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STRATEGIC MANAGEMENT OF LEARNING INITIATION IN ELEMENTARY SCHOOLS: BIO-COMMUNICATION-BASED ON INNOVATION SET INDUCTION

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ABSTRACT

Low motivation and engagement in learning among elementary school students remain a major challenge in implementing meaningful learning. One factor contributing to this problem is the suboptimal management of the learning induction phase (set induction) by teachers. This study aims to examine and formulate a strategic management model for learning induction through bio-communication-based set induction innovation as an effort to increase student motivation and engagement in learning. The research approach used was descriptive qualitative with a library research method. Data were obtained from a systematic review of various national

and international scientific sources relevant to the topics of set induction, biocommunication, motivation, and learning engagement of elementary school students. The analysis was conducted using a thematic analysis technique with four stages, namely literature data collection, source selection, thematic analysis, and conceptual synthesis. The results showed that set induction plays a strategic role in fostering students' attention, motivation, and learning retention, while the quality of teacher communication, both verbal and nonverbal, is a determining factor in the effectiveness of learning initiation. Bio-communication dimensions such as facial expressions, voice intonation, body gestures, and eye contact play an important role in evoking emotional responses in students. This research synthesis produced a conceptual model of bio-communication-based set induction as a learning management strategy that integrates cognitive, affective, and biological aspects. This approach is believed to be capable of creating an active, humanistic, and liberating learning atmosphere in line with the spirit of the Merdeka Curriculum.

KEYWORDS: Strategic Learning Management; Learning Initiation; Bio-Communication; Student Learning Motivation.

1. INTRODUCTION

Student motivation and engagement in elementary school are two key factors that determine the success of the learning process. However, in practice, teachers often face problems with low attention, interest, and participation from students at the beginning of learning activities. The opening of learning (set induction), which should serve as a bridge to prepare students mentally and cognitively, is often done in a conventional and monotonous manner. In fact, classical research shows that the use of effective set induction has a significant effect on student achievement and learning retention (Schuck, 1981). This finding is reinforced by research (K. R. Subedi et al., 2021) which found that teachers who use opening techniques such as sparking questions, short stories, or reviews of previous topics are able to increase students' initial engagement and focus on learning. Recent research also shows that engaging multimodal opening strategies can increase attention and trigger students' emotional engagement directly (Liu, 2025; Schmidt, 2019). Thus, strategic lesson openings can serve as the main trigger for creating an active, communicative, and meaningful learning atmosphere from the very first minutes of the teaching and learning process.

In the context of basic education, lesson opening skills are not merely a formal activity, but part of strategic learning management that determines the effectiveness of subsequent activities. (G. A. Wilkinson, 1994) asserts that both novice and experienced teachers need individual support and training in developing basic teaching skills, including the ability to start lessons in an interesting and relevant way. Research (R. Mirayanti et al., 2023) also shows that lesson opening and closing skills are important elements in creating enjoyable and meaningful learning for elementary school students. Meanwhile, research (Thulin & Pramling, 2009) highlights the importance of communication between teachers and students at the beginning of learning. Even anthropomorphic language used by teachers can help children understand abstract concepts, as long as it is accompanied by appropriate scientific explanations. Additionally, recent research shows that initial teacher-student interactions that contain elements of warmth, closeness, and rapport can predict the level of student engagement throughout the lesson (Hou, 2024; Toivanen, 2025). From an educational communication perspective, the early stages of learning are essentially a bio-communicative space, where the teacher's facial expressions, voice intonation, body movements, and eye contact trigger biological and emotional responses in students that determine their subsequent engagement. This is reinforced by findings that the teacher's vocal prosody, including rhythm, pitch, and voice stress, directly influences student attention through psychophysiological responses (Zhang & Chen, 2022).

Unfortunately, various field studies in Indonesia show that most elementary school teachers have not optimally utilized the potential of set induction. (Maryance, 2017) reveals that many teachers are still limited to verbal methods and rarely use varied approaches based on two-way communication, resulting in low student motivation. In fact, international research by (Yusof et al., 2022) confirms that set induction is effective not only because of its content, but also because of the quality of interaction and communication that occurs when teachers begin a lesson. These findings are in line with global studies that highlight that engaging opening strategies, especially those that combine verbal and nonverbal aspects, are more effective in triggering students' attention and interest (Lazarides, 2024). Within the framework of the Merdeka Curriculum, which emphasizes student-centre learning, the ability of teachers to strategically manage lesson openings is a prerequisite for differentiated and contextual learning. Therefore, innovation is needed in the management of learning openings that combine pedagogical, psychological, and biological principles, namely bio-communication-based set induction.

Based on this background, the research problems can be formulated as follows: (1) how set induction practices are currently applied by elementary school teachers and to what extent they are related to student motivation and learning engagement; (2) what bio-communication factors influence the effectiveness of learning initiation in elementary schools; and (3) how a strategic management design for bio-communication-based learning initiation can be developed as an innovation to increase student motivation and learning engagement. The objectives of this study are to describe the actual practice of set induction in elementary schools, analyse the role of bio-communication in increasing the effectiveness of learning openings, and formulate a strategic management model for learning openings based on set induction and bio-communication that is relevant to the characteristics of elementary school students and the spirit of the Merdeka Curriculum.

Thus, this study is expected to contribute theoretically to the development of learning management and educational communication science, as well as practically in the form of an

innovative learning opening model that can be applied by elementary school teachers to overcome the problems of low motivation and learning engagement among students. Bio-communication-based set induction innovation not only functions as a technical learning strategy, but also as a humanistic approach that places the emotional and biological relationship between teachers and students as the main foundation in creating lively, meaningful, and liberating learning.

2. METHODOLOGY

The research approach used in this study is a descriptive qualitative approach with a literature study (library research) type of research. This approach was chosen because the main objective of the research was not to test empirical hypotheses, but rather to identify, describe, and synthesize various scientific findings related to strategic management of learning initiation (set induction) and the application of bio-communication principles in the context of basic education. According to (Creswell, 2014), a qualitative approach is used when researchers want to understand phenomena in depth based on interpretations of existing text and document data. In line with this, the qualitative approach in literature studies provides space for researchers to explore, interpret, and integrate various previous studies thematically and critically (Snyder, 2019). In this context, the research was conducted through a systematic review of scientific literature relevant to the themes of opening learning, learning motivation, student engagement, and teacher communication approaches in learning.

The research methodology was conducted through four main stages, namely (1) literature data collection, (2) evaluation and selection of sources, (3) thematic analysis and synthesis, and (4) conceptual interpretation. In the first stage, researchers collected scientific sources from national and international journals indexed in Sinta 1–3 and Scopus. Some of these included research (Schuck, 1981) on the effect of set induction on student achievement and learning retention; (G. A. Wilkinson, 1994) on individual support in teaching skills training; (K. R. Subedi et al., 2021) on set induction practices in Nepal; and (Yusof et al., 2022) on the application of set induction by science teachers. In addition, the studies (Thulin & Pramling, 2009) and (Svanes & Andersson-Bakken, 2021) were used to explain the dimensions of teacher communication in early childhood learning, while the studies (Maryance, 2017) and (A. Mirayanti et al., 2023) reinforced the context of basic teaching skills in Indonesia. Additional relevant literature related to bio-communication, such as studies on vocal prosody (Zhang & Chen, 2022), teacher immediacy (Hou, 2024), and embodied communication (Kwon, 2024; Liu, 2025), are also included to provide a more comprehensive theoretical basis.

The second stage was conducted by selecting literature based on the following inclusion criteria: (a) articles discussing the topics of learning initiation, set induction, bio-communication, motivation, or learning engagement; (b) published between 1980 and 2025; (c) sourced from reputable journals or indexed by Sinta or Scopus; and (d) relevant to the context of basic education or teacher learning. This stage is important to ensure the validity and relevance of the data used.

Next, in the third stage, thematic analysis was conducted to identify patterns, concepts, and relationships between findings from various literature. The analysis was conducted by reading each article thoroughly, marking keywords, and grouping the research results into main themes such as: (1) the effectiveness of set induction on learning motivation, (2) the role of verbal and nonverbal communication in opening lessons, (3) the relationship between bio-communication and students' emotional involvement, and (4) learning management strategies in elementary schools. This thematic analysis technique refers to the model (Braun & Clarke, 2006) which emphasizes the process of data codification, theme search, and interpretation of conceptual meaning based on the research context. Thematic analysis is a method widely used in modern educational research to identify cross-study conceptual patterns and produce structured syntheses (Nowell et al., 2017).

The final stage is conceptual synthesis, which is the process of integrating various research results to construct a new theoretical framework and conceptual model of strategic management of bio-communication-based learning. Synthesis is carried out by comparing the similarities and differences between study results and identifying research gaps that have not been widely studied, especially in the context of basic education in Indonesia. The synthesis process refers to the integrative review approach, which is a method that aims to combine various types of research to produce new conceptual insights (Whittemore & Knafl, 2005). The synthesis results are then used to formulate a conceptual model that describes the relationship between set induction, biocommunication, motivation, and student learning engagement.

The entire research process was conducted systematically with an emphasis on the validity

and reliability of the literature sources. According to (Zed, 2014), a good literature study should present a critical analysis of the sources used, not just a summary of the content. Therefore, in this study, each finding from scientific articles was examined comparatively, analyzed for meaning, and linked to the practical needs of learning development in elementary schools, particularly within the framework of the implementation of the Merdeka Curriculum. This systematic approach is in line with the principles of transparency, traceability, and validity in modern literature studies as recommended (Snyder, 2019).

Using the literature study method, this research not only serves to review previous research results but also to produce new conceptual perspectives on bio-communication-based set induction as a strategic innovation to increase the motivation and learning engagement of elementary school students. This approach is expected to contribute theoretically to the development of learning management and provide practical direction for teachers in managing the early stages of learning in a more creative, communicative, and liberating manner for students.

3. RESULTS

The results of this study were obtained through analysis and synthesis of various scientific sources relevant to the topic of strategic management of learning initiation in elementary schools. Based on a review of ten core articles and several supporting literature, four main themes were found that describe the patterns and directions of bio-communication-based set induction innovation development, namely: (1) the strategic role of set induction in student motivation and learning retention, (2) teachers' communication skills as the core of effective learning initiation, (3) the urgency of the bio-communication dimension in creating students' emotional and cognitive engagement, and (4) the need for a strategic learning management model that integrates pedagogical, psychological, and biological elements in the context of the Merdeka Curriculum. These four themes are interrelated and show that the opening of learning is no longer just a procedural initial activity, but a critical phase that influences the entire dynamics of the learning process.

First, the results of the study show that set induction has a significant impact on student achievement and learning retention. (Schuck, 1981) through an experiment with a Solomon Four-Group design proved that groups of students taught using the set induction technique showed higher learning outcomes and memory retention compared to the control group. This research provides preliminary evidence that opening a lesson can serve as a cognitive strategy to prepare students' mental readiness and attention before entering the main lesson. Similar findings were also confirmed by (K. R. Subedi et al., 2021), who found that health education teachers who applied set induction based on provocative questions and initial reflection were able to build better focus and engagement among students. Recent studies further clarify this pattern, where opening strategies that present multimodal stimuli, such as variations in sound, visuals, and introductory activities, have been proven to activate students' attention areas more quickly and for longer periods (Schmidt, 2019; Wilmes, 2021). Thus, these findings show that set induction not only serves as an opening activity but also as a determining factor in building motivation and learning effectiveness.

Second, analysis of basic teaching skills shows that teachers' communication skills, both verbal and nonverbal, are key to the success of the opening phase of learning. (G. A. Wilkinson, 1994) asserts that the success of novice teachers in implementing learning is largely determined by the extent to which they receive individual support in developing basic teaching skills, including lesson opening skills. In the Indonesian context, (R. Mirayanti et al., 2023) and (Maryance, 2017) found that teachers who mastered basic lesson opening skills were able to create a more enjoyable learning atmosphere, increase student attention, and facilitate the optimal achievement of learning competencies. Modern research also reinforces the evidence that the quality of teachers' initial communication, especially the aspects of immediacy and emotional warmth, has a direct effect on student engagement from the beginning of the learning process (Hou, 2024; Toivanen, 2025). In other words, teachers' communication skills are a central element in building positive pedagogical relationships in the opening phase of learning.

Third, a review of international literature reveals that the dimension of bio-communication contributes significantly to the effectiveness of learning initiation. Research (Thulin & Pramling, 2009) shows that communication by teachers at the beginning of early childhood science learning involves many anthropomorphic expressions, gestures, and tones of voice that evoke students' emotions. This strategy has been proven to help

children understand abstract scientific concepts in a more concrete and meaningful way. Meanwhile, a study by (Svanes & Andersson-Bakken, 2021) highlights that open-ended questions asked by teachers at the beginning of a lesson serve as a mediating tool that activates students' cognitive engagement in the context of early literacy. Research on vocal prosody by (Zhang & Chen, 2022) also shows that variations in the rhythm, tempo, and intonation of the teacher's voice have psychophysiological effects that can increase students' attentional readiness. Similarly, studies on embodied communication (Kwon, 2024; Liu, 2025) confirm that teachers' body gestures and physical expressions can stimulate curiosity and facilitate concept understanding in elementary school students. These findings show that the biological elements in teacher communication, through voice, expression, and body language, can trigger physiological and emotional responses in students that directly contribute to increased motivation and focus in learning.

Fourth, the synthesis results indicate the need for strategic management of induction sets through a planned learning management approach. From a strategic management perspective, the opening phase of a lesson is a stage for determining the direction of learning activities that serve to build class readiness, focus attention, and connect learning objectives with student needs (Hoy & Miskel, 2013). (Spindler & Biott, 2000) add that the success of new teachers in managing learning is greatly influenced by a mentoring system and collegial culture that encourages collaboration and professional reflection. Recent studies show that teachers who strategically design lesson openings, paying attention to emotional, multimodal, and individual student needs, are able to create a more conducive and responsive learning environment, especially in education systems that emphasize differentiation such as the Merdeka Curriculum (Huang, 2024; Lazarides, 2024). This shows that a set induction planned with a managerial approach can strengthen the pedagogical relationship between teachers and students.

In addition to these four main themes, the analysis also revealed significant gaps in previous research. Most previous studies have focused on the effectiveness of set induction from a cognitive perspective, while the biological and emotional dimensions of communication have not been explored much, especially in the context of primary education in Indonesia. In fact, primary school students have psychological characteristics that are more responsive to emotional, visual, and interactive stimuli than verbal instructions alone. Modern findings increasingly emphasize that students' biological responses to teacher communication, including through voice, gestures, and facial expressions, are crucial in creating holistic learning engagement (Lehtonen, 2023). Thus, the integration of set induction and bio-communication principles is a strategic opportunity to increase learning engagement that encompasses cognitive, affective, and psychomotor dimensions.

Overall, the findings of this study confirm that effective learning requires a combination of systematic instructional planning and a humanistic communication approach. Bio-communication-based set induction not only serves to stimulate interest in learning, but also forms an emotional bond between teachers and students that becomes the foundation for long-term learning engagement. In the context of the Merdeka Curriculum, this model has the potential to support the creation of liberating learning, where students learn not out of obligation, but because of intrinsic motivation and positive emotional attachment to the learning process. Therefore, the results of this study provide a strong conceptual basis for the development of a strategic management model for opening learning in elementary schools as a pedagogical innovation oriented towards strengthening student motivation and learning engagement.

To illustrate how this approach manifests in practical classroom activities, one example can be seen in the implementation of the "Whisper Game" during the initial phase of learning. This simple yet effective activity embodies the essence of bio-communication—encouraging attentiveness, listening accuracy, and mutual understanding among students. Through this activity, teachers create a light, interactive atmosphere that fosters focus and emotional connection, preparing students cognitively and affectively for deeper engagement with the lesson that follows.

Figure 1: Whisper Game as a Bio-Communicative Set Induction Activity in Grade 1.
Source: Author's Documentation (2025).

The figure shows a teacher guiding students through a "whisper game" activity during the opening phase of the lesson. Each student passes a whispered message to the next until the final student repeats it aloud. This activity demonstrates bio-communication principles through listening accuracy, message relay, and interpersonal engagement, serving as an affective bridge that stimulates students' intrinsic motivation and focus in the early stage of learning.

To consolidate the overall synthesis of these findings, a conceptual model was developed to illustrate the dynamic pathway linking set induction, bio-communication processes, students' biological and emotional responses, and their subsequent motivation and learning engagement. This model integrates the thematic patterns identified in the literature and visually represents how a strategic and biologically attuned learning initiation can foster sustained student engagement in the context of the Merdeka Curriculum. The synthesized framework is presented in Figure 3.

Figure 2: Classroom Ice-Breaking Activity as Part of Set Induction in Grade 1.
Source: Author's Documentation (2025).

The figure shows a teacher guiding first-grade students through an interactive ice-breaking session at the beginning of a lesson. This activity exemplifies the bio-communicative aspects of set induction—using gesture, voice intonation, and expressive interaction to attract students' attention and foster emotional engagement in line with the Merdeka Curriculum approach.

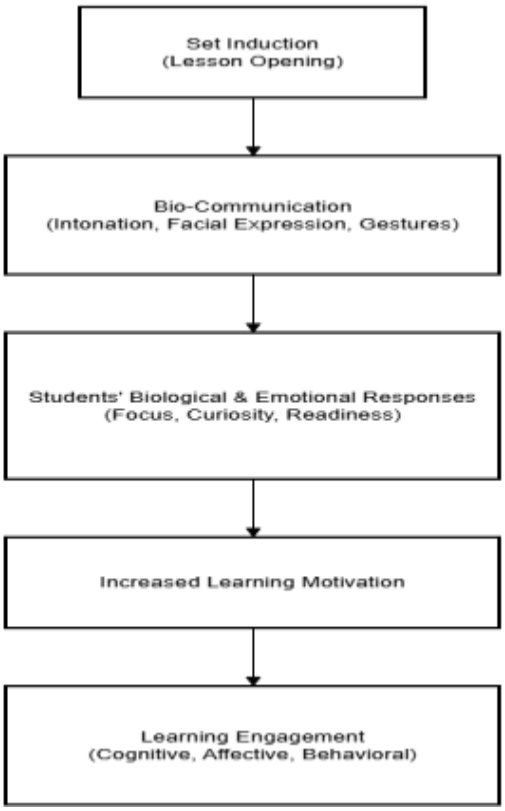

Figure 3: Conceptual Model of Bio-Communication-Based Set Induction.

4. DISCUSSION

The results of the study indicate that set induction plays a strategic role in increasing the motivation and learning engagement of elementary school students. These findings are in line with the results of a classic experiment by (Schuck, 1981), which proved that students taught using set induction experienced a significant increase in academic achievement and learning retention compared to students in the control group. This reinforces the view that the opening of learning is not just an introductory activity, but an important cognitive and affective phase that prepares students for learning as a whole. Similar findings were confirmed by (D. R. Subedi et al., 2021), who found that reflective activity-based set induction practices can increase students' attention and initial engagement. Recent research also supports these findings, such as a study by (Hou, 2024), which shows that teachers' initial skills in establishing instructional presence (teacher immediacy) greatly determine the level of student engagement from the very first minutes of learning. Thus, the results of this study reinforce the conclusion that set induction has a direct contribution to learning success, especially in the context of primary education where students' attention and motivation are highly dependent on how teachers begin the lesson.

Further interpretation shows that the success of set induction is not only determined by the delivery technique, but also by the quality of teacher communication during the lesson opening process. (G. A. Wilkinson, 1994) emphasizes that basic teaching skills, including opening lessons, are greatly influenced by the teacher's ability to manage interactions with students effectively. Research (R. Mirayanti et al., 2023) reinforces these findings by showing that teachers who have mastered the skill of opening lessons are able to increase student enthusiasm and concentration in elementary/Islamic elementary schools. In this context, teacher communication acts as a link between learning objectives and students' psychological readiness. When teachers begin lessons with positive expressions, warm intonation, and motivating attitudes, students respond emotionally and biologically through increased attention, curiosity, and active engagement. The study (Hu & Wang, 2023) also confirms that teachers' nonverbal communication, such as eye contact, gestures, and facial expressions, plays a strong role in increasing students' perception of closeness and strengthening engagement at the beginning of learning. In other words, the effectiveness of set induction cannot be separated from the bio-communicative dimension

that builds human interpersonal relationships between teachers and students.

To provide a clearer overview of the empirical foundations supporting these interpretations, Table 1 summarizes key previous studies on set induction, teacher communication, and learning engagement that inform the conceptual development of this study.

Table 1: Summary of Previous Studies on Set Induction, Teacher Communication, and Learning Engagement.

Author & Year	Focus of Study	Method	Key Findings	Relevance to This Study
Schuck (1981)	Influence of set induction on student achievement and retention	Experimental	Students taught with structured set induction showed significantly higher achievement and retention compared to control groups.	Supports the claim that lesson opening is a critical cognitive–affective phase for learning readiness.
Subedi et al. (2021)	Effect of reflective activity-based set induction	Quasi-experimental	Reflective questioning during lesson openings increased students' attention and initial engagement.	Reinforces the importance of reflective stimuli in motivating learners at the start of lessons.
Hou (2024)	Teacher immediacy in the first minutes of instruction	Quantitative	High teacher immediacy predicts stronger early engagement among students.	Aligns with the bio-communication dimension of emotional closeness influencing learning initiation.
Wilkinson (1994)	Basic teaching skills including lesson opening	Conceptual/pedagogical	Effective openings depend heavily on teacher–student interaction management.	Highlights communication as the foundation of effective set induction practices.
Mirayanti et al. (2023)	Teachers' mastery of lesson-opening skills in elementary schools	Mixed-method	Teachers with strong opening skills improved student enthusiasm and concentration.	Reinforces that set induction affects emotional and cognitive readiness.
Hu & Wang (2023)	Effect of teacher nonverbal communication	Quantitative	Eye contact, gestures, and facial expression increased perceived teacher closeness and engagement.	Supports bio-communication as a key mechanism in engagement.
Thulin & Pramling (2009)	Teacher expressiveness in early science learning	Qualitative	Expressive metaphors and facial cues help children grasp abstract concepts.	Shows biological–emotional resonance as part of effective learning initiation.
Zhang & Chen (2022)	Teacher voice prosody and student attention	Experimental	Variations in prosody activate attention-related neural systems.	Connects vocal communication with biological student responses.
Liu (2025)	Multimodal teacher communication and neural coupling	Neuro-pedagogical	Multimodal cues enhance teacher–student neural synchronization linked to motivation.	Supports the theoretical basis of bio-communication in this study.
Maryance (2017)	Lesson-opening practices in Indonesian classrooms	Descriptive	Teachers' lesson openings often routine and formalistic.	Identifies gaps in practical implementation, supporting the need for improvement.
Gillett (2025)	Teacher workload and training access	Survey	Administrative burden reduces effective pedagogical practice.	Highlights systemic barriers affecting consistent use of set induction.

From the perspective of bio-communication theory, the results of this study indicate that initial interactions between teachers and students involve complex biological mechanisms. Research (Thulin & Pramling, 2009) reveals that expressive communication by teachers, such as the use of anthropomorphic metaphors and lively facial expressions, can help children understand abstract

scientific concepts more easily because it evokes emotional resonance. These results are in line with the findings (Zhang & Chen, 2022) in Frontiers in Psychology, which state that variations in teachers' voice prosody affect the activation of students' attention nervous system, which has implications for increased learning engagement. These findings are further reinforced by recent neuro-pedagogical research showing that multimodal stimuli, a combination of voice, gestures, and expressions, can enhance brain synchronization (teacher–student neural coupling) directly related to motivation and concept understanding (Liu, 2025). Thus, the dimension of bio-communication expands the concept of set induction from a mere cognitive technique to a multidimensional approach that involves biological, emotional, and social aspects in building students' readiness to learn. In the context of primary education, this is particularly relevant because primary school-aged students are more responsive to nonverbal, expressive, and emotional stimuli than to verbal stimuli alone.

The findings of this study also show that the application of set induction in the field still faces considerable challenges, particularly in relation to limited teacher training and low awareness of the importance of communication in learning. (K. R. Subedi et al., 2021) revealed that most teachers in Nepal are aware of the importance of set induction, but are unable to apply it consistently due to limited training and time. Similar conditions were found in the Indonesian context, where (Maryance, 2017) reported that teachers' lesson openings were often routine and formalistic, without regard for students' psychological and motivational needs. This indicates a gap between conceptual knowledge about set induction and teachers' practical ability to implement it effectively in the classroom. International research adds that these obstacles are often related to teachers' administrative burdens and low access to practice-based training (Gillett, 2025; Spindler & Biott, 2000). Therefore, the bio-communication-based set induction innovation developed in this study has the potential to bridge this gap through a teacher training approach that emphasizes the integration of verbal and nonverbal communication aspects in the opening of lessons.

In addition to increasing motivation, the results of this study also confirm that set induction affects student engagement, both behaviourally, cognitively, and emotionally. These findings are in line with the theory of learning engagement proposed by (Fredricks et al., 2004), in which learning engagement occurs when students show active participation, reflective thinking, and feel positive emotions during learning. (Svanes & Andersson-Bakken, 2021) support this view by showing that the use of open-ended questions at the beginning of a lesson can activate students' cognitive engagement through reflective thinking. In the context of the Merdeka Curriculum, student engagement is a key component of student-centre learning. Recent literature such as (Lazarides, 2024) shows that the emotional environment established at the beginning of learning has a significant impact on students' long-term engagement. Therefore, the application of bio-communication-based induction sets can be a relevant strategy for creating a learning space that is independent, inclusive, and oriented towards developing students' full potential.

Compared to previous studies, this study provides a new contribution (novelty) in the form of integration between set induction and the principles of bio-communication within the framework of strategic learning management. Most previous studies have highlighted set induction from cognitive (Schuck, 1981; K. R. Subedi et al., 2021) or pedagogical (R. Mirayanti et al., 2023; J. Wilkinson, 1994) aspects, while the biological and emotional dimensions have not been discussed comprehensively. This study attempts to fill this gap by emphasizing that teachers' biological communication, through expressions, voices, gestures, and empathetic attitudes, plays a strategic role in building student motivation and engagement. This is in line with the embodied cognition framework (Lakoff & Johnson, 1999), which emphasizes that the learning process is not only mental but also rooted in bodily experiences and emotions. Furthermore, this study expands the meaning of set induction as part of teachers' strategic management, not merely as a micro-teaching skill. Thus, the results of this study reinforce a new paradigm that learning success in elementary school is not only determined by curriculum design and teaching methods, but also by teachers' ability to manage biological and emotional communication at the beginning of learning.

In practical terms, these results have important implications for teacher professional development and the implementation of the Merdeka Curriculum. Teachers need to be trained to understand set induction as a communication strategy that builds students' biological, emotional, and cognitive readiness simultaneously. Teacher training should not only emphasize verbal techniques such as conveying learning objectives, but also include the development of vocal, gestural, and expressive

awareness as part of bio-communicative competence. Thus, the opening of learning is no longer seen as a formality, but as a strategic moment to foster intrinsic motivation and active student engagement. Through the application of bio-communication-based induction sets, teachers are expected to create a more lively, interactive, and humane learning atmosphere, in line with the vision of the Merdeka Curriculum to liberate the potential of students through meaningful learning.

To operationalize the conceptual model, this study introduces a strategic learning management cycle that supports teachers in planning, implementing, and continuously improving bio-communication-based lesson openings. This practical framework underscores reflective pedagogical decision-making and is consistent with the adaptive, student-centre orientation of the Merdeka Curriculum. The proposed cycle is depicted in Figure 4.

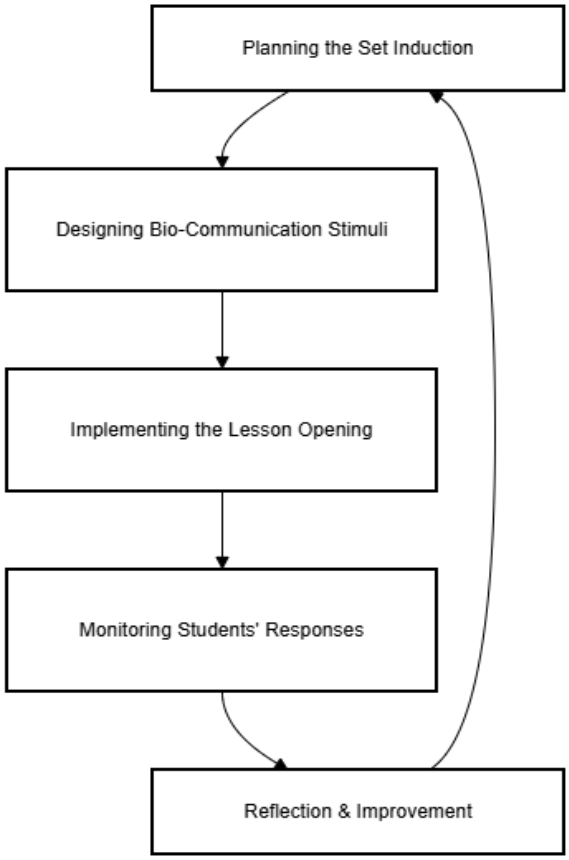

Figure 4: Strategic Learning Management Cycle for Bio-Communication-Based Lesson Opening.

The opening of learning or set induction is an important component in the strategic management of the teaching and learning process, especially at the elementary school level. Conceptually, set induction is defined as the initial learning activity designed to focus attention, foster motivation, and prepare students mentally and cognitively for the material to be learned (Schuck, 1981). From a constructivist perspective (Piaget, 1970), the opening phase serves as a bridge between previous learning experiences and new knowledge, where students actively construct meaning through schema activation and social interaction. Modern studies also show that the initial transition of learning has a significant influence on students' cognitive readiness, especially when the learning stimulus is multimodal and capable of triggering sensory and emotional schema activation (Schmidt, 2019; Wilmes, 2021). Thus, set induction is not merely an initial learning routine, but a pedagogical strategy that determines students' readiness to learn and influences their motivation and engagement throughout the learning process.

In the modern context, set induction is also understood as an integral part of teachers' strategic management in the classroom. (G. A. Wilkinson, 1994) states that teachers' skills in opening lessons are positively correlated with managerial abilities and classroom management effectiveness. Recent research by (Yusof et al., 2022) reinforces this view by showing that engaging and contextual set induction can increase student engagement during learning. Contemporary research even emphasizes that

effective opening design is not only determined by content, but also by the quality of interpersonal interactions and initial rapport between teachers and students (Hou, 2024; Toivanen, 2025). This underscores the need for lesson opening activities to be strategically designed, taking into account the social, psychological, and communicative context of students, especially within the framework of the Merdeka Curriculum, which demands flexibility and creativity from teachers in managing learning experiences.

The bio-communication approach is an important foundation for developing innovations in learning. Bio-communication refers to a process of interaction that is not only linguistic, but also biological and emotional, involving facial expressions, eye contact, voice intonation, and body gestures that influence students' physiological responses (Watzlawick et al., 1967). In learning, the biological aspects of teacher communication play a role in evoking students' sense of security, enthusiasm, and attention to the lesson. (Thulin & Pramling, 2009) found that expressive communication by teachers, including the use of anthropomorphic language, helps children understand abstract concepts through emotional resonance. In line with the theory of embodied cognition (Lakoff & Johnson, 1999), the processes of thinking and learning do not only occur at the cognitive level but also involve bodily experiences and emotions. Recent findings reinforce this: teachers' vocal prosody has been shown to increase students' attention and affective responses (Zhang & Chen, 2022), while teachers' use of body movements and somatic expressions contributes to the formation of deeper conceptual understanding in elementary school children (Kwon, 2024; Liu, 2025). Therefore, effective learning is not only determined by the content of the message, but also by how the message is conveyed in a bio-communicative manner, thereby creating a positive emotional connection between teachers and students.

This aspect of bio-communication is closely related to learning motivation theory. According to Self-Determination Theory (Deci & Ryan, 1985), learning motivation grows when students feel autonomy, competence, and social relatedness. Bio-communication-based set induction can fulfill these three basic psychological needs by creating a warm, dialogical, and meaningful learning atmosphere. (Slavin, 2018) emphasizes that learning motivation increases when teachers are able to arouse students' curiosity through interesting stimuli at the beginning of the lesson. Findings (D. R. Subedi et al., 2021) also show that teachers who apply lesson opening techniques based on reflective questions and contextual stories can significantly increase student motivation and attention. Recent analysis shows that the elements of emotional closeness and warmth in teacher communication, core components of bio-communication, are strong predictors of initial student engagement (Lazarides, 2024). In the Indonesian context, (Maryance, 2017) adds that good lesson opening skills have a direct impact on increasing the interest and enthusiasm of secondary school students, which is also relevant for application at the elementary school level.

In addition, the effectiveness of set induction can also be explained through the theory of student engagement. (Fredricks et al., 2004) argue that student engagement has three dimensions, namely behavioural, cognitive, and emotional. All three can be activated through an introduction to learning that encourages active participation, stimulates intellectual curiosity, and evokes positive emotions in students. (Svanes & Andersson-Bakken, 2021) found that the use of open-ended questions in early learning serves as a mediating tool for developing thinking skills and cognitive engagement in early childhood students. In line with this, other studies have found that opening strategies that contain multimodal elements—such as a combination of visual, gestural, and vocal elements—are more effective in triggering multidimensional engagement in students (Huang, 2024; Lehtonen, 2023). Therefore, induction sets that combine elements of effective communication and bio-communicative strategies can stimulate students' multidimensional engagement from the beginning of the lesson.

Within the framework of strategic education management, lesson opening activities can be understood as part of a teacher's strategy in managing the learning process effectively and efficiently (Hoy & Miskel, 2013). Strategic management in this context includes the teacher's ability to plan, organize, implement, and evaluate learning activities that are oriented towards achieving educational goals. In other words, the induction set is not merely a micro-teaching technique, but also a managerial strategy to build class readiness, foster motivation, and create positive learning conditions. In the Merdeka Curriculum paradigm, this is in line with the principles of student agency and learning that liberates students through humanistic communicative relationships between teachers and students.

Based on these theories, this study assumes that the effectiveness of learning initiation is determined by the synergy between teachers' strategic

management and the quality of bio-communication established from the outset of interaction. The bio-communication-based set induction approach is believed to be capable of activating students' readiness to learn, increasing intrinsic motivation, and strengthening behavioural, cognitive, and emotional engagement. Thus, the conceptual framework of this study integrates the theories of set induction, bio-communication, learning motivation, student engagement, and strategic educational management to formulate an innovative model for opening learning in elementary schools that is relevant to the demands of the 21st century and the spirit of the Merdeka Curriculum.

5. CONCLUSION

The results of this literature review confirm that the opening of learning (set induction) plays a strategic role in increasing the motivation and learning engagement of elementary school students. Based on a synthesis of various previous studies (R. Mirayanti et al., 2023; Schuck, 1981; D. R. Subedi et al., 2021; J. Wilkinson, 1994), it is known that a creatively designed, communicative, and psychologically relevant set induction can increase student readiness to learn, focus attention, and foster student interest in the material to be studied. These findings reinforce the understanding that the opening phase of a lesson is not merely a routine initial activity, but part of a pedagogical strategy that determines the direction of subsequent learning. The effectiveness of set induction depends not only on the opening technique or material, but primarily on the quality of communication between teachers and students in the first minutes of learning.

The bio-communication approach provides significant reinforcement to these findings. Consistent with research by (Thulin & Pramling, 2009) and (Zhang & Chen, 2022), initial teacher-student interactions through facial expressions, vocal intonation, gestures, and empathetic attitudes have been shown to evoke affective and physiological responses that support learning engagement. These biological and emotional dimensions emphasize that an effective lesson introduction not only prepares cognitive abilities but also fosters a safe, warm, and motivating psychological atmosphere. Thus, a bio-communication-based induction set is an approach that integrates cognitive, affective, and biological aspects to create a more active, participatory, and meaningful learning environment.

From the synthesis results, it can be concluded that the innovative approach to opening learning, combining the principles of set induction and bio-communication, is a form of strategic learning management highly relevant to the context of the Independent Curriculum. This approach not only prepares students academically but also emotionally and socially, thereby increasing intrinsic motivation and long-term learning engagement. Teachers who are able to manage set induction with a bio-communicative approach will be more effective in building positive interpersonal relationships, creating a humane learning environment, and facilitating liberating learning. Therefore, this capability needs to be a primary focus in the professional development of elementary school teachers, both through pre-service teacher education programs and ongoing on-the-job training.

Suggestions for further research include the need for empirical studies to directly test the effect of bio-communication-based set induction on student motivation and learning engagement at various levels of elementary education. A quantitative approach can be used to examine the relationship between aspects of vocal prosody, facial expressions, teacher gestures, and student attentional responses in the early stages of learning. Meanwhile, a mixed-method approach can capture teachers' bio-communicative dynamics more comprehensively through classroom observations, in-depth interviews, and student behaviour measurements. Qualitative research based on classroom ethnography can also provide an understanding of how teachers' biological and emotional communication patterns are formed naturally in the daily learning process. Furthermore, further research is recommended to develop a bio-communication-based teacher training model and set induction that is appropriate to the characteristics of Indonesian students so that the results of this study can be applied practically and contextually in elementary school learning.

Overall, this research provides a conceptual contribution to the development of a more holistic learning paradigm. Strategic management of lesson openings serves not only as an introduction to the material but also as a biological and emotional communication instrument that stimulates student motivation and engagement in learning. Through the innovation of bio-communication-based set induction, teachers are expected to act not only as knowledge transmitters but also as learning facilitators who foster reflective, enjoyable, and liberating learning experiences for all students.

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