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Integration of Social Emotional Learning in Mathematics Instruction: A Holistic Approach in Alternative Elementary Schools

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Abstract

This study aims to explore the pattern of Social-Emotional Learning (SEL) in a mathematics lesson at an alternative elementary school in Indonesia. This qualitative case study involved school principal, teachers, and students, recruited using purposive sampling technique. Data were collected using observation, interviews, and document analysis. The latter was done following a model proposed by Creswell, consisting of raw data, organize and prepare the data for analysis, reading through all the data, coding all data, interrelating themes/description, and interpreting the meaning of themes/description. This study concludes that the SEL implementation pattern at the alternative elementary school consisted of a supportive classroom climate, integration of SEL into academic instruction, and explicit SEL instruction. A supportive classroom climate includes a physically healthy environment, cooperative and responsive interactions, a comfortable learning atmosphere, and respect for cultural diversity. Integration of SEL into academic instruction involves activities such as games, case studies, projects, self-reflection, group discussions, individual mentoring, structured assignments, and peer tutoring. Explicit SEL instruction refers to dedicated programs that must be implemented in a routine, active, focused, and explicit manner. Therefore, it is important to implement SEL in mathematics lessons systematically and responsively to support students' social-emotional development and holistically improve their achievement.

Keywords: Alternative Elementary School, Holistic Approach, Mathematics Lesson, Social-Emotional Learning (SEL).

Introduction

The 21st century is characterized by rapid and dynamic changes across various sectors, including technology, economy, and socio-cultural aspects (1, 2). These changes demand a transformation in education to prepare individuals capable of adapting to new challenges and opportunities (3). This transformation is important to ensure that the young generation not only ready to face the increasingly complex professional world but also positively contribute to the more diverse and dynamic community (4). Individuals need to be equipped with good socioemotional skills to build positive relationships and adjust themselves effectively to the environment (5, 6). Social-Emotional Learning (SEL) is a relevant educational approach in response to this transformation (7, 8). SEL aims to cultivate emotional intelligence, social skills, and ethical awareness in students (9, 10). Through SEL, students learn to recognize and manage emotions, build healthy relationships, and make responsible decisions (11, 12). The integration of SEL affects not only students' social and emotional aspects but also contributes to improved academic performance (13). Social and emotional experiences influence brain development, thereby impacting academic outcomes (14). SEL also fosters students' adaptability in areas such as religious behavior, political orientation, and personality development (15). Research findings further show that students who receive instruction and support in social and emotional competencies achieve higher outcomes in educational performance, social skills, behavioral competencies, and positive attitudes (16). Thus, integrating SEL into the educational curriculum reflects an urgent need to prepare students to become balanced, resilient, and competitive individuals in the 21st century (17).

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The Core Competencies for Social and Emotional Learning (SEL) developed by the Collaborative for Academic, Social, and Emotional Learning (CASEL) is a framework which provides that the five interrelated and interdependent social and emotional competencies include self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (18). Such competencies are the basis for classroom instruction, especially math, since it is often the most difficult subject and can emotionally disturb some students through the recognition and teaching of social-emotional skills in math classes (19). Moreover, mathematics instruction requires logical thinking, problem-solving, and collaboration to complete complex tasks (20). The struggle that basically is from the comprehension of abstract concepts and besides this the pressure to find the correct answer may work negatively on students' motivation and confidence in learning (21, 22). SEL empowers students with the most valuable tools needed to regulate emotional experiences such as anxiety, persist through difficult experiences, and communicate clearly with others (23).

Social cognitive theory also shows that learning is performed through observation, social interaction, and self-regulation all of these are affirmed during SEL implementation (24). Specifically, SEL promotes growth mindset and student resilience, enabling them to approach mathematical tasks with higher motivation and reduced fear of failure (25). Research has shown that using SEL alongside math teaching is not only good for students' social learning but also improves their academic performance by creating a good learning atmosphere and increasing student participation and problem-solving skills (26). Clearly, SEL is responsible for emotional development and at the same time develops cognitive skills which are the core learning in math.

Various studies have developed models, methods, and programs integrating SEL into mathematics instruction, such as role-playing, joyful learning, situation-based learning (SBL), and problem-based learning (27–30). Programs like PATHS and Strong Kids have also shown positive effects on social-emotional development and academic achievement (31). Research on SEL implementation has revealed links between mastery of social-emotional competencies and academic performance (32). However, most of these studies have not specifically examined the implementation of SEL in mathematics instruction, particularly at the elementary level.

In Indonesia, SEL approaches are implemented in several alternative elementary schools that promote holistic education values. Alternative schools differ from formal schools in their unique forms and learning methods (33). While traditional schools in Indonesia generally emphasize standardized curricula, academic achievement, and structured classroom instruction, alternative schools adopt more flexible, student-centered approaches. These schools often provide greater autonomy to teachers, integrate experiential and contextual learning, and allow space for emotional expression and character development as core elements of the learning process. Some alternative elementary schools in Indonesia develop character-based education and emphasize a balance between cognitive, emotional, and social aspects in the learning process (34). These schools have adopted SEL principles within their curricula. Considering research findings and the implementation of SEL in these alternative schools, this study aims to explore SEL approach patterns in mathematics instruction at alternative elementary schools in Indonesia. This study is expected to identify more specific strategies for implementing SEL in mathematics learning.

Methodology

Research Design

This study employed a qualitative case study design. Qualitative research seeks to understand the meaning of individuals' or groups' experiences of a social issue through naturalistic data collection and inductive analysis to develop themes or patterns of understanding (35). A case study method was used in this research. A case study is a research method that investigates a particular case such as a program or individual by collecting various types of data in detail over a specific period to gain a comprehensive understanding of the case (36). This study aimed to explore patterns of SEL implementation in mathematics instruction at the elementary school. The research question was: How are patterns of SEL implemented in mathematics instruction at alternative elementary schools? Credibility in this qualitative case study

design is maintained through triangulation. Triangulation is a data collection technique that involves the use of multiple sources, methods, or time points simultaneously to ensure the validity and consistency of the findings (37). This study employed source triangulation, methodological triangulation, and time triangulation.

Participants

This study was conducted at an alternative elementary school in Denpasar, Bali, Indonesia. The selected site was an internationally oriented alternative school. The research location was chosen based on several considerations including the school was open to research activities, its curriculum emphasized a balance between character development and academic achievement, and the school implemented humanistic education, aligning with SEL principles. The study participants included the school principal, teachers, and students from the Alternative Elementary School in Denpasar, Bali. Participants were selected using purposive sampling, a technique that involves selecting individuals based on specific criteria relevant to the research objectives (38). This method allowed the researcher to choose participants who were most relevant and informative in the context of the study, thereby enhancing data credibility (39). Teachers selected for the study had more than five years of teaching experience and had participated in several SEL implementation programs. A total of 24 students from grades 1 through 6 were selected for interviews and observations based on their willingness to participate, their level of engagement in learning activities, and the completeness of their background data.

Data Collection Technique

Data collection in qualitative research is characterized by the researcher's direct involvement in natural settings to obtain in-depth information. The data collection techniques used in this study included observation, interviews, and document analysis. The researcher conducted direct observations at the school using an observation checklist. As a participant observer, the researcher served as the key instrument engaging with participants, adapting to the setting, and becoming part of the environment to gain a deep and detailed understanding of the research focuss. Observations were carried out twice a week over a four-month period. The observations were guided by an observation sheet containing indicators related to mathematics classroom instruction and the learning environment (40). Field activities were recorded descriptively based on what was observed.

In-depth interviews were also conducted to obtain accurate data. The researcher prepared guiding questions in advance to facilitate data collection during the interviews. Tools used in the interview process included an audio recorder and a mobile phone to capture images. A total of five interview sessions were conducted involving two principals, two teachers, and eleven students. Document analysis involved reviewing and examining various relevant documents to support or supplement the data collected. The types of documents analyzed included curricula, lesson plans, student grades, learning resources, and school schedules from the alternative elementary school in Denpasar, Bali. All research instruments including the observation checklist and interview guide underwent content validity testing using expert judgment. Four experts evaluated the instruments based on their areas of expertise, including a linguist assessed language use and sentence structure accuracy, an expert in research instrument development evaluated the effectiveness of each item in measuring the intended variables, a social emotional learning expert reviewed the instrument's alignment with SEL principles, and an educational psychologist verified the appropriateness of the instruments for students' developmental stages.

Data Analysis Technique

Qualitative research data are collected from various sources using multiple techniques and are gathered continuously until saturation is achieved. This study employed Creswell's model of data analysis, which consists of the following steps including organizing and preparing the data for analysis, thoroughly eading through all the data, coding the data, generating descriptions and themes, and representing the descriptions and themes (41).

Results

A Supportive Classroom Climate

The SEL approach to classroom environment management emphasizes the prioritization of positive relationships with students and focuses on the quality of these interactions to create more

effective learning experiences and a supportive educational environment. The findings of this study revealed that teachers at the alternative elementary school consistently implemented inclusive, relationship-centered, and culturally responsive teaching practices. Classroom observations showed that teachers fostered an open and welcoming learning atmosphere, providing opportunities for all students to participate actively without discrimination. Interactions between teachers and students were characterized by warmth and supportiveness, as evidenced through empathetic two-way communication and constructive feedback. This was further confirmed through interviews with the principal, who stated, "*We emphasize the importance of positive relationships through teachers' openness and closeness to students*."

Teachers' strategies for building classroom communities were also implemented effectively. Observations indicated that teachers at the alternative elementary school played a critical role in creating an inclusive and empowered classroom community. Teachers actively encouraged positive interactions through collaborative activities such as group projects, cooperative games, and group discussions. They also paid particular attention to social dynamics within the classroom, supporting students in getting to know one another, appreciating diversity, and building a strong sense of camaraderie. Analysis of lesson plans revealed explicit integration of SEL competencies. Interviews with teachers indicated that this approach was applied consistently to support students' holistic development, particularly in fostering mutual respect and sensitivity to diversity. Support for classroom discussions is illustrated in Figure 1.

Figure 1: Teacher Engagement in Promoting Positive Classroom Interactions

Figure 1 shows a teacher engaging directly with students in a primary classroom setting, fostering interaction through active communication and a supportive learning environment. The physical and social environment at elementary school also supported the recognition of students' values, assets, and cultural contributions. Based on direct observations, the classroom was designed to support collaborative and inclusive learning, equipped with facilities that encouraged exploration and active participation. Extracurricular programs involving the local community were an integral part of the culturally-based learning strategy.

Additionally, the research findings revealed that classroom agreements were developed collaboratively and integrated into the daily practices and routines at the alternative elementary school. The 5S 2B program, consisting of smiling, greeting, politeness, courtesy, and maintaining personal and environmental cleanliness, was implemented as a shared social

norm understood and followed by all members of the school community. Observations showed that these values were not only communicated verbally but were consistently modeled by teachers and internalized by students in their daily interactions. An interview with the principal emphasized the importance of consistently applying these values: "*The 5S 2B program is not just a slogan; it has become a shared culture that we instill at the start of the school year and implement every day*." School internal documentation revealed that these values were included in the student behavior guidelines and the school's annual work plan, indicating reinforcement through a structured and sustainable system. Overall, the findings of this study provide evidence that classroom management practices at the alternative elementary school reflect an inclusive, relational, and culturally responsive approach. Teachers' strategies align with students' developmental needs and foster a supportive, collaborative classroom environment. Shared values, built through participation and daily routines.

Integration of SEL into Academic Instruction

The integration of SEL components into mathematics instruction at the alternative elementary school was guided by the national framework of the Profil Pelajar Pancasila, as outlined in Indonesia's curriculum, which serves as a foundation for designing character-based learning objectives. Interview data with teachers revealed that they explicitly aligned academic goals in mathematics with social-emotional competencies, such as collaboration and independence. One teacher explained: "*If the learning objectives are already integrated with SEL nowadays, there's the Pancasila Student Profile character education*". This statement was corroborated by classroom observations, which showed that learning objectives were clearly communicated to students and followed by the organization of activities reflecting social-emotional competencies, such as group work and individual assignments. Teacher lesson plans demonstrated that character values and SEL components were explicitly stated in the indicators and instructional activities for mathematics lessons.

Teachers also employed intentional, student-centered strategies to foster learners' ownership of the learning process. According to interview findings, instruction typically began with guiding questions connected to students' daily lives, aiming to establish relevance between personal experience and mathematical concepts. As one teacher explained: "*I usually begin with a guiding question that I relate to material found in everyday life*." Observations confirmed that this approach effectively activated students' prior knowledge and engagement. In one mathematics lesson, for instance, the teacher asked a contextual question: "*How do you use mathematical concepts when shopping for daily needs*?" Students responded with diverse perspectives that reflected their conceptual understanding. Document analysis further supported these findings, revealing exploratory activities grounded in students' real-life experiences embedded within the instructional design.

Students were actively engaged in sharing perspectives and practicing social-emotional competencies within the context of academic learning. This was evident in group discussions and classroom presentations that were routinely facilitated by teachers. According to interview data, teachers noted that these activities helped students develop relationship skills, effective communication, and self-awareness. One teacher explained: "*Through discussion and presentations, the students practice communication and gain self-confidence*." This finding was supported by classroom observations, which revealed that students actively expressed their ideas, listened attentively to peers, and collaborated to complete group tasks. Video documentation and observation reports indicated that group presentations were an integral part of the mathematics learning cycle, contributing to the development of social-emotional competencies.

Teachers also actively involved students in co-constructing knowledge. Strategies employed included providing contextual stimuli, utilizing both concrete and digital learning media (e.g., GeoGebra for spatial geometry). One observed practice involved the teacher asking students to construct a "mini city" using various three-dimensional shapes found around the school environment. This activity not only integrated geometric concepts but also fostered teamwork, group responsibility, and appreciation for each member's contribution. Further observations

showed that teachers offered constructive feedback during discussions and facilitated meaningful learning by linking lesson content to students' real-life contexts. Analysis of instructional documents also reflected this principle, with project-based and exploratory learning tasks forming a regular part of instructional strategies, as illustrated in Figure 2.

Figure 2: Use of Concrete Media

Figure 2 shows a teacher facilitating a hands-on science activity with elementary school students using colored liquids to encourage active learning and collaboration in the classroom. Accordingly, the findings of this study indicated that the integration of SEL into mathematics instruction at the alternative elementary school had been implemented systematically.

Explicit SEL Instruction

Explicit instruction in SEL provided a structured space for students to develop, apply, and reflect on their social-emotional competencies in a continuous manner, through approaches that were adaptive to both developmental stages and cultural backgrounds. This dedicated time focused directly on reinforcing social-emotional skills. Based on interviews with the principal and teachers, the alternative elementary school implemented a weekly program dedicated to SEL that complemented mathematics instruction and supported students in achieving the expected competencies. This program served as a consistent space for reflection and socio-emotional interaction. One teacher explained: "*The implementation SEL in our school includes a dedicated learning schedule every Wednesday*. Observations confirmed that these reflective sessions involved activities focused on students' emotions and experiences related to learning mathematics. Document analysis also indicated the presence of a specific weekly schedule allocated to SEL instruction.

In addition to dedicated SEL sessions, teachers actively provided explicit instruction related to SEL during various mathematics lessons. A key strategy employed was the STOP (Stop, Think, Options, and Proceed) approach, which was systematically implemented by teachers to support students in managing their emotions, particularly when encountering difficulties in understanding mathematical concepts. The STOP strategy was not introduced merely as theoretical content but was integrated into real-time classroom moments, particularly when students experienced confusion or anxiety during mathematics tasks. A teacher noted: "*I teach them to pause and calm down when they cannot solve a problem*." Observational data further confirmed that students were guided to reflect on their responses to challenges and to develop more structured approaches. Teachers regularly invited students to share their feelings and impressions about the lessons, reinforcing the integration of SEL into daily learning activities in a consistent and contextualized manner. Overall, the findings regarding explicit SEL instruction indicate that the

implementation of SEL at the alternative elementary school provided structured opportunities during the school week for students to discuss social-emotional competencies.

Discussion

A Supportive Classroom Climate

The findings of this study indicate that classroom management practices in the alternative elementary school reflect an inclusive, relational, responsive, and collaborative educational approach that acknowledges cultural diversity and addresses students' needs. A supportive classroom environment may indirectly impact students' academic performance in mathematics. Such an environment can reduce math anxiety to a certain extent, which in turn can enhance motivation and improve learning outcomes (42). Collaborative settings also foster an inclusive atmosphere and support the development of healthy interpersonal and to improved cognitive performance in solving mathematical problems effectively (43, 44).

A safe and comfortable physical environment provides a solid foundation for students' mental and emotional well-being. Students tend to be more focused and ready to learn when in a physically healthy environment (45, 46). In this context, the teacher's role is crucial, particularly in demonstrating responsiveness to students' social and emotional needs. Teachers who are able to build warm and supportive relationships in the classroom not only foster strong emotional bonds but are also more effective in identifying and addressing students' challenges (47).

In addition, classroom management at the alternative elementary school consistently integrates social-emotional education through the internalization of shared values developed in a participative manner. The 5S 2B program smile, greet, address, polite, courteous, self-cleanliness, and environmental cleanliness forms a living school culture that is sustained in daily routines. These findings align with previous studies showing that habitual practice of the 5S values can shape students' character, foster active engagement in learning, and strengthen social relationships in the classroom (48). Thus, strengthening a school culture grounded in shared values becomes a strategic element in supporting holistic, contextual, and culturally rooted education (49).

Integration of SEL into Academic Instruction

The findings indicate that the integration of SEL components into mathematics instruction at the alternative elementary school has been implemented in a systematic and contextual manner. This integration is evident in how teachers explicitly design mathematics learning objectives to incorporate social-emotional values such as collaboration and independence. The alignment between academic goals and social-emotional competencies in instruction serves as a crucial component and an initial step in implementing SEL in classroom learning (50). Curricula that explicitly integrate social-emotional values tend to result in increased student engagement and academic achievement (51).

Teacher instruction is not merely declarative but is built through participatory processes that emphasize relevant learning experiences for students. One such strategy involves the use of guiding questions connected to students' daily lives. These guiding questions serve as a strategic tool to stimulate student curiosity, direct learning focus in line with the curriculum, and build a classroom culture that supports meaningful learning experiences (52). Contextual problems posed through these guiding questions can help students overcome misconceptions, enabling them to solve mathematical problems by connecting content to real-life situations (53). Teachers actively relate mathematics content to students' experiences, thereby fostering both cognitive and affective engagement simultaneously (54).

Furthermore, instructional activities such as group discussions, projects, case studies, peer tutoring, games, structured assignments, individual guidance, and self-reflection reflect a learning approach oriented toward the development of social-emotional competencies. Collaborative learning practices, such as group discussions and class presentations, provide students with opportunities to develop social and communication skills (55). One practical strategy observed includes cooperative problem-solving activities, in which students collaboratively analyze mathematical tasks while being guided to express their emotional responses and frustrations constructively (56). Math journaling is also used as a reflective tool, allowing students to

document not only the steps they used to solve problems but also their emotional experiences during the process, such as feelings of confidence, confusion, or persistence (57). In addition, lesson frameworks that incorporate "emotional check-ins" at the beginning or end of a math class serve to acknowledge students' emotional states, normalize emotional expression, and promote a supportive classroom atmosphere (58).

The implementation of SEL through community building, designing specific objectives, and problem-solving has the potential to enhance social-emotional competencies, which in turn contributes to improved academic performance in mathematics (59). The learning community is exemplified by the use of the school library as a space where students can develop both academic knowledge and social-emotional skills through reading, discussions, and interactive learning activities beyond regular classroom instruction (60). Learning communities can help create a school environment that supports both the social-emotional and academic development of students. Peer tutoring methods assist students in understanding learning materials, creating active, interactive, and collaborative learning experiences that enhance academic achievement (61). Additionally, incorporating games into mathematics instruction can improve students' emotional intelligence, positively contributing to their mathematical problem-solving abilities (62).

The use of concrete media demonstrates that teachers consistently apply constructivist learning principles in the development of social-emotional competencies. Through direct interaction with manipulatives, students engage in discussion, collaboration, and reflection, which strengthen communication skills, empathy, and emotional regulation within the context of mathematical problem-solving (63). Furthermore, the teacher's involvement in providing reflective feedback during the learning process indicates that knowledge construction is not unidirectional but is shaped dialogically between teacher and students (64).

The integration of SEL within academic instruction can fundamentally be applied in both regular classrooms and those serving students with behavioral disorders (65). Specifically, SEL integration for students who are neurodivergent or have experienced trauma requires a more personalized approach that is sensitive to their emotional and neurological needs. In contrast, regular students typically receive a more general and structured SEL approach aimed at developing foundational social and emotional skills (66).

Explicit SEL Instruction

The implementation of explicit instruction in SEL at this alternative elementary school demonstrates a program that is carried out through a systematic and responsive approach. The strength of the explicit SEL instruction lies in its intentional and structured design, directly targeting core social-emotional competencies (67). The integration of explicit SEL instruction requires clearly defined programs to support the development of social-emotional competencies in a specific and intentional manner, thus contributing to student well-being (68). A dedicated weekly program focused on developing social-emotional skills provides students with opportunities to reflect on and discuss their learning experiences (69).

The STOP strategy applied by teachers during mathematics instruction, serves as a tool to help students manage their emotions when facing academic challenges. This strategy functions not only as an emotional regulation framework but also as a pedagogical instrument aligned with child development. The program has successfully created a classroom climate that supports emotional expression, enhances self-efficacy, and increases student engagement (70). The explicit instruction delivered by teachers particularly through the STOP strategy demonstrates that when social-emotional competencies are explicitly taught, students gain a clearer understanding of how to apply them in real-life contexts. This aligns with previous research findings indicating that explicit instruction is essential in helping students transfer social-emotional skills into formal learning contexts (71). Furthermore, the program within this approach reflects the principles of Sequenced, Active, Focused, Explicit (SAFE), which characterize effective SEL programs. A program that is explicitly designed, well-structured, and consistently implemented is an essential element in supporting the achievement of holistic and sustainable learning goals in elementary schools (72).

Thus, the overall implementation of SEL in mathematics instruction is carried out through three key approaches: a supportive classroom

climate, integration of SEL into academic instruction, and explicit SEL instruction. The professional development approach needed by teachers in this context includes conducting workshops on the impletation of SEL into mathematics learning, creating a supportive environment, and developing explicit programs that complement mathematics instruction (73). Such measures are crucial in preparing teachers to effectively integrate SEL in mathematics lessons. In practice, teachers often face challenges such as difficulties in providing a supportive learning environment and scheduling explicit programs, as these initiatives must be systematically integrated according to the principles of being sequenced, active, and focused so that the tactics that teachers can adopt for SEL integration involve fostering strong collaborations with the school, families, and the wider community to ensure a meaningful and sustainable contribution to students' development (74).

However, practical issues such as time limits, curricular requirements, and assessment misalignment should be addressed to facilitate successful implementation. While teachers strive to create supportive learning environments and schedule explicit SEL programs, the constraints of limited instructional time and rigid curricular demands often hinder the integration process. Moreover, existing assessment systems may not adequately capture students' social and emotional development, making it difficult to evaluate SEL outcomes effectively (75). Addressing these challenges is essential to ensure that SEL integration is both feasible and impactful within the academic setting.

Conclusion

The pattern of SEL implementation in mathematics instruction at the alternative elementary school consists of a supportive classroom climate, integration of SEL into academic instruction, andexplicit SEL instruction. A supportive classroom climate includes a physically healthy environment, cooperative and responsive interactions, a comfortable learning atmosphere, and respect for cultural diversity. Integration of SEL into academic instruction involves activities such as games, case studies, projects, self-reflection, group discussions, individual mentoring, structured assignments, and peer tutoring. Explicit SEL instruction refers to dedicated programs that must be implemented in a routine, active, focused, and explicit manner. These findings have several important implications for curriculum creation, teacher preparation and education policy. For curriculum creation, there is a need to systematically embed SEL components within mathematics instructional design to support both cognitive and emotional development. For teacher preparation, teacher education and professional development programs should include comprehensive training in SEL strategies that can be integrated into academic content. For educational policy, there is a need for supportive regulations and guidelines that mandate and facilitate the integration of SEL into the school curriculum, especially in alternative school settings. Such efforts will promote holistic student development in both social-emotional and academic domains.

Abbreviations

SAFE: Sequenced, Active, Focused, Explicit, SEL: Social-Emotional Learning, STOP: Stop, Think, Options, and Precede.

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Author Contributions

Anesa Surya: designed the study, collected and analyzed the data, prepared the final manuscript, Heri Retnawati: conceptual framework, manuscript review, Haryanto: conceptual framework, manuscript review, Ratna Hidayah: assisted in aligning the findings with elementary education contexts. All authors approved the final manuscript.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Ethics Approval

Not applicable.

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