how to respond to our friends' ideas without belittling them. Our teachers also taught us to speak politely so as not to hurt the other person's feeling."* (S11)

The application of Cultural Congruity in classroom discussions demonstrates the alignment between local cultural practices and modern academic interactions. This principle underscores that classroom communication strategies should not erase students' sociocultural norms; rather, they should leverage these norms to strengthen academic discipline. Teachers who adopt interaction patterns aligned with students' cultural backgrounds are better able to maintain discussion focus and reduce interactional conflict (Chen & Yang, 2017).

In the Karanganyar context, where refined speech (*unggah-ungguh*) (etiquette) is culturally valued, the use of local politeness conventions fosters a discussion climate that is both respectful and productive. Far from diminishing students' critical capacity, these cultural norms enhance the quality of scientific argumentation, as ideas are articulated through well-organized reasoning and ethical communication. Integrating local wisdom and cultural values into classroom discussions not only strengthens students' cultural identity but also cultivates critical thinking, communication, collaboration, and creativity (Esteban-Guitart et al., 2019).

Moreover, employing a *musyawara*h (deliberation)-based discussion format internalizes Javanese collectivist values such as *gotong royong (*mutual cooperation) and *tepa selira* (mutual respect) into scientific reasoning. This approach helps students understand that academic inquiry is not solely about individual correctness, but about building shared understanding through dialogic processes grounded in evidence and empathy. Communication strategies that honor students' cultural norms such as the use of heritage language, storytelling, and locally grounded discussions have been shown to enhance cultural sensitivity, cross-cultural communication skills, and mutual respect (Chen, 2023).

4.3 Improving Student Self-Efficacy through Local Identity Validation

This theme reflects the effective and psychological impacts of CRT innovation, emphasizing both empowerment and validation.

4.3.1 Scientific Writing as a Means to Strengthen Self-Efficacy

Interviews with several high school students in Karanganyar Regency indicate that their academic confidence improved markedly after participating in culturally grounded scientific writing activities. Students who had previously been reluctant to present their ideas became more willing to articulate their observations and arguments.

> *"Before, writing a scientific paper felt like solving a math formula heavy and intimidating. Now, writing about our own village customs feels easier, and I'm more confident because I've experienced them myself. I'm no longer afraid of being wrong."* (S7)

This statement illustrates a significant rise in students' academic self-efficacy. The key factor behind this increase is the connection between their personal experiences and the object of scientific inquiry. By writing about local cultural practices they have directly encountered, students feel a sense of authority over their data and interpretations. The study reinforces that *mastery experience* is a central source of self-efficacy; engaging with familiar cultural phenomena provides authentic experiences that strengthen academic confidence (Gebauer et al., 2021; Hamann et al., 2022).

Classroom observations also reveal shifts in student behavior. Students were more engaged during revision and peer-review sessions. Instead of waiting for teacher instructions, they actively commented on one another's drafts. Teachers further reported increased student participation in non-academic events, such as district-level writing competitions featuring local cultural themes, including "Revitalizing the Gambyong Dance as Intangible Heritage" and "Girilayu Batik as a Local Creative Economy."

These findings demonstrate how the principle of Empowerment in CRT (Gay, 2015), bridges cultural identity and academic autonomy. In this context, empowerment is not merely encouragement; it is a psychological and epistemic transformation in which students recognize that their lived experiences and cultural knowledge hold legitimate academic value. Cultural validation also acts as a catalyst for strengthening self-efficacy. When students perceive their cultural identities as acknowledged and respected within academic settings, they experience increased cognitive confidence the belief that they are capable of thinking, writing, and arguing from an authentic foundation. Students who feel culturally validated tend to show higher self-confidence, stronger learning interest, and lower academic anxiety (He, 2023). An environment that is positive towards cultural diversity in learning environments has been found to enhance the academic self-image and feelings of inclusion among minority and immigrant learners (Bardach et al., 2024; Oczlon et al., 2021).

In Karanganyar, cultural experiences such as *Mandhasiya* (Mandhasiya ritual tradition), the value of mutual cooperation among residents around Cetho

Temple, and *bersih des*a (village cleansing ceremony) serve not only as symbolic traditions but also as ethnographic data that students can analyze scientifically. Writing about these practices allows students to move beyond description to offer critical reflections on cultural values, social functions, and cultural change. Empowerment thus becomes both intellectual and emotional: students are motivated to write and simultaneously become aware that writing is a form of representing themselves as knowledgeable members of their community.

4.3.2 The Role of Students as Agents of Local Knowledge

The analysis reveals that students view their scientific papers as meaningful contributions to Karanganyar, rather than merely completing school assignments. Many expressed pride in presenting field data from their own villages such as community cooperation during *bersih desa (*village cleansing ceremony), the *Nyadran* ritual, or batik production in Girilayu.

> *"I feel that this scientific paper we've written can serve as proof that our village culture still exists. If not us, the next generation, then who else will preserve our culture?"* (S9)

This highlights the emergence of social awareness and cultural identity among students. Scientific writing becomes a medium not only for developing academic skills but also for preserving local wisdom. The statement "if we don't write it, who will?" shows a growing sense of cultural agency, where students understand their role as inheritors and custodians of cultural heritage. Field observations indicate that some students even took the initiative to interview community leaders, village heads, or cultural practitioners as primary sources. This strengthened their papers and fostered awareness that writing can document collective memory.

These findings signal an important shift in scientific writing pedagogy in secondary schools from a reproducing orientation toward a more productive and transformative one. Students no longer merely imitate academic structures but use them to articulate their own social and cultural experiences. This aligns with the transformative and emancipatory dimensions of culturally responsive teaching (Gay, 2018). The transformative dimension encourages education to reshape students' cultural consciousness from passive receivers to individuals aware of local values and potential. The emancipatory dimension positions scientific literacy as a means of intellectual liberation empowering students to speak and write from the vantage point of their own cultural experience.

In the cultural context of Karanganyar, this transformation can be seen in three key aspects:

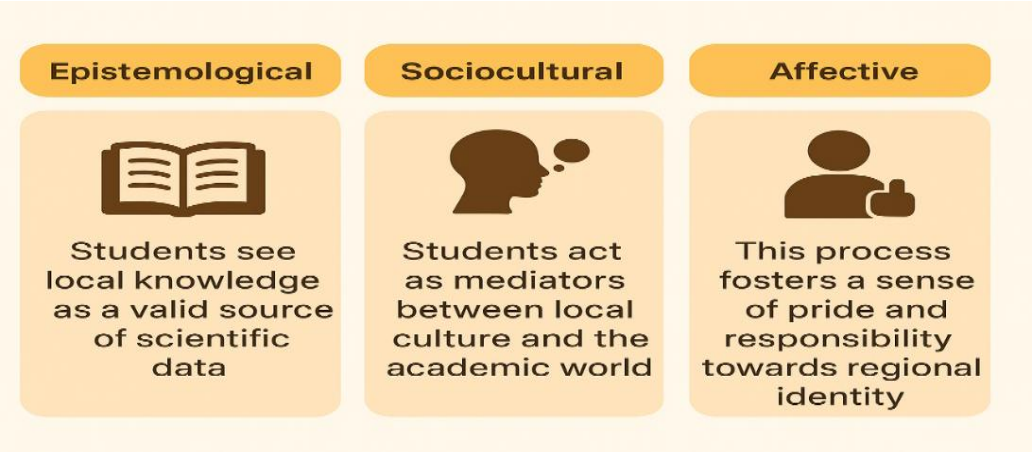

Figure 1: Cultural Transformation in Scientific Writing

Based on Figure 1, it can be explained that learning to write scientific papers through the integration of local cultural contexts produces multidimensional impacts on students. Epistemologically, students begin to recognize local knowledge such as agricultural traditions, batik craftsmanship, and folk arts as legitimate sources of scientific data, equal in value to the theories they encounter in textbooks. From a sociocultural perspective, students position themselves as mediators between local culture and the academic sphere; they do not merely study cultural practices but archive them systematically for scholarly purposes and for the benefit of future cultural preservation.

Affectively, involvement in this process results in a feeling of pride and responsibility regarding regional identity, which further develops motivation to write better scientifically. Thus, learning scientific writing through local cultural foundations is not merely instructional but also transformative, as it cultivates a form of critical cultural consciousness in which knowledge is understood as inherently rooted in the social contexts from which it emerges.

5. Discussion

5.1. The Role of Karanganyar Culture in Developing Students' Cultural Knowledge Base

Based on the research findings, the implementation of the CRT approach by teachers was able to address students' difficulties in generating ideas for writing. Initially, students experienced challenges in identifying topics; however, after teachers provided examples of local wisdom closely related to students' daily lives, these examples served as effective triggers for idea generation. CRT defines the culturally relevant context of the instructional material (Nisa et al., 2025). Therefore, it can be concluded that the CRT approach is effective in strengthening students' cultural knowledge base. CRT helps students connect academic content with their cultural experiences, thereby increasing engagement and giving the learning process personal relevance. Such an approach has been shown to strengthen students' ability to generate ideas and produce writing that reflects

their own contexts rather than depending on generic or disconnected sources (Anyichie et al., 2023; Byrd, 2016; Kim et al., 2021). Previous studies also associate CRT with improved academic performance, higher literacy, and better self-regulation, particularly among students from diverse or marginalized backgrounds (Boat et al., 2025).

5.2. Transforming Classrooms through Caring Pedagogy

The findings indicate that the implementation of Caring Pedagogy within the CRT approach fosters a more inclusive learning environment and enhances students' self-confidence. In this context, teachers act as cultural facilitators by utilizing local language and lived experiences to build emotional rapport and reduce students' academic anxiety. This facilitative role also enables students to generate ideas more effectively(Utami et al., 2023). Furthermore, the application of cultural congruity through Javanese norms such as unggah-ungguh and musyawarah mufakat promotes classroom discussions that are both respectful and critically engaged. In the context of Karanganyar, these practices not only strengthen students' cultural identity but also improve their communicative politeness, which in turn contributes to enhanced learning outcomes(Mubarok et al., 2024; Prayitno et al., 2019).

5.3. Improving Student Self-Efficacy through Local Identity Validation

The integration of local culture into scientific writing instruction also has a significant impact on enhancing students' self-efficacy through the validation of their cultural identities. When students write about cultural practices they have directly experienced, they develop a sense of authority over the data and interpretations they produce, thereby substantially increasing their academic confidence. During reflection activities, students reported that writing about their own culture made them feel "smarter about themselves," as they gained a deeper understanding of the values transmitted by their families and communities. This finding is consistent with previous studies indicating that the recognition and affirmation of students' cultural resources can enhance self-efficacy, motivation, and academic engagement. Therefore, the CRT approach not only improves academic competence but also empowers students both intellectually and culturally (Ialuna et al., 2025; Rocha et al., 2024).

6. Conclusion

This study illustrates that by integrating cultural perspectives in scientific writing instruction through the CRT model, significant shifts in the knowledge building process, reasoning, and understanding the intention of academic writing occur among the learners. This research makes three major contributions to literature. First, the use of local culture as an authentic learning resource enriches students' processes of knowledge construction and enhances their critical and reflective thinking capacities. Second, CRT-based pedagogical strategies consistently strengthen students' academic self-efficacy, as shown by their increased confidence in expressing ideas and presenting observational findings grounded in their cultural experiences. Third, reframing scientific writing as a form of social contribution shifts students' perspectives from viewing academic writing as a mechanical requirement to understanding it as a meaningful practice of cultural

preservation. Taken together, this instructional innovation fosters a holistic set of competencies encompassing cognitive, affective, and sociocultural dimensions, while also illustrating that the integration of local culture can serve as a mechanism for cultural empowerment and the strengthening of contextual scientific literacy. While existing models of Indonesian language education largely overlook cultural context, this approach provides a novel alternative. It implements a CRT approach explicitly integrated with local wisdom familiar to students, an area that remains underexplored in current literature. The study's limitations lie in the restricted cultural scope and limited number of participating in schools, as well as the measurement of affective outcomes that relies heavily on students' subjective reflections.

Future research involving more diverse cultural contexts and more standardized evaluation instruments is therefore needed to enhance the generalizability and validity of the findings. In light of these findings, educational policymakers and curriculum developers are strongly urged to formally integrate CRT frameworks and local cultural materials into standard language education guidelines. Furthermore, educational institutions should prioritize targeted professional development to equip educators with the practical skills needed to implement this pedagogical model.

Conflict of Interest

No potential conflict of interest was reported by the authors.

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