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Project-based Learning in Basic Education: Literature Review and Research Perspectives

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Abstract: Project-Based Learning (PBL), as a central innovative model in the field of education in the 21st century, has garnered global attention. Through a literature review, this study systematically reviews the development of PBL both domestically and internationally, encompassing the construction of theoretical frameworks, the evolution of practical pathways, diverse implementation strategies, comprehensive assessment mechanisms, and its specific application within the national curriculum system. PBL demonstrates multifaceted characteristics in educational practice, such as interdisciplinary integration, student-centered instructional design, and a close connection with real-world issues, which together reveal its unique advantages in cultivating students' core competencies. Additionally, PBL plays a pivotal role in national curriculum reform, particularly in fostering critical thinking, creativity, communication, and collaborative skills among students. Looking ahead, the development of PBL models tailored to different regional characteristics, especially the formulation of feasible implementation plans for resource-poor areas, and an increased focus on the professional development and training of teachers in western regions, have become significant research directions. The overall advancement of PBL in the national curriculum at the school level not only helps students meet national curriculum standards but also stimulates proactive learning and innovative thinking through PBL's distinctive teaching methods. Therefore, how to effectively promote project-based learning in the national curriculum at the school level has become a key issue in current research. This topic holds significant theoretical and practical value and has a profound impact on promoting educational innovation and enhancing students' comprehensive qualities.

Keywords: Project-Based Learning (PBL); Core Literacies; Educational Reform; Literature Review; Western Regions of China; Curriculum Integration

1. Introduction

In the field of education in the 21st century, Project-BasedLearning (PBL) has received widespread attention as an innovative teaching mode. With the rapid development of global informatization and knowledge-based economy, the goal of education has changed from pure knowledge transfer to the cultivation of students' core literacy, i.e., critical thinking, creativity, communication and cooperation skills. Project-based learning, with its unique interdisciplinary, practical and student-centered characteristics, has become an effective way to achieve this goal.

1.1 Demands of the Times: Project-Based Learning Is an Effective Way to Cultivate Students' Core Literacy Skills

With the development of global informatization and the knowledge economy, the cultivation of learners' core literacy has become an important breakthrough in China's education reform and a basic choice for future talent training. [1]However, in international comparisons, Chinese students are often regarded as having a solid foundation, but lacking in creativity and problem solving, or even having "shortcomings". [2]Basic education in China is considered to be more focused on knowledge mastery and the construction of knowledge systems.

In recent years, with the new requirements for talent cultivation in the new era, project-based learning (PBL), as an innovative teaching model, has gradually attracted widespread attention in the field of education.

Project-based learning enables students to engage in the process of solving real-world problems, mobilizing their existing knowledge and skills to creatively address complex issues in authentic contexts.

1.2 The Realities: the Practical Dilemmas of Project-based Learning in Schools in the Western Region

A preliminary study was conducted in a city in the western region by means of a questionnaire to 40 junior high school principals and 40 elementary school principals. Through interviews with principals for in-depth exchanges, the conclusion is that "schools in the western region in the implementation of the national curriculum in the practice of the dilemma, the lack of concrete practice path. 80% of the schools surveyed by the author are still adopting the original teaching methods, waiting for new teaching materials and new training. Secondly, 20% of the schools in order to cope with the needs of the curriculum reform, project-based learning, interdisciplinary learning to do a separate adjustment attempts, such as in the national curriculum continues to use the traditional teaching methods, while in the school-based curriculum arrangements for the implementation of project-based teaching methods. At the same time, according to the results of another questionnaire survey conducted in 2020 among 625 pre-service teachers in more than 30 teacher training colleges across China, more than half of the respondents had not been exposed to the project-based teaching method.[3]

The practical dilemmas of educational and pedagogical change in the West are amenable to advanced theories and the experiences of pioneering regions. For example, more than 500 schools in 41 states included in the U.S. Deep Learning Consortium have adopted project-based learning as their main teaching method. [4]The Shanghai Municipal Education Commission issued the Three-Year Action Plan for Project-based Learning in Compulsory Education (2020-2022) in October 2020, and first-tier cities and cities with developed education levels in China are in full swing to carry out practice and application exploration. For China, where regional development is not balanced, education and teaching practices can be designed and carried out according to local conditions.

1.3 Exploration of Countermeasures: Project-Based Learning as a Way to Optimize the Quality of National Curriculum Implementation

Literacy-oriented curriculum reforms are adapted to the trend of the new curriculum standards. In the compulsory education curriculum program and curriculum standards of various subjects, "project learning", "project-based learning", "project learning" and "project-based learning" appear a total of 79 times. Project-based learning" and "project learning" appear a total of 79 times in the curriculum program and curriculum standards of various disciplines, among which project-based learning has even become the main learning mode in mathematics, English, chemistry, art, science and labor courses. This change means that project-based learning is leading the direction of change in learning styles in China's basic education stage, and it is worthwhile to conduct in-depth interpretation and research on it. [5]In practice, the status quo of project-based learning is the same as the national curriculum, and the difficulty of entering project-based learning in comprehensive practical activity courses and subject courses is different. When project-based learning enters these subject areas, will it be done only during students' leisure time or as an addition to the normal content of lessons, or will it enter the national curriculum, involving a reconstruction of the teaching content, and project-based learning in the original "should be taught" in the national curriculum?[6]

2. The Evolution of Project-Based Learning Theory and Practice: International Perspectives and Chinese Practice

The academic community has a long history of concern and research on project-based learning, and a more comprehensive research pattern has been formed, which will be synthesized around several dimensions such as the connotation, characteristics, and strategy application of project-based learning.

2.1 Conceptualization of Project-Based Learning

Project-based learning is called "Project-basedlearning", "ProjectMethod" or "PBL" in foreign countries, and "project-based teaching", "project-based learning",

"project-based learning", "project-based learning" and "project-based learning" in domestic literature. In the domestic literature, there are "project-based teaching", "project-based learning", "project-based learning", "project-based learning" and so on. Project-based learning" and so on. Various expressions are not the same, but in the concept and practice but the same way.

First, the concept of "project" is traced in the dictionary and in the field of economics. Project is a program, plan or subject, research object, or planning, planning or forecasting, anticipation. [7]In the perspective of management and economics, "project" is basically the same as its original meaning, which is expressed in the following ways: first, emphasis on time, budget and manpower; second, the existence of clear objectives and rules; and third, the quality of the results to be presented. [8]Educational projects focus more on learner participation and stimulate internal motivation.

Secondly, foreign scholars usually define project-based learning around situations and problems, or consider it a teaching method from the perspective of teachers or a learning mode from the perspective of students. The Buck Institute for Education (Buck Institute for Education, or BIE for short) in the United States believes that project-based teaching is a teaching method that guides students to research and be able to cope with an attractive, authentic, and complex problem or issue within a certain period of time, and to acquire knowledge and skills in the process of research.[9] JohnWThomas believes that project-based learning requires the design of complex task endings, decision-making, or investigative activities. [10]Some other scholars consider PBL as a teaching method that encourages students to learn and apply their knowledge and skills through engaging experiences. [11]Also, in such activities, students develop an understanding of the topic or issue by engaging in an actual (or simulated) real-life problem or issue. [12]Project-based learning (PBL) is a learning model that reflects sociocultural perspectives in educational settings.[13]

Finally, the majority of the national academic community agrees with the ideas put forward by the Buck Institute for Educational Research, which emphasizes the application of knowledge to a specific problem and its relevance to the real world. According to Liu Jingfu et al, project-based learning is a new mode of inquiry learning centered on the concepts and principles of the discipline, with the aim of completing works and carrying out authentic problem inquiry activities supported by various resources. [14]Xia Huixian sees project-based learning as a learning style driven by authentic problems in which students obtain visual learning outcomes through collaborative inquiry. [15]Xia Xuemei et al. define project-based learning under the literacy perspective.[16]

In summary, although domestic and foreign researchers have defined the concept of project-based learning differently, the following consensus has been reached on the basic elements in general: namely: context, problem, students and teachers. Specifically (1) emphasizes the authentic context based; (2) the problem is the stimulus and focus of students' activities and learning. (3) Student development tends toward deep learning and collaborative inquiry; (4) Teacher guidance toward resource integration and outcome orientation. On this basis, this study argues that project-based learning is the process of guiding students to work on an engaging, authentic, and complex problem or situation for a certain period of time, and ultimately resulting in a diverse project work.

2.2 Research on the Development of the Origins of Project-Based Learning

At the beginning of the 20th century, the idea of project-based learning originated from the pragmatism of John Dewey. He pointed out that "education is life, and education is a way of transmitting experience", and explicitly advocated the teaching-learning model of "learning by doing". [17]His disciple, William H. Kilpatrick, further proposed the design pedagogy, pointing out that there are four steps in design activities, namely, deciding the purpose, formulating the plan, implementing the plan and judging the results. [18]This pedagogy had a great impact on our Republic of China.[19]

In the 1970s, project-based learning was developed as a teaching model in medical school programs.[20] In 1969, Barrows in the United States gave a specific description of the connotation and implementation process of the

PBL teaching model. [21]With the continuous improvement of the theoretical system, scholars have applied it to a wider range of fields, such as engineering, information technology and education.

In the 21st century, a global wave of project-based learning continues Dewey's understanding of education and learning but embodies new learning theories and literacy pursuits. [22]For example, Linda Darling-Hammond at Stanford University, Joseph S. Krajcik in the field of learning sciences, and the Buck Institute for Research in Education emphasize deeper understanding of knowledge, the development of expert thinking in doing things, and the triggering of cross-situational transfer.[22]

In China, the idea and concept of "project-based learning" has been richly discussed in the traditional education of ancient China. For example, in Xunzi's "Advice to Learning", "The learning of a gentleman is in the ear, in the art in the heart, in the four bodies, in the form of movement and stillness", which emphasizes the unity of knowledge and action, and the body learning of integration; and in the "Meanwhile", "Learning by erudition, inquiring, thinking prudently, discerningly, and practicing faithfully...", which reveals the concept of "project-based learning" from "knowing" to "learning by doing"...." reveals the deepening and diversification of learning strategies from "knowing" to "doing". [23]In the late modern period, Tao Hsing-chi put forward the educational method of "teaching and doing as one", taking the society as the school, and life as education.[24] In the early 1940s, Chen Heqin began to implement the experiment of "living education" in a more systematic way, with the intention of "turning the kind of stagnant and corruptive education", "into a forward, automatic, lively and energetic education. The purpose of the experiment of "living education" was to "change the dead and corrupt education" to "forward, automatic, lively and energetic education， " [25]

Since the new era, the practical exploration of project-based learning in China has been carried out in the form of experimental schools and experimental districts, which has promoted the localization of project-based learning. 2020, the Shanghai Municipal Commission of Education released the "Three-year Action Plan for Project-based Learning in Compulsory Education (2020-2022)"[26] Some achievements have been made, and in 2022, the results of a questionnaire on "Teachers' Knowledge of Project-Based Learning in Geography" showed that 47.93% of teachers had "some knowledge and could give a general explanation about project-based learning. In 2022, a questionnaire on "Teachers' Knowledge of Project-based Learning in Shanghai" showed that 47.93% of teachers "know something about project-based learning and can give a general explanation "[27] The China Institute for Educational Innovation at Beijing Normal University has set up a "Project-based Learning Research Center", which is dedicated to the nationwide development of project-based learning in China. "The Research Center for Project-based Learning was established by the China Institute for Educational Innovation at Beijing Normal University to promote the implementation of project-based learning nationwide.

2.3 Research on the Application Strategies of Project-Based Learning

Strategies for project-based learning are generally thought to include disciplinary support, driving questions, collaborative

Explore learning, demonstrate results, and evaluate diversity.

First, scaffolding guides student learning. Scaffolding is the help provided by teachers or competent peers to enable students to move smoothly through the "zone of nearest development" for further development.[28]

National scholars have interpreted scaffolding in terms of when it is provided and to whom it is provided.[29] Dresse and Thompson argue that scaffolding cannot be too detailed and specific, and that independence is undermined whenever the educational experience is under the close or constant supervision of a teacher, or when detailed specifications are established in advance."[12]

Second, project-based learning requires the presentation of project work to the public. Students should be able to create a set of practical products that solve a problem, which are visual outcomes of classroom learning and can be shared publicly. [30]Even more, the purpose of project-based learning is to create products and market the work to customers.[31]

Third, project-based learning is a pedagogical approach driven by authentic problems.

Domestic scholars are driven based on solving an authentic problem and respecting students' right to choose and have a say. [32]Foreign scholars believe that a good driving problem should have four characteristics: feasible, valuable, contextualized, and ethical. [33]The significance of being driven by an authentic problem is that it can make students' learning meaningful, focus on the essence of the problem, and enhance their thinking ability.

Fourth, the assessment of project-based learning needs to point to core literacy. Enhancing the quality of project-based learning design and implementation, assessing and promoting students' authentic academic growth [34]. Foreign scholars link project-based learning with Bloom's taxonomy to construct a hierarchy of course structure and organizational feedback, as shown in Table 1, for example.[35]

Table 1. Learning Methods

Bloom's Classification of Objectives	Project-based learning
Knowledge and understanding	Conceptualization of process skills
Applications and Analysis	Craft skills subject knowledge
Synthesis and evaluation	creative critical thinking

2.4 Study on the Current Status of Project-Based Implementation of the National Curriculum

Project-based learning in the National Curriculum is conducive to changing the way of teaching and learning, and effectively promotes the reform practice of "curriculum integration" in schools. [36]From a subject-learning-student perspective, project-based learning is of great practical value when used on a regular basis in the main battlefield of the National Curriculum. [37]In the existing research, the relationship between project-based teaching and the existing school curriculum is still unresolved, and most of them still treat it as an adjunct and supplement to the traditional school curriculum, and some even confuse it with research-based learning and multidisciplinary theme teaching, remaining at the level of "shallow project-based teaching". It is necessary to think about whether project-based learning, after being incorporated into the curriculum of the National Curriculum, will be done sporadically in one or two semesters, or whether a systematic analysis will be made of the teaching materials, the nature of the subjects and the goals of literacy for the whole volume and the whole academic period, and then logical and systematic consideration will be given to which contents and units are suitable for adjusting and reconstructing project-based learning, so as to make it into a serialized and regular pattern?[38]

Project-based learning currently has certain dilemmas. In the study, it is pointed out that there are often problems in project-based learning, such as low student participation, excessive task difficulty, and unreasonable evaluation methods. Due to the deep-rooted traditional didactic teaching methods and the lack of in-depth research on project-based learning by educational practitioners, project-based learning has encountered a series of dilemmas and challenges in practice. [39]At the same time, projects tend to be highly structured, but it is difficult to obtain knowledge constructs when groups work on projects by merely compiling and presenting information they have copied from books, other media resources, experiments, the teacher's notes on the blackboard, or the teacher's comments. [40]Moreover, there is a need to explore how a coherent system of curriculum, instruction, assessment, and professional learning can facilitate student learning.[41]

3. Challenges of Project-Based Learning in Western China and a Forward-Looking Research Agenda

The views and conclusions of scholars at home and abroad have extensive theoretical reference and practical reference value. However, at the same time, there are still some problems to be further explored in the existing research.

3.1 Project-Based Learning Empirical Research is Regionally Uneven, With Applied Research in the Western Region to Be Examined

Empirical research on project-based learning (PBL) is regionally uneven in China and has not been fully explored in the western region. Currently, PBL is mainly concentrated in cities with rich educational resources such as Shanghai and Beijing, making it difficult for schools in the west to take advantage of PBL. Schools in these regions face a lack of class time, resources, space, evaluation systems, and management models, limiting the promotion of PBL. Future research should develop PBL

models that are suitable for different regions, especially in the west, considering cost-effectiveness and adaptability. The study also needs to focus on the professional development of teachers in the west, enhance their teaching ability through PBL training, and narrow the differences in teachers' professionalism between regions. At the same time, it will provide practical guidance for western schools to help overcome difficulties in PBL implementation, promote the widespread use of PBL in western regions, and promote educational balance and quality improvement.

3.2 The Research on the Influencing Factors of Project-Based Learning is not Systematic, and its Connotation and Content Framework is yet to be Constructed.

The implementation of project-based learning (PBL) is complex and influenced by multiple factors such as teachers, students, curriculum and resources. Existing research has mostly focused on the operational aspects of PBL, such as teaching methods and process management, but has neglected the overall consideration of systematicity and coherence, resulting in the possible one-sidedness of PBL design and implementation. To address this issue, future research needs to construct a comprehensive theoretical framework and analyze in depth the integration of key factors, including teacher professional development, student needs, curriculum design, and resource utilization. The research should adopt an interdisciplinary perspective, integrating pedagogy, psychology, and sociology to reveal the interactions among factors, and validate the theoretical framework through empirical studies to provide guidance for educational practice. This will promote the adaptive and innovative development of PBL in different educational environments and facilitate its wide application and in-depth development.

3.3 Many Subject Case Studies and Overall Promotion of Project-based Learning of the National Curriculum in Schools to Be Expanded

In the field of education, case studies of Project Based Learning (PBL) have mostly focused on the sciences, while relatively few studies have been conducted in disciplines such as liberal arts and the arts. Currently, PBL research mostly focuses on activity design and lacks systematic consideration of overall promotion in schools. Schools should promote PBL as a whole in order to facilitate cross-curricular integration between subjects. However, existing studies have neglected the promotion of PBL at the national curriculum level, failed to fully utilize the compulsory education curriculum standards, and have not adequately constructed a teacher professional development support system that matches PBL.

Future PBL research should expand into broader subject areas and explore strategies for designing and implementing interdisciplinary programs for knowledge integration and skill transfer. Research should focus on school-level PBL promotion strategies, including school culture, policies, resource allocation, and teacher collaboration. This requires systematic planning and implementation of PBL within the overall educational framework of the school in order to utilize school leadership and teacher professional development to promote in-depth development of PBL. In addition, the study needs to explore how to effectively align the national curriculum standards with PBL and design PBL projects that meet the individual needs of students, stimulate motivation and increase engagement. This will help students meet national curriculum standards while fostering active learning and innovative thinking. These research directions will enrich the theory and practice of PBL and promote its wide application and in-depth development in Chinese basic education.

Project-based learning, as an innovative teaching model, is of great significance to the development of students' core literacy. Despite the many challenges faced during implementation, project-based learning is expected to be widely used in Chinese basic education through the adoption of effective strategies and policy support. Future research and practice should continue to explore the best practices of project-based learning in order to modernize and internationalize education.

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