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CONSTRUCTIVIST PERSPECTIVE OF PROJECT-BASED LEARNING: A MILESTONE IN INITIAL SCIENCE EDUCATION

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Abstract. Rapid global changes in science, technology, and education require adjustments in the educational system, relying on the constructivist theory of learning. Constructivism is a key strategy in science education, promoting students' involvement in the construction of knowledge from an early age, fostering self-confidence, creativity, independence, and lifelong learning. Project-based learning (PBL), a learning approach based on constructivism, combines student-centred practices with theoretical principles of knowledge construction. Understanding the role of science education in resolving global challenges requires appropriate integration of constructivism and PBL in primary education. This study presents theoretical research on the benefits of constructivism and PBL, as well as their significance for the application in science teaching (biological contents) in the first cycle of primary school. Theoretical analysis validates the educational potential of PBL in a constructivist context as an effective approach for enhancing students' knowledge and abilities enabling them for the wide range of global concerns.

Keywords: constructivism; primary education; project-based learning; science; theoretical research

Introduction

Rapid worldwide changes, which present new demands for the individuals and the entire society, require adjustments in the educational system (Džinkić & Milutinović, 2018; Juvova et al., 2015; Rehman et al., 2023). Changes in society and politics, the workplace, technology and IT sectors, and the intensifying development of science need innovations in the learning environment and teaching methods that will foster the growth of open, responsible, and active individuals, equipped for lifelong learning, and prepared for the frequent changes (Džinkić, 2020). In today's modern world, students have to be equipped with 21st century skills, particularly those related to solving real-life problems, to ensure competitiveness in the current global economy (Farhana et al., 2017; Rehman et al., 2023).

Contemporary education is based on the constructivist model, according to which knowledge is not acquired passively, but is the result of an individual's active construction. The constructivist learning environment is focused on the student who is prepared to solve problems, develop self-confidence, creativity, independence of thought, and the ability to learn for life (Milutinović, 2015). Teachers play a crucial role as facilitators, guides, or mentors, encouraging students to actively engage in education and create meaningful connections between prior and new knowledge. This approach is particularly relevant in education, as it aligns with lifelong learning ideals (Babić, 2007; Džinkić, 2020; Juvova et al., 2015).

Constructivist theory, which emphasises learning through demanding, relevant, and practical experience, is often associated with terms like *authentic learning activity* and *hands-on learning*. A topic of discussion among educational researchers is the challenges associated with an implementation of this learning theory in teaching and learning settings (Farhana et al., 2017). The project-based learning (PBL) approach, described as *constructivist* by numerous experts in the field (Farhana et al., 2017; Grossman et al., 2019; Loyens et al., 2015), is one of many concepts and learning models derived from constructivism's principles that have surfaced in educational practice (Rodek, 2011). This approach proved to be particularly important in teaching natural sciences at preschool and younger school age (Lev et al., 2020/2022). It allows students to learn by doing, and it is among the most successful student-centred learning strategies within the constructivist learning approach (Baran et al., 2017). All students, regardless of age, should participate in PBL. Students are given the freedom to learn and make many discoveries about the world and themselves by engaging in PBL. Utilising the curiosity and interests of preschoolers and younger students, PBL involves them in research and discovery that is most relevant for them, and has an effect on both, their own and other people's lives (Lev et al., 2020/2022).

Given the abundance of research on constructivism and PBL, this study aims to highlight their potential in the context of teaching and learning natural science contents in the first cycle of primary education.

Constructivism: from historical to modern perspective

The philosophical ideas that emerged in the 17th century influenced the development of the constructivist paradigm, which aimed to unite various related ideas in one direction (Stojnov, 2005). In the late 19th and early 20th centuries, altered pedagogy movements emerged in Europe and the US in order to address the shortcomings of traditional education. Student-centred teaching, active learning strategies, real-world knowledge, and practical skills were the main focuses of these reform initiatives (Evtimov & Petrović, 2021). The emphasis shifted from the teacher as a facilitator of predetermined knowledge to the student as an active researcher and constructor of their own knowledge, emphasising students' responsibility for their own learning (Milutinović, 2016).

Constructivism, a theory originating from Jean Piaget and Lev Vygotsky, and other theorists such as Immanuel Kant, Jerome Bruner, and John Dewey (Ćirić & Jovanović, 2018; Dagar & Yadav, 2016), has evolved into various perspectives, including radical, cognitive, social, cultural, sociocultural, and critical constructivism (Thompson, 2015). Vygotsky's social constructivism theory emphasises education for social change, focusing on individual development within a sociocultural framework. It highlights the importance of contextual and social foundations in learning, as well as the role of society and culture. The fundamental starting point of this perspective is the belief that human knowledge emerges from social interactions and situations (Milutinović, 2011). Piaget's individual constructivism theory is based on intrapsychic processes that construct reality (Jukić, 2013). It emphasises that students actively reconstruct their knowledge in their unique ways, forming individual meanings (Milutinović, 2015). Piaget sees constructivism as a necessary part of the creative process of scientific development (Ćirić & Jovanović, 2018). In teaching, students should be viewed as active individuals, respecting individual differences and focusing on their cognitive abilities and structures (Džinkić, 2020).

In the modern educational landscape, constructivism is an important concept, focusing on the students as active participants in knowledge creation rather than passive recipients (Milutinović, 2016). It is a dominant pedagogical theory that impacts students' abilities to build and construct knowledge, understand content, and discover connections without direct guidance from adults. According to this viewpoint, constructivism requires a different approach to students than typically reflected in the curriculum. It requires the creation of a free learning environment where students cooperate, discuss content, ask questions, seek explanations, and present their own ideas, attitudes, and assumptions (Džinkić, 2020).

Constructivism as a learning theory

Although constructivism was initially established as a learning theory, it eventually expanded to other domains and evolved into a pedagogical theory that facilitates the production of ideas, as well as personal and scientific knowledge (Mattews, 2002). Constructivism emerged in education following the behaviourist movement as a novel approach to learning that emphasises the active individual in the learning process (Džinkić, 2020). The constructivist theory of learning is established on the idea that the act of learning is based on a process that connects new knowledge to prior knowledge (Dennick, 2016). Its fundamental principle is that reality is shaped by people's needs, interests, prejudices, and cultural traditions (Ševkušić, 2011). Contrary to the conventional view, which connects knowledge to the pursuit of truth, constructivists stress that knowledge is understood as a creation of particular communities. A constructivist-based pedagogy is required because of the significant problems that globalisation of economy and communication has posed to education

(Ćirić & Jovanović, 2018). In the context of educational policy, the theory considers the ideals of *lifelong learning* and *learning society* (Ristanović, 2016).

Constructivism in teaching implies the existence of specific potentials and possibilities, is amenable to various results, and embraces a pluralistic perspective on learning goals (Evtimov & Petrović, 2021). Asiksoy and Ozdamli (2017) define constructivism as a theory of learning predicated on the notion that learners create their own knowledge within the framework of their experiences. Instead of establishing strict and objective standards, it holds that a person is capable of processing learnt information and translating it into useful actions. A student has to learn to accomplish this through independent activity under the expert direction and support of a teacher (Evtimov & Petrović, 2021). Contrary to the traditional teaching methods, constructivist theory-based education places equal emphasis on the process and activities that an individual engages in, as well as the actions that are taken to achieve the desired result, enabling the fullest possible realisation of student's own psychophysical potential (Mijanović, 2023).

The constructivist approach used in education is a way to involve students in the entire process of creating knowledge from the earliest age and serves as the foundation for determining the teaching process (Ristanović, 2016). This teaching and learning approach is based on the idea that learning is the result of *mental construction*. In other words, students acquire knowledge by connecting new information to what they already know (Bada & Olusegun, 2015). According to constructivist theory, learning occurs through a process in which knowledge is built on prior knowledge, and learning is the result of experience and ideas. This theory emphasises active learning, which entertains and activates students, rather than teacher-directed teaching (Džinkić, 2020).

The main goal of the theory of constructivism in teaching refers to the creation of a curriculum that encourages effective learning (Džinkić & Milutinović, 2018). Constructivist concept serves as the foundation for the development of innovative curriculum and educational approaches, and it strongly supports the learning paradigm as opposed to the knowledge transmission paradigm (Milutinović, 2016). In public schools, most students do not actively participate in their education because of the teacher-centred approach to learning (Rehman et al., 2023). According to the constructivist concept, a teacher is expected to take on the role of a facilitator (Bada & Olusegun, 2015), guide or mentor (Juvova et al., 2015), whose major responsibility is to encourage students to actively engage in their education and to draw meaningful connections between their prior knowledge, their new knowledge, and the learning processes. Namely, they gather and alter data, compare current to previous data, and update the rules when they are no longer applicable. As a result, and opposed to the traditional teaching, the student is subject of the teaching rather than its object (Evtimov & Petrović, 2021).

Project-based learning in primary education

New forms of education have received significant attention in educational discussions over the last ten years in many countries, including Serbia, due to frequent changes in society that are leading to the development of a learning society (Džinkić, 2020). The traditional method of learning is anticipated to change into a new culture of learning that is in line with and more receptive to the needs of the novel society (Rodek, 2011). PBL is one of many concepts and learning models that have been developed in educational practice based on constructivism's ideas (Baran et al., 2017; Rodek, 2011). According to Huang et al. (2022), PBL is aligned with the social constructivist approach, which emphasises students' participation in the learning process through group projects and teacher supervision.

Teaching that takes place in the form of PBL is based on the beliefs of constructivism and the values found in the five principles of constructivism (Table 1) (Driscoll, 2005). According to Driscoll (2005), the five constructivist principles are as follows:

Table 1. Principles of constructivism

Principle 1	Incorporate learning into complex, realistic and relevant environments.
Principle 2	Facilitate social discussion and shared responsibility as part of learning.
Principle 3	Support multiple perspectives and the use of multiple content representations.
Principle 4	Encourage a sense of ownership of what has been learned.
Principle 5	Cultivate self-awareness and understanding that knowledge is constructed.

Understanding the principles of constructivism, which are not only educational guidelines but values that influence teaching decisions and inspire the culture inside the classroom, is necessary for a full, effective, and purposeful implementation of project teaching in the classroom (Lev et al., 2020/2022). The aforementioned principles provide educators with a solid foundation for creating an atmosphere conducive to PBL.

PBL, as defined by Moghaddas and Khoshsaligheh (2019), is a constructivist teaching method that involves students engaging in a sequence of research-orientated tasks that necessitate their cooperation in order to accomplish the objective. According to Papanastasiou et al. (2019), students can improve their *critical thinking, communication, collaboration*, and *creative skills* by engaging in these activities. PBL endorses these concepts, which are frequently referred to as *the 4Cs* (Almazroui, 2023). According to Kurniahtunnisa and Wowor (2023), educational professionals have acknowledged the significance of the 4Cs for student achievement and have suggested that PBL, as an instructional design, can enhance students' mastery of the 4Cs. Technology, according to Özeren (2023),

is essential for the implementation and use of these skills. PBL fosters critical thinking, problem-solving, interpersonal communication, information and media literacy, cooperation, leadership and teamwork, innovation, and creativity, all of which are important 21st century skills (Häkkinen et al., 2017). Accordingly, the 21st century student's necessary skill is to be engaged in thinking techniques like creativity, critical thinking, problem-solving, and working methods such as cooperation and communication (Özeren, 2023). According to Almulla (2020), these include giving students a chance to work on difficult problems, engage with ongoing problems, come up with viable solutions, assist with project selection, consider trends, evaluate and re-evaluate work, and produce a general product.

PBL empowers students who can participate actively in their learning throughout the project and encourages students to draw on prior knowledge and experiences in order to construct knowledge (Lev et al., 2020/2022). According to Chiang and Lee (2016), PBL is a teaching methodology wherein students demonstrate their proficiency in a subject by generating and displaying solutions to real-world issues. Planning requires students to assess the needs for new product development, pinpoint problems with existing products, and alter them using the creative problem-solving approach (Chiang & Lee, 2016). PBL is an effective method for transforming prior knowledge and misconceptions into scientific concepts, as it involves independent research and collaboration (Ristanović, 2016). PBL of natural sciences promotes independent information gathering, creative thinking, internal motivation for learning, proper presentation of ideas and information, motor skills through experimentation, communication skills, and teamwork (Kovačević & Grmuša, 2017).

Active student participation and comparative learning define the PBL approach, which is a common cooperative and research-based learning strategy (Loyens et al., 2015). PBL students typically collaborate to solve a given problem, create a product for a particular market, and then assess the project and development process (Kokotsaki et al., 2016). According to Lev, Clark and Starkey (2020/2022), one of the most widespread misconceptions among teachers is that PBL stands as too unstructured and student-focused to be effective when working with younger children. This presumption primarily captures the mind-set of those who are unaware of constructivism, a complex but fundamental theory that establishes the framework for instruction and learning in the specific context of PBL. PBL has gained international recognition as an alternative to traditional teacher-centred education because of its emphasis on experiential, group, and inquiry-based learning activities (Yang et al., 2021). PBL combines the presumptions of student-centred practices with the theoretical principles of how children learn the best (the construction of knowledge). The foundation of PBL is the constructivist idea that learning is most effective when knowledge is constructed or when students build on a wealth of prior knowledge and experiences (Lev et al., 2020/2022).

Constructivism and PBL in the classrooms

According to Farhana et al. (2017), constructivism is a learning theory that perceives learning as the process of creating knowledge from experience. The research into the application of the theoretical presumptions of the constructivist approach to learning (teaching) has shown that it is beneficial for students to understand what and how scientists do. Students can build understanding by explaining and predicting what will happen in an investigation, and then watching and taking part in the research (Lev et al., 2020/2022). If it is made clear to students that scientists also go through periods of ups and downs, coming up with new ideas may become particularly acceptable to them (Mirkov, 2013; Ristanović, 2016). Researchers in educational constructivism agree that applying this theory to natural science courses is the most effective and efficient way to increase students' knowledge. Teachers, on the other hand, face numerous challenges when teaching abstract scientific concepts, some of which are beyond the students' experiential knowledge (Matthews, 2002). A possible solution to the aforementioned challenge is to teach scientific principles, as well as learning processes and procedures, methods of collecting and evaluating information, and a number of other skills necessary for the contemporary learning.

Given that it supports the principles of lifelong learning, constructivism is especially relevant in education (Babić, 2007; Džinkić, 2020). PBL emerged as an approach that most closely aligns with constructivist learning theory (Baran et al., 2017), and its application in the educational process had a significant impact on students. Using PBL, teachers can implement a curriculum that is based on pre-established learning objectives (Handrianto & Rahman, 2018). A recent study (Yang et al., 2021) has demonstrated that through learning activities and objectives guided by a central guiding question, PBL can assist students in building knowledge and developing learning skills. Additionally, PBL can foster self-directed inquiry, creativity, critical thinking, communication, collaboration, and lifelong learning abilities (Condliffe, 2017). PBL is also thought to assist in social learning since it prepares students for the desirable present-day skills, including cooperation, communication, and collaboration (Kokotsaki et al., 2016; Rizkiyah et al., 2020).

The PBL approach is highly recommended for its educational benefits. Due to its rising popularity as a teaching approach in preschool and primary education, PBL is becoming increasingly important in the teaching of natural sciences (Lev et al., 2020/2022). The incorporation of PBL into the educational systems leads to improved academic performance (Rehman et al., 2023). In addition, it has increased PISA rankings of some countries, such as Finland, due to the fact that the PBL fosters student-centred learning, collaboration, and problem-solving abilities, facilitating a thorough understanding of the studied subjects. According to Petrović and Hoti (2020), PBL is a learning approach that combines planned learning with learning from the real-world situations and play. Research indicates that PBL

enhances student engagement through the facilitation of knowledge, information exchange, and discussion (Almulla, 2020), as well as by fostering positive student-teacher relationships and increasing students' enjoyment in the classroom (Hugerat, 2016). PBL combines active participation, flexibility, and research. It influences the formation of social bonds between children and adults, where social interaction fosters learning, and it aids in the development of the research spirit (Petrović & Hoti, 2020). Studies on PBL's efficacy in science education for primary school students have demonstrated that PBL can help students acquire content knowledge, group work skills, motivation, and positive attitudes toward their peers (Kaldi et al., 2011). Similarly, Karaçalli and Korur (2014) revealed a statistically significant improvement in academic achievement and knowledge retentionin PBL students. According to Andanawarih et al. (2019), PBL can enhance students' talents, knowledge, attitudes, and inventiveness in solving problems. Some studies indicated that PBL activities enhanced students' problem-solving and collaboration abilities (Kokotsaki et al., 2016; Rehman et al., 2023). Furthermore, another benefit of the PBL is that everyone participates in the project by conducting research and learning together, contributing to their real-world experiences (Hugerat, 2016; Krnjaja & Pavlović Breneselović, 2017).

Along with communicating the content knowledge, PBL develops lifelong learning abilities such as creativity, critical thinking, teamwork, but also flexibility, and self-evaluation (Artama et al., 2023). According to Rizkiyah et al. (2020), PBL encourages students to collaborate in groups in order to find agreeable solutions, develop ideas, define concepts, or produce a final product. However, PBL can be difficult to implement in practice compared to traditional teaching methods (Rehman et al., 2023). Some studies have questioned PBL's efficacy in particular situations, pointing out its potential drawbacks and implementation difficulties. In addition, some researchers pointed out that a number of variables, including the degree of student preparation, teacher preparation and support, student-centred learning, curriculum alignment, and assessment techniques, may affect the effectiveness of PBL (Loyens et al., 2023; Szalay et al., 2023). Accordingly, many educators believe that the phrase *student-centred learning* means that the student controls or has own curriculum and that the teacher will veer from it in response to astudent's interests and enquiries. In contrast, as the authors (Lev et al., 2020/2022) emphasised a student-centred classroom means that the student's academic, social, and emotional needs, as well as their ideas and questions, represent what is *at the centre* of teaching decisions. According to Kurt and Akoglu (2023), one of the student-centred approaches is constructivism. Hence, this is precisely how the PBL fits in – at the intersection of theoretical constructivist principles (the construction of knowledge) and the fundamental principles of teaching in which the student is at the centre of the learning process.

Proposal for the application of constructivism and PBL on biological content in primary education

Teaching of natural sciences requires an interdisciplinary approach. In order to comprehend the complicated system of knowledge about nature, students have to be instructed how to acquire knowledge and discover scientific truths. As an innovative teaching model, PBL creates a constructivist learning environment in which students may freely generate their own knowledge. Kovačević and Grmuša (2017) suggest that students learn about nature by actively investigating their surroundings and constructing their own knowledge system.

Global research on the adoption and comprehension of biological content through the use of PBL in natural science primary (Kaldi et al., 2011; Reiss & Tunnicliffe, 2001), as well as secondary education (Fancovicová & Prokop, 2019; Kovačević & Grmuša, 2017) is expanding. One of the reasons PBL is a suitable form of educational activity, is the necessity to focus education and training on the development of students' and teachers' key subject and cross-subject competences. Research indicates that innovative teaching methods, particularly PBL, are underutilised in implementing natural science content in schools. However, when implemented, students enjoy engaging in natural sciences via projects (Kaldi et al., 2011; Kovačević & Grmuša, 2017; Ristanović, 2016).

Numerous studies in the area of biology teaching, particularly anatomy and physiology of the human body, attest to students' low levels of knowledge and certain misconceptions at the primary and secondary school levels (Fancovicová & Prokop, 2019; Manchová & Ehler, 2021; Özgür, 2013). A study conducted by Assaraf et al. (2013) discovered that even high school students' comprehension of the human body as a system and a whole is still underdeveloped. Biological content, such as the cellular level of the organisation of all living beings, anatomy and physiology of the human organism, are unfairly neglected in the curricula for the first cycle of primary education, resulting in a low level of prior knowledge and a large number of eventual students' misconceptions about the human organism (Allen, 2019; Prokop & Fancovicová, 2006; Reiss & Tunnicliffe, 2001; Yeong & Kim, 2012). Research shows that properly prepared teaching programmes may effectively modify children's prior knowledge and beliefs at the younger school age level (Allen, 2019; Blagdanić et al., 2019; Kovačević & Grmuša, 2017; Ristanović, 2016). According to Silva and Almeida (2017), it is abundantly evident that a specific learning model has to be developed. This model should emphasise the identification and deconstruction of misconceptions and experiential knowledge from an early age, in order to organise gained knowledge into accurate and explicit scientific concepts (Pine et al., 2001).

Regarding the biological content, a large body of evidence considers constructivism theory and PBL as a good way of teaching in the classroom. Therefore, rather than being taught in isolation and independently of other concepts,

the contents of the human body, such as anatomy and physiology, constitute one feature whose teaching should be interrelated. Through the implementation of the PBL model, students can learn about the organisation of all living things at the cellular level, and gain a comprehensive understanding of one of the greatest concepts in science: "All fundamental functions of life and the organism are the outcome of what occurs in the cell" (Harlen, 2010, p. 34). Furthermore, students will learn that organ systems are not separate, disconnected entities, but rather one cohesive functioning unit (Reiss & Tunnicliffe, 2001). One of the fundamental concepts for this PBL model is "Organisms are organised on a cellular basis", which, according to Harlen (2010), means that all living things are cellular in nature, i.e. all organisms are composed of one or multiple cells. This is one of ten big ideas of science (Table 2), a collection of core ideas that form a framework for students to understand the scientific aspects and shape decision for science application, relying on scientific phenomena and principles (Harlen, 2010).

Table 2. Big ideas of science

1	"All material in the Universe is made of very small particles.
2	Objects can affect other objects at a distance.
3	Changing the movement of an object requires a net force to be acting on it.
4	The total amount of energy in the Universe is always the same but energy can be transformed when things change or are made to happen.
5	The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate.
6	The solar system is a very small part of one of millions of galaxies in the Universe.
7	**Organisms are organised on a cellular basis.**
8	**Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms.**
9	**Genetic information is passed down from one generation of organisms to another.**
10	**The diversity of organisms, living and extinct, is the result of evolution."**

Notes. From "Principles and big ideas of science education" (Preface: Ten Principles and Fourteen Big Ideas of Science Education) by W. Harlen, 2010, The Association for Science Education. Copyright 2010 by Wynne Harlen.

Four out of ten big ideas of science are related to the biological content (in bold, 7 – 10). Introducing the cellular level of structure, prior to understanding biological processes, promotes problem-solving by encouraging students to seek answers and provides a foundation for learning about other big ideas. The constructivist nature of the PBL teaching model improves achievement and increases awareness of the importance of understanding the anatomy and physiology of the human body, beginning with the cellular level of the organisation. By interpreting concepts such as

cell, *tissue*, *organs*, and *organ systems*, students can form the basis for understanding and interpreting more complex biological and chemical processes in the second cycle of primary education. These complex concepts are not taught at an early age in some countries, but in others, like Serbia, they are introduced and processed gradually in accordance with the developmental capacities of young children. In Serbia, the concept of the organisation of living organisms, from cells to organ systems, is vaguely mentioned in initial education, which is not sufficient especially when it is presented in a traditional way. Therefore, applying the PBL model to the biological content is expected to improve students' understanding of the importance of knowing the anatomy and physiology of the human body, thereby contributing to their objective and scientific knowledge about the holism of their own organism.

The next step in biological content teaching can be to introduce the concept of the importance of energy and building materials for growth and development, since all organisms are dependent on other organisms or are competing among each other for energy and materials they need to live and reproduce (the big idea of science number 8). Further step will go beyond the previous concepts, and include fundamental knowledge about the transfer of genetic information, inheritance and variability, regarding the structure and function of our bodies (the big idea of science number 9). The ultimate result of biological education is expected to be the notion of how living organisms sequentially evolved throughout time (the big idea of science number 10), as "all life today is descended from a universal common ancestor that was a simple one-celled organism" (Harlen, 2010, p. 22). By following these ideas, students could advance through the first and second cycles of compulsory education, creating meaningful connections between prior and new knowledge. The first two big ideas related to biology should be introduced at a younger school age. The other two are much more complicated and demand more complex mental processes, thus they should be introduced at an older school age. However, according to Harlen (2010), distinct boundaries for learning in various age groups are not established, and it is not feasible to identify precise boundaries because every child has a different cognitive development path. The objective is to establish fundamental conceptions, expand them to include a greater variety of experiences, and ultimately develop abstract concepts for comprehending objects in the natural world and relationships among them.

Conclusion

Modern education necessitates a new method of instruction. It is necessary to shift the conventional emphasis on the teachers to the students and enhance it with concepts such as active and collaborative learning, learning by experience, and creating and constructing knowledge.

With reference to the natural sciences, this theoretical study illustrates the benefits of teaching in primary schools using PBL and the constructivist theory

of learning. The study suggests that creative teaching methods, particularly PBL, are crucial for implementing science content in schools, as they increase students' achievement, understanding and enjoyment through projects. PBL represents a pedagogical approach in which students actively construct their knowledge over an extended period of time and collaborate with their peers to complete a public product that addresses a current issue or provides a solution to a key topic (Lev et al., 2020/2022). Our study shows that the principles of constructivist teaching theory provide teachers with a solid foundation for creating an atmosphere where PBL can flourish. These principles and values can have a significant impact on education. When teachers endeavour to introduce these concepts into the core of their work, they help students understand that they also play a role in the world. The goal is to encourage students to make a difference in the surroundings, both as members of the classroom community and as members of the greater community outside the classroom walls. Understanding individual principles and how they overlap can help teachers design, create, and manage a classroom climate that promotes student progress through PBL.

It is suggested that teachers use constructivism and PBL more often in primary education due to its effectiveness. Despite the common claim that PBL is challenging, time-consuming, and complex to use, this can be disproved with research on the subject and practice recommendations tailored to the classroom setting. These findings underline the necessity for creative teaching approaches to equip students to handle the challenges of the 21st century. Noticeably, teachers and curriculum developers have the key roles in this demanding, but crucial process.

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