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Implementation of The Learning Sciences Approach Through The Reading and Thinking Aloud Method to Improve Reading Comprehension Skills of Elementary School Students

Erna Sefriani Sabuna[1*], Henny Dewi Koeswanti[1], Stefanus Christian Relmasira[1]

[1] Program Studi Magister Pendidikan Dasar, Universitas Kristen Satya Wacana Salatiga, Salatiga, Jawa Tengah, Indonesia.

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Corresponding Author:
Erna Sefriani Sabuna
ernasabuna@gmail.com

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Abstract: This study examines the implementation of the Learning Sciences approach through the Reading and Thinking Aloud method to improve the reading comprehension skills of elementary school students who have difficulty in understanding the meaning of text content. Qualitative research with a case study approach was conducted at SD Negeri Salatiga 06, Salatiga City, Central Java Province, with 26 Grade 6 learners as the research subjects. Data were collected through participatory observation, semi-structured interviews, and Y-charts, and analyzed using MAXQDA application. The analysis revealed three main clusters: Material Content Cluster, which shows that presenting material through visual media, interactive discussions, and a dynamic classroom environment increases understanding and learning satisfaction; the Constructivism Theory Cluster, which emphasizes the importance of social interaction, scaffolding, and collaboration between teachers and learners in developing critical thinking skills, in line with Vygotsky's Zone of Proximal Development concept; and the Content Use of Technology Cluster, which highlights the role of technological innovations, such as the use of QR codes, in creating interactive learning experiences and increasing learning motivation. The research findings show that the implementation of the Reading and Thinking Aloud method supported by technology significantly improves learners' reading comprehension and encourages active engagement and collaboration in the classroom. The data suggests that this learning strategy shows the potential of the Solution to address the problem of weak reading comprehension skills at the primary school level.

Keywords: Constructivism; Learning sciences; Reading and thinking aloud.

Introduction

In formal education, especially the first level, namely elementary school (SD), one of the things that must be taught is language. Language is one of the elements of culture as well as a tool used to interact with each other. Language plays a very important role in human life. Language makes it easier for humans to communicate with each other, tell stories, share experiences and be able to improve intellectual abilities (Bahari et al., 2025). Therefore, language needs to be taught since elementary school. There are four language skills: Speaking, listening, reading, and writing (Adventama et al., 2024). Reading is one of the things that everyone needs to do in order to acquire other language skills. According to Bion & Hinshelwood (2023) reading is an activity of understanding, studying and seeking information from reading material in the form of news, fiction stories, and non-fiction.

Reading ability is one of the basic competencies that must be mastered by students at the elementary school level (Hassan et al., 2021). Reading ability is not only important for understanding various types of texts in Indonesian language learning, but also acts as a foundation for mastering other subjects (Hasibuan et al., 2024). Reading ability has an important role, namely to

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get information and can also add insight to the reader (Zayed, 2021).

Reading is not just recognizing letters and words but includes understanding the content of reading as a whole, one of the main aspects of reading, because the main purpose of reading activities is not speed, but understanding the content of reading. in addition, reading comprehension includes the ability to understand the meaning of text, capture information, and connect the content of reading with experience or prior knowledge. "Reading comprehension is one of the abilities that must be developed in an effort to increase students' knowledge of science and information that is always developing" (Jatmiko & Koeswanti, 2025). Reading comprehension is one of the abilities that must be developed in an effort to increase students' knowledge of science and information that is always developing (Zayed, 2021). Reading comprehension is the process of understanding the meaning contained in a text (Nia & Gumala, 2024). The comprehension ability that a person has is not an ability that is passed down from generation to generation, but the result of the learning process and diligent practice. Reading ability reflects a person's ability to understand reading material (Ainussyifa, 2020). Furthermore, Utami & Cunandar (2024) added that reading comprehension ability has a very important role because the success of students in participating in the learning process at school depends on reading comprehension ability. Thus, students need to be equipped with the ability to read comprehension and the basic things as the success of students (Umami & Dafit, 2024).

However, the phenomenon that occurs is that reading comprehension habits among elementary school students tend to decline. In addition, it is clarified by Desiana et al. (2024) that students experience various difficulties in reading comprehension, namely difficulty identifying the main sentence in each paragraph in the text being read, experiencing obstacles in formulating relevant questions based on the content of the text so that when given questions to respond to reading texts the answers submitted by students are often not in accordance with the content of the text. According to Dewi et al. (2021) the purpose of reading is to understand the content of reading but not all students can achieve this goal and many children can read fluently a reading material but do not understand the content of the reading material.

This is also stated by Dewi et al. (2021) that the weakness of reading comprehension is caused by learning that is still carried out conventionally such as assignments and students' reading skills are less considered so that in learning students are less focused on the text being read. Furthermore, according to (Cohen 2023) students have difficulty in compiling appropriate conclusions based on the text that has been read and when students are asked to retell the contents of the reading, they often tend to just memorize the text without understanding its meaning in depth. While (Susanto et al., 2022) students in reading comprehension skills are still relatively weak, this can be seen from the ability of students in reading comprehension is still not well developed, as well as the interest and enthusiasm of students in the reading learning process is still relatively low. Only a small number of learners show high interest and enthusiasm when participating in learning activities.

Based on the results of the analysis of the 2024 Education Report Card of SD Negeri Salatiga 06, a problem was found, namely in the indicator of literacy skills showing unsatisfactory results, with the sub-indicator of competence in accessing and finding the meaning of text content decreasing to 2.65. In addition, initial observations made in previous lessons, for reading comprehension skills in understanding and finding the meaning of text content in class VI obtained 34.6% (9 students) who reached the Minimum Completion Criteria (KKM) and the remaining 65.4% (17 students) scored below the KKM and showed that students' understanding was still weak. This happens because the tendency of learning in the classroom emphasizes memorization so that students have difficulty in capturing information from the content of the reading and connecting the content of the text with their knowledge. So this condition not only inhibits the mastery of subject matter, but has the potential to limit students' access to relevant information and inhibit the development of critical thinking skills. As a result, students also look less enthusiastic in learning. Therefore, to overcome these problems, it is necessary to use a learning approach that does not just emphasize memorization but is meaningful and in-depth. Therefore, this study aims to implement the learning sciences approach through the reading and thinking aloud method as a solution to overcome the problems at SD Negeri Salatiga 06, with the hope of improving the reading comprehension skills of elementary school students.

One of the effective and meaningful learning is learning sciences-based learning which is based on constructivism learning theory (Piaget and Vygotsky) Learning Sciences is an interdisciplinary field that studies how people learn and how to design effective learning environments based on empirical evidence. This approach emphasizes the importance of understanding the cognitive and social processes involved in learning, and how to apply this knowledge to create more relevant and meaningful learning experiences for learners.

In this study, the principles of Learning Sciences will be implemented through the Reading and Thinking Aloud method, which is expected to improve learners' reading comprehension skills. Thus, learners are not only memorizing information, but also able to build a deep understanding and connect it with their experiences. The learning sciences approach in education provides learners with opportunities to develop creative thinking skills through interdisciplinary learning experiences and complex problem solving, and stimulates collaboration between learners in groups (Aslan Berzener & Deneme, 2021). According to Audina et al. (2020) learning sciences emphasize the importance of understanding how learning occurs in various contexts, as well as the use of scientific research to inform classroom learning practices. Meanwhile, the Reading and Thinking Aloud method is a learning strategy that combines reading aloud techniques with verbal thinking while reading (Think Aloud). Reading Aloud is a reading strategy by saying the text out loud, which aims to increase mental focus, raise questions, and stimulate discussion (Chinpakdee & Gu, 2024). Reading aloud is a way of reading text using voice intonation that can be heard by others and those who read can summarize the data informed by the author. Rıstanto et al. (2021) say that "The thinking-aloud, which includes both teachers' and students' thinking-aloud processes, helps to develop individual comprehension skills", meaning that thinking aloud includes strategies between teachers and students in the process of helping to develop individual reading comprehension skills. Kim et al. (2021) through thinking aloud teachers show how to use comprehension to understand and solve problems, and provide opportunities for learners to practice by expressing thoughts verbally while reading.

Method

Waruwu (2024) argues that qualitative research is an effort to understand certain context situations with all their uniqueness, trying to understand the nature of the environment, the meaning of the existence of participants in the environment, participant activities, what happens to participants, what they mean, what the participant's social environment is like, analyzing and communicating to others to get a deep understanding. This means that qualitative research is a research method that aims to understand reality through an inductive thinking approach.

The research was conducted at SD Negeri Salatiga 06, which is located in Salatiga City, Central Java Province. The selection of this location was based on the identification of problems related to the low reading comprehension skills of grade 6 students at the school. The study lasted for three months, from September to December 2024.

To obtain valid data regarding the implementation of the learning sciences approach through the reading and thinking aloud method to improve the reading comprehension skills of elementary school students. So data collection to facilitate researchers in carrying out this research, includes: a) Observation: The researcher played an active role in observing the implementation of the learning sciences approach through the reading and thinking aloud learning method to obtain authentic data in the classroom. After the end of each meeting, learners make a reflection which is outlined in the Y-chart. Finally by conducting in-depth semi-structured interviews to explore learners' views on the effectiveness of the Reading and Thiking Aloud method with learning sciences. b) Data collected through learners' reflection using the Y-Chart instrument (Relmasira & Thrupp, 2016). This instrument is used to reveal the perceptions of students regarding Indonesian language learning, especially in reading comprehension skills that have been learned so far. Furthermore, interviews were conducted to obtain more in-depth and accurate answers regarding the experiences and views of students towards learning Indonesian, especially in reading comprehension skills. c) Document Analysis: Analysis was carried out on the results of students' work, notes, and photo documentation to support observation and interview data.

Data analysis techniques in this study include data collection, data reduction, data presentation and drawing conclusions. Data collection is collected in the form of observation data, interviews, student reflections as outlined in Y-Chart, student work results. Data reduction is data obtained from observations, interviews, and Y-chart reflections and documentation are selected, summarized, and focused on information relevant to the research objectives (Miles & Huberman, 1994). Based on the data obtained from observations, interviews and the results of students' Y-Chart reflections, it was analyzed using the MAXQDA 2020 qualitative data analysis program.

Result and Discussion

In this study, the purpose of implementing learning sciences through the reading and thinking aloud (RTA) method to improve reading comprehension skills of elementary school students. The implementation of learning sciences-based RTA in this study is organized into five interrelated stages, each designed to maximize learner engagement and deep understanding.

Table 1. Learning Sciences-based RTA Implementation Steps

Level	Implementation Steps	Principle Learning Sciences
Preparation	Prepare texts that are relevant to students' interests and experiences. As well as preparing guiding questions to facilitate *thinking aloud*	Contextual, differentiated learning
Reading aloud	The teacher reads the text aloud with appropriate intonation, provides appropriate pauses, and asks short questions so as to trigger students' attention.	Active learning, attention
Thinking aloud	- The teacher models *thinking aloud* by expressing thoughts verbally while reading. - Students express their thoughts verbally (predictions, questions, connections, conclusions).	Metacognitive Learning; Social Interaction; Knowledge Construction
Group Discussion	- Students discuss in small groups, share interpretations, provide feedback, and build mutual understanding. - The teacher facilitates discussion, provides *scaffolding* if needed.	Collaborative Learning; Social Knowledge Construction; Scaffolding
Reflection	- Learners reflect on their own learning process (what they learned, what is still confusing, how they can improve their understanding in the future). - Using Y-Charts to help students reflect on learning.	Metacognitive Learning; Evaluation

Based on table 1, the implementation steps of RTA are: The first stage of preparation emphasizes relevance and differentiation, two key principles in Learning Sciences. By selecting texts that match learners' interests and experiences, for example news stories about current environmental issues or fictional stories with familiar settings, teachers ensure that the learning materials are meaningful and accessible. In addition, careful preparation includes formulating guiding questions designed to stimulate thinking aloud, which will be discussed further in the next stage. This stage aligns with the idea of situated learning, where learning is more effective when connected to real-world contexts (Hoadley & Campos, 2022).

The second stage of reading aloud not only improves fluent reading skills but also promotes attention and engagement. By reading the text aloud with proper intonation and providing appropriate pauses, the teacher creates an interesting and supportive atmosphere. The short questions asked during reading aloud spark curiosity and prepare learners to think more deeply about the text. This feature is in line with the attention principle of cognitive theory, which states that effective learning requires focused attention (Ceyhan & Yıldız, 2021).

The third stage of thinking aloud is the core of the implementation, as it directly promotes metacognition, social interaction and knowledge construction. The teacher models the thinking process by verbally expressing his/her thoughts while reading, giving examples of how to make predictions, ask questions, make connections, and draw conclusions. Then, learners are encouraged to do the same, sharing their thoughts openly and honestly. This process is in line with Kim et al. (2021) theory of constructivism, which emphasizes the role of social interaction in constructing knowledge.

The fourth stage of group discussion provides an opportunity for learners to share interpretations, provide feedback, and build shared understanding. In small groups, learners feel more comfortable to talk and share ideas, so as to collaborate and construct social knowledge. Teachers play an important role in facilitating discussions, providing necessary scaffolding, and ensuring that all learners have the opportunity to participate.

The reflection stage provides an opportunity for learners to process what they have learned and to connect new information with prior knowledge. Using the Y-Chart, learners reflect on what they saw, heard and felt during the lesson, helping them to consolidate their knowledge and identify areas for future improvement. This stage is in line with the principle of metacognition, which emphasizes the importance of learners being aware of their own thinking processes.

Based on the results of small group presentations, it shows that all learners consisting of 26 Grade VI learners divided into 8 groups have successfully reached the Minimum Completion Criteria (KKM) in reading comprehension, especially in understanding and finding the meaning of text content. This indicates a significant improvement in students' reading comprehension skills, especially in accessing and interpreting the meaning contained in the reading text.

Furthermore, the data has been analyzed using MAXCDA application. The data analysis displayed in the diagram shows the complex relationships between important elements identified during the research process. It is known in the diagram notes that there are

colors showing groups, the size of the nodes shows the magnitude of the frequency, and the thicker the line the more interrelationships between codes. The following are the results of the research analysis expressed in the diagram. The results of data analysis show that there are three clusters that have a relationship and relationship between the elements in the three clusters. The first cluster is the blue square category called the material content cluster. The second cluster is the pink circle category, which discusses the constructivism theory cluster. The third cluster is the purple triangle category, which is the technology usage content cluster.

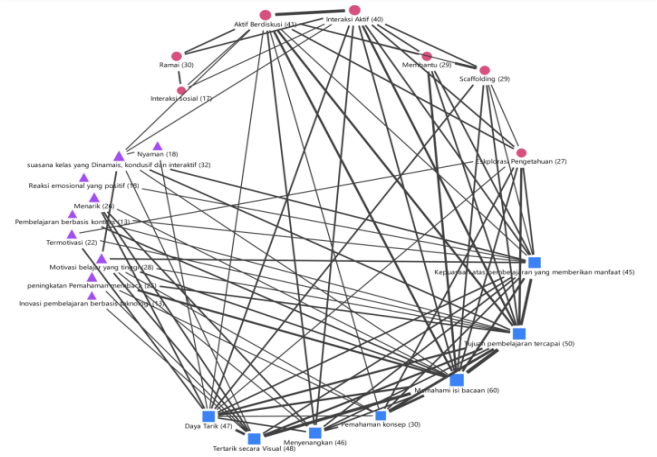

Figure 1. Results of y-chart analysis and interviews related to the implementation of learning sciences through the reading and thinking aloud method.

Discussion

Based on the results of the research data analysis, it illustrates that there are three clusters, line thickness, and nodes size that have a relationship between the data provided by students related to the application of learning sciences through the reading and thinking aloud method. When viewed on the analysis diagram of the research results, the blue square, namely the material content cluster, has a very strong relationship marked by the thickness of the line. Furthermore, the pink circle is the cluster of the theory of constructivism in learning and the last is the purple triangle which is the cluster that talks about technology and the content of technology use.

Cluster Material Content

Research findings show that cluster Material content is closely related to student learning satisfaction, visual appeal, and achievement of learning objectives. Aspects of cluster The content of the material can be seen from the thickness of the lines in the analysis results diagram which explains the strong connection in learning. Based on these aspects, it is in line with the principles learning sciences which emphasizes the importance of meaningful and relevant learning (Rıstanto et al., 2021). Data analysis shows that the use of a QR Code to access the text "Raka's Adventure in Saving the Earth" significantly increases student engagement in learning. Students reported that they felt more motivated to read and participate in discussions because of the ease of access and visually attractive text format. This is in line with the principle situated learning in Learning Sciences, which emphasizes the importance of connecting learning content to real-world contexts and learner experiences. The use of QR Codes is not only for students to see the relevance of the material to environmental issues that students face every day, but students can also identify examples of waste management in their environment and relate it to the actions of the shop in the story. This learning situation will become meaningful (situated) because the main character in the story text is relevant to the issues that exist in the reality of students' lives.

In addition, through methods Reading and Thinking Aloud Students are encouraged to activate existing knowledge about the environment and technology before reading the text. This facilitates meaningful learning because new information is integrated with existing knowledge patterns, but not passively memorized. Next method reading and thinking aloud help students when faced with questions about reading texts. Furthermore, students not only read passively, but also actively construct meaning and make connections with previous knowledge. This is in accordance with the principle constructivism, where knowledge is seen as the result of an active process of constructing meaning, rather than simply receiving information. One of the student quotes, "It felt fun and exciting because we exchanged ideas about what we didn't know, for example difficult words. So by collaborating we can find out" describes how social interaction is a key element in learning sciences can facilitate students' understanding. Students not only receive definitions of difficult words from the teacher, but students also actively build understanding through discussions and explanations from peers. By discussing the meaning of difficult words, students not only expand their vocabulary but also improve their reading comprehension skills. This is in line with the opinion of Rıstanto et al. (2021) which states that collaboration-based learning is able to increase students' absorption of material and actively build knowledge together.

Furthermore, the use of pictures and illustrations in learning materials seems to increase students' interest and memory. As one student stated, “It looks like the lesson is easy to understand because the pictures are clear and reading together helps me understand and comprehend" indicates that the delivery of material uses visual media such as images as outlined in readings and

methods reading and thinking aloud has a positive impact in improving reading comprehension. This is in line with Chinpakdee & Gu (2024) research on cognitive multimedia theory, which shows that students learn better when words and images are presented together rather than words alone. In context reading and thinking aloud Images function as full support in reading, helping students connect text with concrete experiences and making abstract concepts easier to understand. Apart from that, seeing pictures in reading can improve students' memory and imagination. In accordance with research by Rohim & Wardhani (2024), visual media that is integrated in learning can increase the effectiveness of information transfer, motivation and understanding of students.

The next student statement, "It's fun because I can read the news and know the detrimental impact that technology can have if it is not used properly.". Illustrating how to implement learning sciences through method reading and thinking aloud succeeded in creating situated learning or learning that is related to real world contexts. Students not only receive general information about technology but also connect it directly to relevant issues in real life and know the potential negative impacts of technology. This connection is very important in learning sciences, because learning is more meaningful and easier for students to remember when it is connected to previous experience and knowledge. Use of the real world in subject matter and discussed in methods reading and thinking aloud has a positive impact on students' motivation and achievement (Rompegading et al., 2023). In this case, method reading and thinking aloud activate the knowledge students already have about technology, reflect on its impact and integrate new information into a broader understanding. Furthermore, the statement shows that the method reading and thinking aloud not only focuses on understanding content, but develops students' critical thinking skills. Apart from that, students not only enjoy reading the news, but also analyze the positive and negative impacts of using technology today. This is in line with the goal learning sciences namely to prepare students to become lifelong learners who are able to think critically and contribute to society (Fauziah & Sukmawati, 2023). Students' active involvement in the learning process is not limited to receiving material but can also be seen in the research results diagram, where learning satisfaction, understanding reading content, and enjoyable learning experiences are interrelated and support the creation of effective learning.

Recognizing that each learner's learning needs vary, in-depth analysis of material content clusters highlights the importance of learning differentiation to accommodate individual learning needs. In line with the principles Learning Sciences that emphasizes learner-centered approach, researchers strive to provide material choices that are relevant and challenging for each student. This is reflected in the students' statements, "I prefer to read stories about Raka's adventures in saving the earth, because I understand better and can tell them to my friends,". Based on this statement, it shows that students feel more involved when the learning material is connected to personal interests and experiences. So to facilitate this interest, researchers provide a variety of text choices in the form of narrative story texts and news texts with varying levels of difficulty, as well as providing ease of adaptability in the way students interact with the material when students read independently, in pairs and in small groups.

Next, strategy scaffolding also tailored to individual needs. Learners who have difficulty understanding certain concepts are given more structured guiding questions and more concrete examples, while more independent learners are encouraged to explore the concept in more depth and make connections with previous knowledge. As stated by one student, “At first I imagined how Raka could actually save the earth, but after the teacher gave examples of how people around us have started to reduce plastic waste, I understood better." The statement shows the construction process that occurs when students read, but students actively provide opinions with their peers about the meaning of the story. Students share examples of the use of other meanings in different contexts, thereby building a deeper and independent understanding rather than just memorizing definitions. In the discussion process, students scaffold each other by providing instructions, discussion questions, and explanations that help peers to understand difficult concepts. In the discussion process, students carry out scaffolding or help from peers by providing instructions, questions and explanations that help peers to understand difficult concepts. This also supports Vygotsky's constructivism theory which states that knowledge is socially constructed through interactions with other people in the zone of proximal development (ZPD). So in this context, peers function as scaffolding which helps students achieve a deeper understanding than when studying independently.

Thus, through material differentiation, interaction, and scaffolding, implementation Reading and Thinking Aloud seeks to create an inclusive and effective learning environment, where every learner has the opportunity to build a meaningful and relevant understanding of crucial themes such as sustainability and environmental responsibility.

Constructivism Theory Cluster

Based on the diagram, the research results can be seen from the pink dots talking about constructivism theory. In implementation learning sciences through method reading and thinking aloud There is a lot of talk about constructivism theory which can be seen from the aspects of social interaction, active discussion, active interaction, helping, scaffolding, and knowledge exploration that occur during the learning process in the classroom.

Data analysis shows that through the method reading and thinking aloud with approach teaching sciences effectively supports the principles of constructivism in several ways, namely: during group discussion activities about the narrative text "Raka Saves the Earth", students actively share their views about the actions of the characters in the story. One of the students' statements is: "At first I was confused about why Raka wanted to take risks to save the earth, but after I heard opinions from friends, I understood that every small action is important." This statement shows that social interaction activities can facilitate students' knowledge construction. This statement describes the way of social interaction, which is the core of Vygotsky's constructivist theory by providing opportunities for students to build deeper understanding when students learn on their own. During the discussion process, there is debate between students who challenge each other's assumptions so that students clarify wrong ideas and build mutual understanding.

Based on the elements of cluster constructivist theories such as social interaction, active discussion, scaffolding, and knowledge exploration. This makes it clear that learning is not just a transfer of knowledge information from teachers to students, but rather an active process in which students build new knowledge based on previous knowledge experiences. This is a view that is the foundation for development learning sciences (Desiana et al., 2024). Based on Hoadley & Campos (2022) views, he emphasizes that learning sciences emerged as a response to the traditional view of passive and isolated learning. On the contrary learning sciences views learning as a dynamic, social, contextual process, where students actively participate in building understanding independently.

Apart from that, the research findings also highlight scaffolding from teachers and peers play an important role in facilitating learning, especially in building deep understanding. The important role of collaboration and scaffolding in facilitating students' understanding is that in group discussion activities, students share thoughts, questions and connections, creating a supportive and collaborative learning environment (Ceyhan & Yıldız, 2021). This is in accordance with theory social constructivism Vygotsky, who emphasized that knowledge is socially constructed through interactions with other people. In addition, teachers apply flexible scaffolding, providing gradual support according to individual and group needs.

When students experience difficulties, the teacher provides more structured guiding questions or concrete examples. Conversely, when students demonstrate strong understanding, teachers encourage students to explore broader implications and make connections to real-world problems. This scaffolding approach helps students to move deeply zone of proximal development (ZPD), namely the space between what students can do independently and what they can do with the help of others.

In line with theory Zone of Proximal Development (ZPD) Vygotsky, this social support makes it easier for students to surpass previous abilities and reach a higher level of understanding. This is reinforced by the statement of a student, "The class feels more comfortable because all the friends help each other when reading and understanding the content of the reading," which underscores the importance of a supportive and collaborative learning environment. However, what is more interesting is how social interactions look in the context of different learning materials, ultimately contributing to improving students' reading comprehension. These findings have important implications for learning practice when teachers create a supportive and collaborative classroom environment so that students feel safe to share thoughts and challenge each other's assumptions.

In method Reading and Thinking Aloud with narrative texts, interaction focuses not only on understanding the storyline, but also on exploring the moral values and environmental messages contained therein. In method reading and thinking aloud, social interaction is not limited to sharing opinions but about clarifying mutual understanding, identifying gaps in understanding, and building a more comprehensive understanding through the dialogue process. This is demonstrated when students provide alternative explanations, or concrete examples, which help their peers to understand the concepts of the material provided. This social interaction facilitates knowledge construction, where students do not receive information passively, but students actively process, reflect new information into existing knowledge patterns. This is evident from the students' ability to identify the main themes in the story and relate them to personal experiences, which shows increased conceptual understanding.

Method reading and thinking aloud facilitate teachers to identify students' scaffolding needs directly. By listening to students' thoughts when reading, teachers know where difficulties lie and provide support

in the form of guiding questions, additional explanations and providing appropriate examples to students. Effective scaffolding does not come from teachers but also from peers. In group discussions, students provide scaffolding to each other by explaining difficult concepts, as well as providing feedback to friends to connect the reading text with the students' personal experiences. In the activity, share interpretations of the actions of characters in the reading text and show how students can apply these values in everyday life. Meanwhile, in activities with news texts, interaction focuses more on critical analysis of complex issues and the development of innovative solutions. In line with the opinion of Karsini et al. (2024) that scaffolding is an essential form of support in the early stages of learning, where assistance is given in stages to support students' learning process. Therefore, it is reflected in students' ability to identify reading points in news sources, evaluate different arguments, and formulate realistic solutions, which shows increased critical understanding. As stated by one student, "Discussions with friends are fun, we can learn from other people's opinions and increase our understanding," which shows that social interaction can broaden students' perspectives and help in building a more comprehensive understanding. In method reading and thinking aloud In the use of narrative texts, interactions tend to focus on understanding character, motivation and moral values, this happens because narrative texts often offer space for personal interpretation and reflection, thereby triggering discussions about the morals and implications of the reading text. In contrast, in news texts, interaction focuses more on critical analysis of complex issues with the development of innovative solutions. In line with Inah (2015) research on the role of student interaction in learning activities, communication between students has a very important role in the learning process. Based on the data from the analysis, effective interaction is not just about sharing opinions, but also demonstrates the ability to listen actively, appreciate different perspectives, and the ability to articulate thoughts clearly and concisely, all of which are important elements in building a collaborative community of learners, and directly contribute to improving students' reading comprehension, whether literally, inferentially, or critically. Effective learning occurs when students get the right support in completing tasks that are slightly beyond the reach of personal abilities.

Technology Use Content Cluster

Based on the results of research data analysis, cluster those marked with purple triangles show important aspects in using technology. Data analysis on cluster it highlights how the integration of technology, pedagogy, and supportive content enhances students' learning experiences through Reading and Thinking Aloud. Technology-based learning innovations, especially the use of QR codes to access interactive digital content containing reading material in the form of illustrated stories as supporting multimedia in the learning process, are an integral part of the approach. Learning Sciences in improving reading comprehension. This is in line with the principle Learning Sciences which emphasizes its importance situated learning And context-based learning, where students learn more effectively when learning materials are connected to their real-world experiences (Hoadley & Campos, 2022).

Statement by a student, "When I scanned QR, I felt like I had entered Raka's adventure story. The picture also really helped me understand the content of the story," based on these learners' statements illustrates the positive impact of technology in increasing cognitive and affective engagement. Cognitively, QR codes make it easier to access reading material and trigger deeper information processing, as students can access the material digitally. Affectively, QR codes create a more engaging and emotional reading experience, as learners feel connected to the story through visual and interactive elements. The integration of QR codes in this learning shows that technology can be used as an effective tool in enriching learning content knowledge and strengthening pedagogical strategies through methods Reading and Thinking Aloud in line with technological developments. Next student statement "When I scanned the QR and saw Raka's adventure story, the story was exciting and from that story I learned to want to care for the environment around me." Based on the students' perceptions, the use of QR codes in learning significantly increases students' learning motivation. This is in line with the principle situated learning in Learning Sciences, which emphasizes the importance of connecting learning to real-world contexts and students' experiences. QR codes provide students with the opportunity to access interactive digital content that is relevant to everyday life, thus making learning more meaningful and interesting. This is also in line with the principles Learning sciences which emphasizes its importance active learning And constructivism, where students actively build new knowledge based on independent experience (Brown & Pressley, 2023). In the context of technology use, these innovations are not just about adding technology, but also changing how students interact with the material and build understanding. The reading experience becomes more in-depth and contextual, because students not only read the text, but also experience it directly through visual and interactive elements. In line with the opinion of (Fauziah & Sukmawati, 2023), the use of QR codes in

learning has high effectiveness in improving the reading comprehension of elementary school students.

Apart from that, increasing learning motivation is an essential factor in the success of Learning Sciences-based learning. This is in accordance with the principle learning sciences which emphasizes its importance intrinsic motivation And emotional involvement in the learning process. In this research, method Reading and Thinking Aloud provides opportunities for students to actively think critically and construct the meaning of texts independently, which contributes to increasing intrinsic motivation. Social support from peers, as expressed by a student, "I actually felt confident because my friends listened and encouraged me. That way I also understood the story," also plays an important role in creating a dynamic, conducive and interactive classroom atmosphere, which supports context-based learning. Thus, implementation Learning Sciences through method Reading and Thinking Aloud with technology support provides significant benefits in improving students' reading comprehension. Integration of pedagogical aspects of the method Reading and Thinking Aloud, relevant and challenging material content, and QR code technology create a learning experience that is more interesting, effective, and relevant to everyday life, which ultimately improves students' reading comprehension comprehensively.

This approach is in line with the principles Learning Sciences to create an optimal learning environment, where students not only gain knowledge, but also develop critical thinking, creativity, and collaboration skills that are essential for success in the 21st century (Sawyer, 2022).

Conclusion

Method implementation Reading and Thinking Aloud proven to improve students' reading comprehension. The results of the small group presentation showed that all students consisting of 26 class VI students divided into 8 groups had succeeded in achieving the Minimum Completeness Criteria (KKM) in understanding and finding the meaning of the text content. This indicates a significant increase in students' reading comprehension abilities, especially in accessing and interpreting the meaning contained in reading texts. This is demonstrated by students' active involvement in discussions, use of visual media, and think-aloud strategies that help them understand the content of the reading more deeply. The research results show that this method is in line with Vygotsky's constructivism theory, especially in the aspects of social interaction, scaffolding, and knowledge exploration. Students actively build understanding through discussion, reflection, and collaboration with peers and teachers. The use of technology in learning, such as the use of QR codes to access digital content, increases learning motivation and provides a more immersive and interactive reading experience. These innovations support approaches that effectively combine technology with pedagogy and content. This method creates a more dynamic, interactive and conducive classroom atmosphere. Students feel more interested in learning, experience increased motivation, and are able to relate the material to real life experiences. With approach Learning Sciences and methods Reading and Thinking Aloud, the goal of learning is not only limited to transferring knowledge, but also encouraging students to understand concepts in depth and apply them in everyday life.

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Author Contributions

Erna Sefriani Sabuna: Conceptualized the research, designed the methodology, and coordinated the research implementation and data analysis. Dr. Henny Dewi Koeswanti, M.Pd.: Provided input, direction, and advice in the literature review and preparation of the discussion section. Dr. Stephen Christian Relmasira, M.Pd.: Provided input, direction, and suggestions in data analysis and final editing of the manuscript.

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Conflicts of Interest

There is no conflict of interest in this research.

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