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Application of the Synthetic Analytical Structural Method to Improve the Reading Skills

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ABSTRACT

Purpose – This study aims to evaluate the implementation of the Structural Analytic Synthetic (SAS) method in teaching beginning reading within the context of 21st-century skills, particularly during online learning environments prompted by the COVID-19 pandemic. It examines the extent to which first-grade teachers effectively apply the SAS method and align their instructional practices with the demands of modern literacy education.

Methodology – This study employed a quantitative descriptive research design using a survey method. This research aims to analyze the extent to which teachers apply the Structural Analytic Synthetic (SAS) method in beginning reading instruction within the framework of 21st-century learning, particularly during the implementation of online learning in response to the COVID-19 pandemic. A total of 35 respondents were selected through a probability sampling technique, specifically using simple random sampling, and the sample size was determined based on the Krejcie and Morgan table at a 95% confidence level. The data collection techniques used in this study were questionnaires, structured interviews, and documentation.

Findings – The findings of this study indicate that the implementation of the Structural Analytic Synthetic (SAS) method in teaching beginning reading during online learning has been generally successful, particularly in the context of 21st-century education. Teachers demonstrated a good level of mastery in applying the SAS method, as evidenced by consistent improvements in each observed session and positive responses from parents. The integration of 21st-century competencies—such as critical thinking, creativity, communication, and collaboration—was evident in teachers' instructional practices despite the challenges posed by the sudden transition to online learning during the COVID-19 pandemic.

Contribution – This study contributes to improving early reading skills in first-grade students and offers a classroom strategy to enhance student reading comprehension outcomes.

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INTRODUCTION

Indonesian, as the language of instruction at all levels of education, plays a crucial role in efforts to improve the quality of education, particularly at the elementary level. In primary schools, Indonesian language instruction is fundamentally aimed at equipping students with the ability to use the language effectively for various purposes, especially for communication and social interaction (Pambudi et al., 2019; Indriyani & Yusnani, 2021). According to the 2013 Curriculum, the content of Indonesian language learning in elementary education is designed to develop four essential language competencies: speaking, listening, reading, and writing (Arum & Yuanta, 2019). These four language skills are interconnected and mutually support one another throughout the learning process (Perni, 2019). Among these skills, reading is particularly crucial for elementary students, as proficiency in reading facilitates more explicit reasoning through the information acquired during reading activities (Tahmidaten & Krismanto, 2020).

Findings from the Progress in International Reading Literacy Study (PIRLS), a global assessment of reading ability among fourth-grade students conducted by The International Association for the Evaluation of Educational Achievement, indicate that Indonesian students rank near the bottom among participating countries (Mutji & South, 2021). This outcome highlights that reading proficiency among Indonesian learners remains considerably low. Transitioning from this problem, one contributing factor is the insufficient integration of reading instruction with the competencies required in the 21st century. According to current literature, reading is not merely a linguistic skill but a core literacy that underpins other essential 21st-century competencies such as critical thinking, information literacy, and problem-solving (Rahmawati, 2019; Lavi et al., 2021; Zhao & Wu, 2021). Therefore, efforts to improve reading ability in primary education must also consider the broader framework of future-ready learning, which often involves digital platforms and blended modalities (Redhana, 2019).

In an era marked by rapid technological advancement, students are expected to acquire a range of 21st-century competencies to thrive academically and socially (Lavi et al., 2021). These include communication, collaboration, creativity, ICT literacy, and lifelong learning abilities (Ichsan et al., 2019). Among these, reading literacy serves as the gateway skill for developing broader knowledge and cognitive abilities (Lai et al., 2019; Widodo et al., 2020). Reading enables students to access information, reflect critically, and develop a nuanced understanding of complex ideas. It is an indispensable tool for academic success and lifelong learning (Zhao & Wu, 2021). In elementary education, reading instruction typically consists of two stages: beginning reading and advanced reading (Memiş & Kandemir, 2019; Wang et al., 2021). The initial stage, which occurs in the lower grades, focuses on developing basic decoding skills and improving reading fluency, laying the essential foundation for future literacy development.

Early reading instruction in the lower grades is considered critically important (Tse et al., 2019) because it not only enhances students' language abilities but also directly influences their performance in other subjects (Sheen & Luximon, 2021; Vuong et al., 2019). However, despite its importance, early reading instruction in Indonesia still faces many challenges (Yuniarti & Radia, 2020). Students often exhibit a range of reading difficulties, including poor decoding, incorrect pronunciation, skipping or adding words, and difficulty recognizing words in context. If left unaddressed, these problems can hinder students' overall academic progress and reduce their motivation to learn.

These challenges necessitate the identification and implementation of effective instructional strategies. Teachers, as key actors in the classroom, must be equipped with effective methods that are responsive to students' developmental needs. This is particularly critical for first-grade students, who are typically in the concrete operational stage of cognitive development (Toropova et al., 2021). Instructional approaches must align with students' abilities to process information through hands-on, meaningful learning experiences. One method that is well-suited for this stage is the Structural Analytic Synthetic (SAS) method. The SAS method systematically guides students through stages of recognizing whole sentences, analyzing them into parts, and reconstructing them (Hermita et al., 2020; Chen et al., 2021). It is based on the linguistic principle that the

sentence is the smallest unit of meaning and is particularly effective in building early reading skills through its structured and student-centered approach (Sulaiman & Hasrianti, 2021).

Nevertheless, the Covid-19 pandemic has introduced new complexities into the learning environment. The sudden shift to online learning has disrupted instructional routines, shortened adequate learning time, and challenged the application of methods like SAS that rely heavily on structured teacher-student interaction (Solong, 2021). Teachers often prioritize content completion over instructional quality due to time limitations (Nengrum et al., 2021). Although the SAS method is endorsed by educational policy, its implementation in online learning settings remains largely unexamined. Challenges include limited student engagement, inadequate parental support, and difficulties in delivering phonological and syntactic components virtually. These issues underscore the need to assess how effectively the SAS method can be adapted to online environments and whether it continues to foster the development of essential reading skills and 21st-century competencies under such constraints.

The research gap in this study lies in the limited exploration of how the SAS method functions within the context of online learning and its alignment with 21st-century education principles. While previous studies have highlighted the effectiveness of SAS in traditional classrooms (Jabir, 2020; Yusmiati, 2021), few have examined its implementation during pandemic-induced remote learning or how it supports critical 21st-century skills. Additionally, existing literature has not sufficiently addressed the specific challenges teachers face when applying the SAS method in digital learning environments, nor the degree to which the method's original syntax remains intact in these settings.

The problem in this research is that there is an insufficient understanding of how the SAS method has been implemented in online learning, particularly regarding its instructional procedures and the demands of 21st-century learning. This study aims to analyze the application of the SAS method in early reading instruction, specifically in online learning environments, and assess its compatibility with principles of 21st-century education. The research will employ a survey method due to its suitability for collecting data from a relatively large number of participants and for exploring practical implementation issues. By examining how teachers implement the SAS method in digital learning environments, this study aims to provide new insights into literacy instruction strategies that remain effective and relevant in the modern educational landscape.

METHODOLOGY

Research Design

This study employed a quantitative descriptive research design, utilizing a survey method, to obtain measurable and generalizable data regarding the implementation practices of the SAS method in online learning. This approach is suitable for addressing the research questions, as it enables a systematic collection and analysis of respondents' perceptions, experiences, and patterns of SAS method application, thereby providing a comprehensive overview of its implementation in a real educational context. This research aims to analyze the extent to which teachers apply the Structural Analytic Synthetic (SAS) method in beginning reading instruction within the framework of 21st-century learning, particularly during the implementation of online learning in response to the COVID-19 pandemic.

A total of 35 respondents were selected using a probability sampling technique, specifically simple random sampling. The target population consisted of 52 teachers from public elementary schools in Palu City who had implemented the SAS (Structure–Analysis–Synthesis) method in online learning during the 2023/2024 academic year. The sample size of 35 respondents was determined using the Krejcie and Morgan table at a 95% confidence level, which recommends a minimum of 33 participants for a population of 52. Although the sample size appears relatively small for a survey study, it is proportionate to the total population and statistically acceptable for generalization within this specific context. Moreover, all selected respondents met the inclusion criteria and voluntarily agreed to participate in the study. To ensure random selection, the researchers compiled a complete list of eligible teachers, assigned each teacher a unique identification number,

and used a random number generator to select 35 participants without bias. The demographic characteristics of the respondents were also documented in detail. Of the 35 respondents, 24 (68.6%) were female and 11 (31.4%) were male. The majority of respondents (60%) were between 31 and 45 years old. In terms of teaching experience, 40% had 6–10 years of experience, while 37% had over 10 years. Educational background varied, with 80% holding a Bachelor's degree in education and 20% holding a Master's degree. These demographic details provided important context for interpreting the findings regarding the implementation of the SAS method in online learning.

Data Collection

The data collection techniques used in this study were questionnaires, structured interviews, and documentation. The questionnaire was the primary instrument, designed in a closed format using a Likert scale with five answer options: excellent, good, medium, low, and very low. The questionnaire items were developed based on indicators derived from the core components of the SAS (Structural Analytic Synthetic) method and principles of 21st-century learning, including aspects such as sentence recognition, analysis and synthesis stages, student engagement, use of digital tools, and parental involvement. The content validity of the questionnaire was assessed through expert judgment involving two literacy education specialists and one instructional design expert. Subsequently, the construct validity was tested using Pearson Product Moment correlation, with item-total correlation coefficients ranging from 0.512 to 0.773, indicating that all items were valid. Reliability testing was conducted using Cronbach's Alpha, yielding a reliability coefficient of 0.861, which indicates a high level of internal consistency. Structured interviews were conducted using an interview guide to explore more profound insights into respondents' answers to the questionnaire. These interviews aimed to gain a deeper understanding of the implementation of the SAS method during online learning from the perspective of parents who directly assisted their students at home. Documentation was employed to support the validity of the research findings. It involved collecting physical data and visual evidence related to the implementation of learning, including screenshots of online learning activities and instructional materials used by teachers. Although documentation was not directly used to assess the application of the SAS method, it served as supporting evidence in verifying the application process during the study.

Data Analysis

The data analysis technique used in this study was descriptive statistical analysis, which aims to systematically describe and interpret quantitative data collected from questionnaires, interviews, and documentation. The primary data from the questionnaires were processed using a Likert scale to determine the tendency of teachers to apply the SAS method in early reading instruction during 21st-century online learning. Each item on the questionnaire was scored on a five-point scale, and the resulting scores were analyzed to calculate mean values, frequency distributions, and percentage tendencies. The classification of teacher implementation levels was divided into five categories (Table 1).

Table 1. The classification of teacher implementation levels

Category	Score Range	Interpretation
Very good	$X > 96$	The implementation level is very high, significantly above the average
Good	$92 < X \leq 96$	The implementation level is above average
Moderate	$88 < X \leq 92$	The implementation level is at the average
Low	$84 < X \leq 88$	The implementation level is below average
Very Low	$X \leq 84$	The implementation level is very low, far below the average

Note: X = The score obtained by an individual or observed subject

These categories were determined using interval ranges derived from statistical formulas such as Sturges' formula to group the data and interpret trends. Additionally, responses from structured interviews were analyzed using thematic coding, a qualitative approach that involved identifying, organizing, and interpreting patterns or themes emerging from the interview data. This method allowed for a nuanced understanding of parents' perceptions and experiences during online learning, particularly regarding the implementation of the SAS method. The qualitative findings were used to complement and contextualize the quantitative results, enabling a deeper interpretation of the survey data. This integration served as a form of methodological triangulation, enhancing the validity and credibility of the overall findings by cross-verifying evidence from questionnaires, interviews, and documentation.

Additionally, documentation analysis, including a review of lesson plans, student assignments, and screenshots of online learning activities, was conducted to verify the authenticity of instructional practices and further strengthen data triangulation. Prior to analysis, the questionnaire instrument underwent rigorous testing for validity and reliability. Of the 60 items initially developed, 35 items met the required statistical thresholds and were deemed both valid and reliable. These validated items ensured that the quantitative data accurately captured key dimensions of the SAS method's implementation, particularly its alignment with structured instructional steps and integration of 21st-century learning skills.

FINDINGS

The findings of this study present the results obtained from the analysis of quantitative and qualitative data collected through questionnaires, interviews, observations, and documentation. This study focuses on the application of the SAS (Structural Analytic Synthetic) method in improving the early reading skills of first-grade students during 21st-century online learning. It aims to provide a comprehensive understanding of how teachers implement each step of the SAS method, starting from presenting whole sentences, breaking them down into words, syllables, and letters, and then reconstructing them while also integrating elements of 21st-century learning, such as critical thinking, collaboration, communication, and creativity.

The implementation of beginning reading instruction using the Structural Analytic Synthetic (SAS) method in the context of 21st-century online learning demonstrated clear and consistent improvement across four observed sessions. Observations were conducted to evaluate how effectively teachers applied each step of the SAS method, using a rubric that assessed five key instructional components: (1) presentation of whole sentences, (2) analysis of sentences into words, (3) breakdown of words into syllables, (4) identification of individual letters from syllables, and (5) reconstruction of sentences. Each component was scored on a 1-5 scale, and the total scores were converted into percentages to determine session-specific success rates. The results showed that in the first session, the success rate was 90.74%, indicating a strong initial implementation. This increased to 92.59% in the second session, then to 94.44% in the third, and finally reached 96.29% in the fourth session. The overall average score across the four sessions was 93.98%, which categorizes the implementation as "very high." The steady upward trend suggests that teachers gradually improved their mastery of the SAS method in online settings. Among the observed components, the highest performance was found in sentence reconstruction (96%), followed by sentence presentation (94%), while the decoding of syllables showed slightly lower consistency (90%) (Figure 1). These findings indicate that, although all components were generally well-executed, teachers became more proficient as the sessions progressed, especially in guiding students through structured reading tasks. This improvement also reflects growing teacher confidence and adaptability in applying a syntactic and phonological reading method under the constraints of virtual instruction.

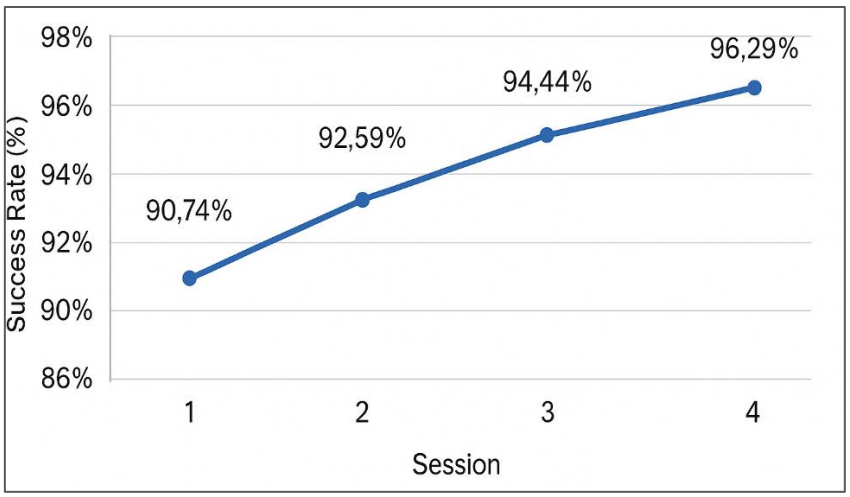

Figure 1. Implementation of learning

This progressive performance improvement demonstrates the teachers' growing confidence and competence in applying the SAS method within a digital environment. It also suggests that, despite the challenges posed by the sudden transition to online learning primarily due to the COVID-19 pandemic, we were able to adapt effectively and maintain high standards in delivering reading instruction to early-grade learners. Furthermore, the consistent improvement reflects that their teaching strategies became more refined over time, integrating elements of 21st-century learning such as communication, collaboration, creativity, and critical thinking, all of which are essential for holistic student development in today's educational landscape. To complement and validate the observational findings, the study also employed a quantitative approach by distributing a questionnaire to the parents of first-grade students. The aim was to assess external perceptions and experiences related to the implementation of the SAS method in early reading, particularly in the context of remote learning. The questionnaire consisted of 35 items/statements, structured on a five-point Likert scale ranging from "very low" to "very good." It was distributed to 64 parents whose children were actively participating in the learning process.

To analyze the data, the Sturges formula was used to determine the appropriate number of class intervals for frequency distribution: $1 + 3.3 \log 64 = 6.973$, which was rounded up to 7. The range of the data—calculated by subtracting the lowest score from the highest (78 - 65) was 13. This range was then divided across the seven intervals, resulting in a class width of approximately 1.857, rounded to 2 for ease of calculation. The responses from the parents were compiled into a frequency distribution table, and the data were then analyzed using Microsoft Excel to generate descriptive statistics. The statistical analysis yielded a mean score of 91.871, which was rounded to 92% (Chandrathilaka et al., 2021). This high percentage indicates a very favorable perception among parents regarding the use of the SAS method in teaching beginning reading during the online learning period. It suggests that parents recognize both the effectiveness and appropriateness of the method in supporting their children's literacy development, even within a virtual learning environment.

To better understand the trend of teachers' application of the SAS method in the 21st-century online learning context, the data were further categorized using a five-point scale classification system. This system grouped the responses into five categories: very low, low, moderate, high, and very high. The classification aimed to clarify the level of implementation and provide an overview of how consistently teachers were applying the method in alignment with 21st-century learning principles. The categorized data were presented in Table 1, and a visual representation in the form of a pie chart was provided in Table 2. The visual data revealed that a majority of teachers fell into the "good" and "excellent" categories, confirming their strong commitment and consistent effort in implementing the SAS method effectively.

The conclusion that the SAS method remains a relevant and highly effective strategy for early literacy instruction even when adapted for online learning platforms is supported by the data obtained from the study.

The results demonstrated a significant improvement in students' literacy skills, as indicated by the increase in post-test scores compared to pre-test scores, as well as positive feedback from teachers and students gathered through questionnaires and interviews. These findings demonstrate the effectiveness of the SAS method in enhancing early reading abilities in an online learning environment. The combination of observational and survey data strengthens the conclusion that teachers have successfully internalized and applied this method in ways that align with modern pedagogical expectations. However, the findings also underscore the importance of continued professional development, particularly in integrating innovative and engaging digital media into reading instruction. While the SAS method has proven adaptable to online learning, optimizing its application for digital contexts remains an area for further development. Thus, ongoing training, access to educational technology, and opportunities for collaborative learning among teachers are essential to enhance teaching practices further and ensure high-quality literacy instruction within the evolving landscape of 21st-century education.

Table 2. Classification of the Tendency of Teachers to Apply the SAS Method

Criteria	Interval	Frequency	Percent (%)	Score
Very good	$X \geq 75{,}399$	5	8	A
Good	$72{,}787 \leq X < 75{,}399$	23	36	B
Enough	$70{,}215 \leq X < 72{,}797$	14	22	C
Not good	$67{,}632 \leq X < 70{,}213$	17	26	D
Not very good	$X < 67{,}632$	5	8	E

Note: X = The score obtained by an individual or observed subject.

DISCUSSION

The Structural Analytic Synthetic (SAS) method has proven effective in supporting the development of early literacy skills, even when applied in online learning contexts. This effectiveness is rooted in its structured approach that aligns with the stages of literacy acquisition, starting from sentence-level meaning and systematically progressing toward individual letters. In this study, 93.98% implementation fidelity, as measured by teachers based on observational data, demonstrates a high level of procedural adherence despite the transition to remote instruction. From a constructivist perspective, the SAS method supports Vygotsky's theory of the Zone of Proximal Development (ZPD), where learners construct understanding through guided interactions (Vygotsky, 1978). By deconstructing and reconstructing language units in meaningful contexts, students engage in active knowledge construction. This dual process also resonates with the bottom-up and top-down approaches to reading, facilitating both decoding and comprehension (Ehri, 2005; National Early Literacy Panel, 2008). International research supports the structured and progressive nature of the SAS method. A study by Kumar and Baggi (2022) found that analytic-synthetic approaches significantly improved phonemic awareness and decoding among early readers. Moreover, systematic instruction emphasizing phonological structure—is recognized as a key factor in successful early literacy programs (Jogezai et al., 2021).

Survey results indicated that 53% of parents acknowledged teachers' efforts in integrating 21st-century skills, such as critical thinking, creativity, communication, and collaboration, into beginning reading instruction. This percentage reflects that more than half of the instructional practices have shifted from rote literacy instruction toward more holistic and skill-based learning. For example, the use of image prompts, realia, and student-centered dialogues suggests intentional attempts to foster creative and critical engagement among early learners. This is consistent with research emphasizing that early literacy should not be isolated from broader educational competencies. Jogezai et al. (2021) argue that teachers need to merge pedagogical knowledge with digital and design thinking to create meaningful learning experiences. Such integration is essential to prepare students for a future that demands adaptability and multiliteracy (Voogt & Roblin, 2012).

Despite the effectiveness of the SAS method, 62% of parents expressed dissatisfaction with the instructional media used during online learning. The dissatisfaction largely stemmed from the continued reliance on static, conventional media that had not been adapted to meet the demands of innovation. This response indicates a disconnect between pedagogical goals and the media used to support them. In literacy learning, media should function as scaffolds—helping learners visualize abstract language structures (Jogezai et al., 2021). Digital tools such as YouTube videos, educational games, and synchronous sessions via Zoom were employed by some teachers to enhance comprehension and engagement. However, the inconsistency in their use may have contributed to varying levels of learning experiences. Research suggests that multimedia-supported instruction can significantly enhance student engagement and retention when appropriately integrated with structured pedagogical strategies (Mayer, 2009).

The implementation of the SAS method during the pandemic required pedagogical flexibility. In this study, 52% of parents reported that the online application of the SAS method was comparable to offline instruction. While digital platforms enabled synchronous interaction, the essence of the SAS sequence —starting from meaningful sentences and breaking down language hierarchically —remained intact. Offline learning continued to rely on face-to-face instruction using printed worksheets. Nevertheless, both modalities incorporated 21st-century competencies. The difference lies more in media delivery rather than in the instructional logic itself. This finding aligns with Singh and Thurman (2019), who argue that effective online learning must preserve the cognitive structure of instruction rather than merely digitizing content.

These findings underscore the significance of teacher competence in adapting structured literacy methods, such as SAS, within evolving educational environments. The ability to maintain instructional coherence across modalities while embedding 21st-century skills shows the necessity for continuous teacher professional development. Schools and policymakers should support teachers through training in digital pedagogy and media innovation to maximize the benefits of methods like SAS. Moreover, instructional design for early literacy should strike a balance between systematic skill development and interactive, context-based strategies that reflect students' real-world experiences and developmental stages.

This study has several limitations. First, it was conducted in only one primary school, SDN 9 Mamboro, which limits the generalizability of the findings. Second, the primary source of evaluative data came from parents, which may introduce subjective bias. Observational data were also collected by the researcher, raising potential concerns about observer bias. Future research should include multiple schools, triangulate data with student performance metrics, and involve more diverse respondent groups such as students and school administrators.

CONCLUSION

The findings of this study indicate that the implementation of the Structural Analytic Synthetic (SAS) method in teaching beginning reading during online learning has been generally successful, particularly in the context of 21st-century education. Teachers demonstrated a good level of mastery in applying the SAS method, as evidenced by consistent improvements in each observed session and positive responses from parents. The integration of 21st-century competencies, including critical thinking, creativity, communication, and collaboration, was evident in teachers' instructional practices despite the challenges posed by the sudden transition to online learning during the COVID-19 pandemic. However, the study also revealed areas requiring further attention, particularly regarding the innovation and effectiveness of learning media used in online environments. Many teachers continued to rely on conventional media that may not be fully optimized for virtual instruction. Therefore, ongoing professional development and support for teachers are crucial to enhance their ability to adapt teaching methods and tools to dynamic learning contexts. Overall, the SAS method remains a relevant and effective strategy for early literacy instruction when implemented thoughtfully and in alignment with modern pedagogical demands.

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