EDUHUMANIORA: Jurnal Pendidikan Dasar

Journal homepage: https://ejournal.upi.edu/index.php/eduhumaniora/

Implications of Constructivism Theory in Elementary School Science Learning: Systematic Literature Review

Diana Arista Dewi[1*], *Eva Imania Elisa*[2]

[1,2]Faculty of Education, Yogyakarta State University, Indonesia
*Correspondence: Email: dianaarista.2024@student.uny.ac.id

ABSTRACT

Science learning in elementary school requires a contextual, adaptive approach and is able to develop students' critical thinking skills. This article aims to examine the application of constructivist theory in science learning based on the thoughts of Jean Piaget and Lev Vygotsky. The study was conducted through a Systematic Literature Review (SLR) approach to five scientific articles published in 2020–2025 that were strictly selected from the Google Scholar, SINTA, and Garuda databases. Data analysis uses the Miles and Huberman model, including data reduction, data presentation, and conclusion drawn. The results of the review show that concrete experiential learning and social collaboration are effective in building an understanding of science concepts and 21st century skills. The integration of Piaget's and Vygotsky's theories resulted in a strong pedagogical framework, with an emphasis on the stages of cognitive development, self-exploration, scaffolding, and social interaction. This study concludes that the constructivism approach is relevant to be applied in science learning in primary schools, but further research is needed to test its effectiveness empirically in various learning contexts. This study suggests the need for teacher training, the development of contextual teaching tools, and advanced empirical studies to test the effectiveness of constructivism approaches in the classroom.

ARTICLE INFO

Article History:
Submitted/Received 21 Jan 2025
First Revised 23 Feb 2025
Accepted 20 Jun 2025
First Available Online 25 Jul 2025
Publication Date 25 Jul 2025

Keywords:
Cognitive development,
Constructivism,
Scaffolding,
Science learning,
Zone of proximal development.

1. INTRODUCTION

Entering the 21st century, education is faced with much more complex demands than in previous eras. Rapid changes in the fields of technology, information, and globalization have created major challenges in the world of work and social life. For this reason, the education system must be able to respond to these changes by preparing the younger generation who not only master knowledge academically, but also have critical, creative, communicative, and collaborative thinking skills. These competencies are part of 21st century skills, which emphasize the importance of the ability to solve problems, innovate, and be able to adapt in various complex and uncertain situations (Rosita et al., 2024).

The transformation of education in the 21st century also demands a paradigm shift in learning, from teacher-centered to student-centered learning. In this new approach, students are seen as active subjects who build their own knowledge through direct involvement in the learning process. Therefore, learning strategies that encourage exploration, reflective thinking, and problem-solving independently and collaboratively are needed (Lestari et al., 2024). Such learning will help students develop lifelong learning skills that are very important to survive and succeed in the global era.

Basic education, as the initial stage of forming the cognitive foundation and character of students, has a very strategic role in instilling scientific skills and ways of thinking from an early age. One of the subjects that has made a great contribution in this regard is Natural Sciences (IPA). Science learning not only instills an understanding of natural concepts, but also equips students with science process skills such as observing, classifying, formulating hypotheses, conducting experiments, and concluding the data obtained. These processes encourage students to actively find out, experiment, and develop knowledge through scientific approaches (Chusni & Yuningsih, 2023).

The practice of science learning in elementary schools still faces many obstacles. The approach used is still mostly conventional, such as lectures and written assignments that do not provide space for students to actively engage in the learning process. Teachers are still dominant as the main source of information, while students tend to be passive recipients. This condition has an impact on students' low motivation to learn, lack of deep conceptual understanding, and limited critical thinking and problem-solving skills (Bustomi et al., 2024). This is exacerbated by limited facilities and infrastructure, lack of teacher training on active learning, and low awareness of the importance of experiential learning and real exploration (Lestari et al., 2024).

One of the developments that will be experienced by children is cognitive development. This approach to cognitive development is based on the assumption or belief that cognitive ability is fundamental and guides children's behavior. Cognitive development in humans began to be studied in the Middle Ages, where scientific advances began to rise. The psychological figures who discuss this cognitive development are Jean Piaget and Lev Semyonovich Vygotsky. Both discuss cognitive development in children and use a constructivism approach. However, what distinguishes this constructivism approach is that Piaget emphasizes more on the theory of adaptive constructivism (cognitive constructivism), while Vygotsky uses a social (sociocultural) constructivism approach (Khoiruzzadi & Prasetya, 2021).

In the context of the cognitive development of elementary school-age children, abstract and theoretical learning approaches tend to be less effective. Children at this age are at a concrete operational stage according to Jean Piaget, which means they understand concepts more easily when they are conveyed through direct experience and concrete media.

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

Concepts that are conveyed verbally or symbolically without the support of real activities will be difficult to understand and internalize completely. As a result, the learning process becomes mechanical and only oriented to memorization (Ulya, 2024). Therefore, it is crucial for teachers to design learning that is contextual, interactive, and appropriate to students' stages of cognitive development (Wardani et al., 2023).

In answering these challenges, constructivism theory is one of the most relevant and applicable approaches to be applied in science learning. Constructivism views that knowledge is constructed by individuals through active processes that involve interactions between experiences, environments, and pre-owned cognitive structures (Bustomi et al., 2024). The basic principle underlying the philosophy of constructivism states that knowledge is not acquired directly through the senses such as smell, touch, or hearing, but is constructed by the individual through experience. This view is different from the assumption of realists who believe that knowledge is objective and directly accessible. Although there is no single theory of constructivism, most constructivists agree that learners actively build their own knowledge, and that social interaction plays an important role in the process of knowledge construction (Nuryati & Fauziati, 2021). This process occurs through activities that allow learners to explore, discover, and construct knowledge independently. Piaget emphasized the importance of assimilation and accommodation in the formation of cognitive schemas, which can only occur if students are directly involved with the object or phenomenon being studied. Therefore, learning approaches that allow direct interaction with natural phenomena such as simple experiments, field observations, and simulations are very important to be applied in science learning.

In addition to the individualized approach emphasized by Piaget, Lev Vygotsky added a social dimension to the learning process through his theory of the Zone of Proximal Development (ZPD). Vygotsky believes that children will reach their highest potential if they are accompanied by more competent adults or peers through guidance called scaffolding (Wardani et al., 2023). Thus, the learning process should not only pay attention to individual aspects, but also social aspects that involve group discussions, collaboration, and dialogue between teachers and students. In the context of science learning, collaboration can be facilitated through group experiments, discussions of observations, and joint problem-solving, all of which reflect the principles of social constructivism.

Jean Piaget, as the pioneer of constructivist theory, stated that knowledge is developed through the active process of individuals in understanding information, and is impermanent and constantly changing over time. After Piaget, Lev Vygotsky's ideas also had a great influence through the concept of the Zone of Proximal Development (ZPD) and scaffolding. ZPD shows the difference between individual learning abilities without assistance and with assistance, while scaffolding is support that is provided at the beginning of learning and is gradually reduced as students begin to become independent. Vygotsky emphasized the importance of social interaction in learning, so the involvement of teachers, parents, and peers is key. An important constructivist approach to learning that emphasizes the exploration of new information, such as cooperative, discussional, and collaborative learning. Through this process, students reconstruct old knowledge into new understandings. Learning in groups also develops social, communication, and problem-solving skills that support active learning (Voon & Amran, 2021).

Constructivism's emphasis on the active role of students creates a foundation for the development of critical thinking skills and the ability to relate knowledge to real contexts. By combining personal experience and formed understanding, students can construct deeper and more relevant knowledge (Tohari & Rahman, 2024). These constructivist principles have

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

been accommodated in the Independent Curriculum through a scientific learning approach that emphasizes five main steps, namely observing, questioning, trying, reasoning, and communicating. This approach provides space for students to actively explore and understand concepts through hands-on experience. In addition, the problem-based learning (PBL) and scientific inquiry models are also very suitable to be applied in science learning, because they encourage students to solve real problems, increase curiosity, and develop high-level thinking skills (Pratami, 2024).

Although conceptually constructivist theory is ideal, in practice, the implementation of constructivism-based learning still faces various obstacles. Teachers often have difficulty adapting the principles of constructivism into a learning design that fits the curriculum and students' needs. Most teachers also have not received adequate training to design learning activities that involve exploration, reflection, and collaboration. In fact, there are still many teachers who do not fully understand how to implement scaffolding or how to manage the dynamics of group discussions so that learning becomes meaningful (Lestari et al., 2024). This indicates that there is a gap between the well-established theory of constructivism in the academic realm and its implementation in the field of basic education (Mulyani et al., 2024).

Based on these conditions, there is an urgency to examine more deeply how the theory of constructivism, especially based on the ideas of Piaget and Vygotsky, can be applied practically in science learning that is relevant to the characteristics of elementary school students. Students at this level are at the stage of concrete operational cognitive development, where direct experience, the use of real media, and social interaction have an important role in the process of forming scientific concepts. Therefore, the application of a constructivist approach in science learning needs to consider aspects of child development holistically, both in terms of logical thinking skills, understanding of cause-and-effect relationships, and the ability to communicate and collaborate with peers.

This research is important to close the gap between theory and learning practice that has been an obstacle in realizing active and meaningful learning in elementary science classes. Many teachers have a theoretical understanding of the importance of actively engaging students in the learning process, but still struggle to design learning activities that truly empower students and fit their stages of cognitive development. On the other hand, learning practices that overemphasize memorization and procedures without conceptual understanding actually weaken the main goal of science learning, which is to form scientific mindsets and scientific attitudes from an early age. Therefore, a study is needed that not only reviews the philosophical and psychological foundations of constructivist theory, but also offers a practical implementation model that can be applied by teachers in the field. This study is expected to be able to bridge the gap between theoretical discourse and the reality of learning in schools, so as to encourage the realization of a more exploratory, reflective, and meaningful learning process in accordance with the spirit of the Independent Curriculum and the demands of 21st century education.

The novelty of this study lies in the synthesis approach that combines Piaget and Vygotsky's thinking practically and contextually in a constructivist-based science learning design. This study not only highlights the relevance of constructivism theory in basic science education, but also provides practical contributions in the form of learning strategies and activity design that are applicable in accordance with the demands of the Independent Curriculum and the characteristics of elementary school students. Thus, the main purpose of this article is to present a conceptual analysis and practical recommendations in applying constructivism theory to elementary school science learning. It is hoped that this study can

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

be an academic and practical reference for teachers, researchers, and policy makers in developing learning strategies that are contextual, responsive, and in accordance with the development of students in the 21st century era.

2. METHODS

This study uses a qualitative descriptive approach by applying the Systematic Literature Review (SLR) method to explore in depth the application of constructivism theory in science learning at the elementary school level, through an analysis of the thoughts of Jean Piaget and Lev Vygotsky. The choice of this method was motivated by its ability to compile a systematic and organized thematic synthesis from various previous studies (Bamber & Schneider, 2022). Literature is collected through a number of academic databases such as Google Scholar, ResearchGate, as well as national journal portals such as Garuda and Sinta. The keywords used in the search process included "constructivism", "Piaget learning theory", "Vygotsky learning theory", "Zone of Proximal Development", "scaffolding", and "elementary science learning".

The criteria for articles that are used as references are determined selectively. The articles under consideration are those published between 2020 and 2025, in Indonesian or English, focus on basic education, and explicitly contain constructivist theories. To ensure the quality and relevance of the data, the researcher established inclusion and exclusion criteria. Articles eligible for inclusion include scientific writings that discuss Piaget's and Vygotsky's theories in the context of science learning in primary schools, and are accessible both openly and through institutions. In contrast, non-scientific articles, which do not focus on basic education, or do not explicitly mention the theoretical foundation, are eliminated from the study.

From the initial search results, 25 articles were found which were then selected based on their titles and abstracts. This process resulted in 12 selected articles for further thorough review. After a full review, only 5 articles were judged to meet all the inclusion criteria and were used as the main source in the preparation of the analysis.

The data analysis process is based on the Miles & Huberman (2020) model which consists of four steps, namely data collection, data reduction, data display, and conclusion drawing. Relevant articles are based on the previously mentioned keys. Therefore, it is necessary to re-explore and find the key that best suits the focus of the study, such as the integration of Piaget and Vygotsky's theories in science learning in elementary school. The data that has been collected is then presented in a theme table format to highlight the most important points. Based on these results, information analysis was carried out to discuss the theoretical and practical implications of constructivism education in elementary schools.

3. RESULTS AND DISCUSSION

The article selection process in this study was carried out systematically using the Systematic Literature Review (SLR) approach to identify literature that is relevant to the application of constructivism theory in science learning in elementary schools. Literature searches were conducted on several leading databases such as Google Scholar, SINTA, and Garuda using the following keywords: "constructivism," "Piaget's theory of learning," "Vygotsky's theory of learning," "Zone of Proximal Development," "scaffolding," and "elementary science learning."

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

The inclusion criteria set in the literature selection include (1) scientific articles published in the 2020–2025 time frame, (2) discussing the application of constructivist theory, especially the ideas of Piaget and/or Vygotsky, (3) focusing on science learning at the elementary school level, and (4) being accessible openly and through academic institutions. Meanwhile, articles that are non-scientific opinions, irrelevant to basic education, or do not explicitly mention the theory, are eliminated from the analysis.

From the initial search results, 25 relevant articles were obtained based on their titles and abstracts. After screening based on inclusion criteria and reading thoroughly, only 5 articles met all the requirements and were worthy of being used as the main reference in this study. However, for the sake of the focus of the analysis, the five most representative articles were selected to be summarized in the following **Table 1**.

The Results

Table 1. Summary of the Results of a Literature Review on the Implications of Constructivism Theory in Science Learning in Elementary School

Source	Focus of Findings	Implications in Elementary Science Learning
Bustomi et al. (2024)	The integration of Piaget and Vygotsky's thought in cognitive constructivism.	Teachers need to understand the stages of cognitive development and the social role of students to design contextual and adaptive science learning.
Lestari et al. (2024)	Constructivism encourages self-exploration and active learning.	Science learning should be based on direct activities and real experiences so that students can build concepts through observation and reflection.
Rosita et al. (2024)	The relationship between constructivism and the scientific approach in IPAS.	Scientific steps such as observing, questioning, trying, and inferring are in line with the constructivist approach.
Ilham & Tiodora (2023)	Constructivist theory encourages inquiry and problem-based learning.	Learning models such as inquiry and Problem-Based Learning can increase students' curiosity and critical thinking skills.
Wardani et al. (2023)	Role scaffolding and ZPD in supporting learning development.	Teachers need to provide gradual support (scaffolding) according to the needs of students in order to be able to understand the concept of science in more depth.

The discussion

An analysis of the literature of the article shows that the use of Piaget and Vygotsky's constructivist theories provides significant support for the development of science learning strategies at the highest level of primary school. Constructivist theory, which is based on the idea that knowledge is actively created by individuals through interaction with the surrounding environment and others, offers pedagogical solutions that are relevant to the characteristics of students in core schools. In general, the three main aspects of this study are: (1) the need to understand the stages of children's cognitive development; (2) the need for teaching approaches that encourage concrete experiences and social collaboration; and (3) the importance of the teacher's role in providing scaffolding and positive social interaction during the learning process. Constructivist theory views learning as a truly active

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

activity in which students build their knowledge, search for their own meaning, explore what they have learned, and refine new concepts and ideas with existing knowledge (Firdaus et al., 2023).

Constructivism is a theory that provides freedom to humans who want to learn or seek their needs with the ability to find their desires or needs with the help of other people's facilities (Fitri, 2020). The constructivism approach is an approach in which students must be able to find and transform complex information into another situation, and if desired, the information becomes their own (Fitria et al., 2021). Understanding the stages of cognitive Development Piaget states that the effectiveness of education is highly correlated with the cognitive development of students at each stage of learning. Children in elementary school are in the concrete operational stage, which is the time when they begin to be able to think logically but are still influenced mainly by things that are real and directly observed. Therefore, abstract concepts in science, such as gravity, energy change, or air pressure, will be easier to understand if they are explained through direct explanations and manipulation of real objects. According to the research of Lestari et al. (2024), learning based on direct experience, observation, and the use of props can facilitate assimilation and accommodation in students' cognitive structures. These exploratory activities encourage students to develop new schemes or modify old schemes based on the learning experiences they have experienced firsthand. This is where the important role of science learning based on hands-on and minds-on activities lies.

Social Dimensions and Scaffolding in Learning Vygotsky offers a complementary perspective on constructivism by emphasizing the social dimension in children's cognitive development. Effective learning occurs in zones where the child can complete tasks with the help of others, but is not yet able to do so independently. The assistance can be in the form of scaffolding, which is temporary support provided by teachers or peers until students are able to be independent. Research by Wardani et al. (2023) shows that the provision of scaffolding in the form of open-ended questions, strategy guidance, and reflective feedback is able to improve students' understanding of complex science material. In practice, teachers can use techniques such as think-pair-share, group discussions, and guided demonstrations to create social interactions that enrich students' cognitive processes. This activity allows students to build understanding collaboratively, which is in accordance with the principles of social constructivism.

Integration of Piaget and Vygotsky Principles in Learning Design A number of studies, including Rosita et al. (2024) and Bustomi et al. (2024), underscore the importance of integration between Piaget and Vygotsky principles. This strategy can start with individual exploration based on students' cognitive stages, then continue with social activities such as group work and discussions to strengthen understanding. Thus, students engage in two processes of knowledge construction: individually (internal) and socially (external). The scientific approach in the elementary science curriculum which includes the stages of observing, questioning, trying, reasoning, and communicating is also in line with the constructivist framework. This process encourages students to become active agents in the search for knowledge, not just recipients of information. Such science learning allows for the transfer of concepts from the real world to the mental world of students, strengthening understanding through the cycle of experience-reflection-abstraction-application. According to Vygotsky's view, the basis of human mental function is built biologically and to develop this mental function, humans fulfill the role of society and culture (Dewi et al., 2021).

One of the important aspects of the constructivism approach is the generative nature of the learning process. This means that students not only passively receive

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

information, but are actively involved in constructing new knowledge through activities that encourage them to think critically, solve problems, and generate new ideas. In the context of schools, the application of generative constructivism learning processes can be carried out through various teaching methods and strategies. Teachers act as facilitators who create a learning environment that supports student exploration, discussion, and collaboration. One of the methods that is often used in the constructivism approach is project-based learning. In this method, students are presented with real challenges or complex problems that must be solved through the process of investigation, research, and solution development independently or in groups (Julia et al., 2024).

Constructivistic learning models, such as inquiry-based learning and problem-based learning (PBL), are practical implementations of constructivist theory. Inquiry-based learning requires students to explore questions and answers on their own based on observed phenomena. PBL encourages students to face real problems, think critically, and work together to find solutions. Ilham & Tiodora (2023) study states that these two models are able to foster scientific skills, concept understanding, and increase the learning motivation of elementary school students. In the context of science, for example, students can be invited to research the causes of changes in the weather or how the respiratory organs work. Teachers play the role of facilitators who guide the inquiry process, not as an information center. Strategies such as guided inquiry are also important to bridge students' concrete abilities with scientific skills. The teacher designs structured worksheets to keep students focused, but still actively exploring and drawing conclusions on their own.

Metacognition and Reflection in Science Learning Constructivism also contributes to the development of students' metacognitive awareness. In science learning, students are encouraged not only to know "what" but also "how" they learn. Strategies such as post-experiment reflection, writing a study journal, and discussing thought processes can strengthen students' metacognition. This awareness is important because it teaches students to evaluate their thought processes, correct mistakes, and become independent learners. In the long run, metacognitive awareness encourages the ability to think systematically about science. Students are accustomed to identifying problems, formulating hypotheses, evaluating results, and communicating their findings logically. Such learning not only transfers knowledge, but also shapes the way of thinking.

Differentiated Learning and Learning Equity The constructivist approach supports differentiated learning practices. Because students have different learning styles, experience backgrounds, and levels of readiness, teachers need to provide a variety of methods and media. Some students are more interested in visual activities, others kinesthetic or verbal. By providing a choice of activities, such as experiments, drawing, modeling, or discussions, teachers create a more inclusive and participatory learning atmosphere. In addition, it is important for teachers to recognize students' prior knowledge. In constructivism, students' past experiences become the foundation for the formation of new knowledge. Techniques such as diagnostic assessments, early lesson questions, or concept mapping can help teachers identify learning starting points. For example, for material on changing the shape of an object, teachers can start by associating students' everyday experiences such as seeing ice melting or boiling water.

The use of technology and educational tools according to constructivism, the use of technology and educational tools, such as language, symbols, and digital media, is essential in education. The use of these tools helps students transform concrete experiences into more abstract concepts. This can be demonstrated in science education through digital simulations, experimental videos, interactive diagrams, and sanity-based applications. These

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

media enhance the visualization of complex concepts and increase student engagement, especially for those with visual or digital-native learning styles. For example, technology allows for the personalization of education. With educational apps, students can learn at their own pace and interests. It follows constructivist principles, which view students as active and unique participants in the learning process.

Challenges of constructivism implementation although promising, the implementation of constructivism in elementary science classes cannot be separated from various challenges. Teachers need a deep understanding of cognitive development, active learning design, and formative assessment strategies. On the other hand, obstacles such as limited time, experimental facilities, large number of students, and administrative demands can be obstacles in implementing ideal learning. The assessment system that is still dominant emphasizes final results or quantitative values is also not in line with the spirit of constructivism that values the learning process. Therefore, it is necessary to transform assessment towards an authentic form of assessment that reflects the development of student competencies holistically.

The Importance of formative assessment and the role of teachers in the constructivist approach, assessment is not just a tool for measuring outcomes, but an integral part of the learning process. Formative assessments monitor student progress, provide constructive feedback, and help teachers adjust teaching strategies. Techniques such as observations, interviews, portfolios, reflective journals, as well as scientific projects can be used to assess students' science process skills and critical thinking abilities. Teachers in the constructivist approach do not only play the role of material presenters, but also facilitators, mediators, and learning companions. Teachers must be able to create a conducive, democratic, and supportive classroom climate for the free exploration of ideas. In this atmosphere, students are not afraid to make mistakes, dare to ask questions, and are motivated to keep learning.

Thus, the use of Piaget and Vygotsky's constructivist theories in elementary science education provides valuable conceptual and practical guidance for creating engaging, contextual, and effective learning experiences for students. This approach allows students to develop their knowledge through meaningful experiences and social interactions. It also supports the development of 21st-century skills such as critical thinking, problem-solving, communication, and teamwork. Apart from the implementation of policy support, teacher readiness, and education system transformation, a constructivist approach has been proven to improve the quality of science teaching at the highest level in a meaningful way. Therefore, collaboration between teachers, schools, students, and policy is essential to ensure that science education is transformed in a more inclusive, humanistic, and flexible way in light of historical circumstances.

4. CONCLUSION

The results of the review of five articles show that the constructivist theories of Jean Piaget and Lev Vygotsky contributed significantly to designing science learning in primary schools. Piaget emphasized the importance of adapting learning strategies to the stages of students' cognitive development, especially at the concrete operational stage, which is characterized by the ability to think logically about real objects. Therefore, science learning needs to involve object manipulation, hands-on experimentation, and empirical experience. Vygotsky highlighted the role of social interaction and the learning environment in optimizing children's cognitive potential. Through the concept of Zone of Proximal Development (ZPD), he explained that children can complete complex tasks with the help of

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

teachers or peers, known as scaffolding. Therefore, science learning should ideally combine independent exploration with appropriate pedagogic interventions. Models such as inquiry-based learning, problem-based learning, and scientific approaches reflect the application of constructivism in science learning. These models encourage students to actively build knowledge through experience, observation, reasoning, discussion, and reflection. As a result, students not only understand concepts, but also develop critical thinking, scientific communication, and problem-solving skills collaboratively. However, this study has some limitations. First, the study only relied on five articles that passed the inclusion criteria in the 2020–2025 range, so the scope of the analysis was limited. Second, this study does not discuss in depth the context of implementation in various geographical and socio-cultural conditions that can affect the effectiveness of the application of constructivism in elementary science classes. In addition, the qualitative approach through SLR has not provided direct empirical evidence on student learning outcomes. Therefore, advanced research is highly recommended to bridge the gap between theory and practice. Classroom action studies and quasi-experiments can be conducted to directly test the effectiveness of the integration of Piaget and Vygotsky theories in improving students' conceptual understanding and critical thinking skills. The development of contextual constructivism-based teaching tools, as well as the evaluation of the results of their implementation in diverse classroom settings, is also an important agenda going forward. With consistent implementation and the support of an adaptive education system, the constructivist approach can be a strong foundation in shaping the 21st century generation that understands science in depth, thinks critically, and is able to work together. Science learning based on constructivism is not just a process of knowledge transfer, but a means of forming individuals who are reflective, creative, and adaptive to global changes.

5. ACKNOWLEDGMENT

The author would like to express his sincere and big thanks to everyone who has helped during the process of compiling this article. A special award was given to the lecturer in the Elementary School Student Development and Learning course for knowledge, direction, and guidance that is very meaningful in each stage of writing. Thank you are also extended to the family who always provide encouragement, attention, and moral support without stopping. Not to forget, appreciation was given to colleagues who participated in looking for references, discussing, and helping to compile this manuscript. Hopefully this article will be useful and make a small and meaningful contribution to the development of science, especially educational and learning psychology.

6. AUTHORS' NOTE

The author states that in the writing and publication of this article there is no conflict of interest in any form. In addition, the author ensures that this manuscript is originally composed and does not contain elements of plagiarism.

7. REFERENCES

Bamber, M. D., & Schneider, J. K. (2022). College students' perceptions of mindfulness-based interventions: A narrative review of the qualitative research. *Current Psychology*, *41*(2), 667–680. https://doi.org/10.1007/s12144-019-00592-4

Bustomi, Sukardi, I., & Astuti, M. (2024). Pemikiran konstruktivisme dalam teori pendidikan kognitif Jean Piaget Dan Lev Vygotsky. *Jurnal Review Pendidikan Dan Pengajaran*, *7*(4), 16376–16383. http://issn.pdii.lipi.go.id/issn.cgi?daftar&1544413580&1&&2018

Chusni, M. M., & Yuningsih, E. K. (2023). *Review literatur tentang persepsi teori konstruktivisme dalam keterampilan proses sains*. *10*(2).

Dewi, L., & Fauziati, E. (2021). Pembelajaran tematik di sekolah dasar dalam pandangan teori konstruktivisme Vygotsky. *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar,* 3(2), 163–174.

Firdaus, A., Sugilar, H., & Aditya, A. H. Z. (2023). Teori konstruktivisme dalam membangun kemampuan berpikir kritis. *Gunung Djati Conference Series*, 28, 1–7

Fitri, Y. (2020). Implementasi penerapan teori konstruktivisme dalam proses pembelajaran di sekolah dasar. *SHEs: Conference Series*, 3(4), 1300–1307. https://doi.org/10.20961/shes.v3i4.55740

Fitria, D., Lestari, M., Aisyah, S., Renita, R., Dasmini, D., & Safrudin, S. (2021). Meta-analisis pendekatan pembelajaran konstruktivisme dalam meningkatkan hasil belajar siswa pada pembelajaran IPS sekolah dasar. *Jurnal Simki Economic*, 4(2), 192–199. https://doi.org/10.29407/jse.v4i2.65

Ilham, M. F., & Tiodora, L. (2023). Implementasi teori belajar perspektif psikologi konstruktivisme dalam pendidikan anak sekolah dasar. *3*(3).

Julia, M. A., Fitriani, N., & Setiawan, R. (2024). Proses pembelajaran konstruktivisme yang bersifat generatif di sekolah dasar. *Jurnal Pendidikan Guru Sekolah Dasar,* 1(3), 1–7. https://doi.org/10.47134/pgsd.v1i3.519

Khoiruzzadi, M., & Prasetya, T. (2021). Perkembangan kognitif dan implikasinya dalam dunia pendidikan (Ditinjau dari pemikiran Jean Piaget dan Vygotsky). *Jurnal Madaniyah*, 11(1).

Lestari, S., Manurung, A. A., & Sumarni, S. (2024). Teori belajar konstruktivisme dan Implikasi dalam pembelajaran IPA SD. *JIIP - Jurnal Ilmiah Ilmu Pendidikan*, *7*(9), 10622–10628. https://doi.org/10.54371/jiip.v7i9.5476

Miles, M. B., & Huberman, A. M. (2020). *Qualitative data analysis: An expanded sourcebook*. SAGE Publications.

Mulyani, A., Pd, S., Jamilah, D. H., & Pd, M. (2024). Rancangan pembelajaran berlandaskan teori konstruktivisme dan humanistik. *Journal of Education*.

Nuryati, N., & Fauziati, E. (2021). Pendekatan konstruktivisme dalam pembelajaran tematik terpadu di SD Negeri Sumogawe 01 Kab. Semarang. *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar*, 3(2), 1–8.

Pratami, R. (2024). Pendekatan konstruktivisme dalam kebijakan pembelajaran berbasis proyek: Transformasi pendidikan menuju kreativitas dan kolaborasi. *Jejaring Administrasi Publik*, *16*(2), 76–87. https://doi.org/10.20473/jap.v16i2.60539

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457

Rosita, R., Safitri, R. D., Suwarma, D. M., Muyassaroh, I., & Jenuri, J. (2024). Pendekatan konstruktivisme terhadap peningkatan hasil belajar siswa SD. *Jurnal Review Pendidikan Dasar : Jurnal Kajian Pendidikan dan Hasil Penelitian*, *10*(3), 238–247. https://doi.org/10.26740/jrpd.v10n3.p238-247

Tohari, B., & Rahman, A. (2024). Konstruktivisme Lev Semonovich Vygotsky dan Jerome Bruner: Model pembelajaran aktif dalam pengembangan kemampuan kognitif anak. *Jurnal Pendidikan Indonesia*, 4(1). https://doi.org/10.14421/njpi.2024.v4i1-13

Ulya, Z. (2024). Penerapan teori konstruktivisme menurut jean piaget dan teori neuroscience dalam pendidikan. *journal of education*, *7*(1).

Voon, S. H., & Amran, M. S. (2021). Pengaplikasian teori pembelajaran konstruktivisme dalam pembelajaran matematik [Application of constructivism learning theory in mathematical learning]. *Sains Insani*, 6(2). https://doi.org/10.33102/sainsinsani.vol6no2.285

Wardani, I. R., Zuani, M. I. P., & Kholis, N. (2023). Teori belajar perkembangan kognitif lev vygotsky dan implikasinya dalam pembelajaran. *DIMAR: Jurnal Pendidikan Islam*, *4*(2), 332–346.

DOI: http://dx.doi.org/10. 17509/eh.v17i2.86250
p- ISSN 2085-1243 e- ISSN 2579-5457