

Project-Based Learning in the Digital Age: Preparing Learners for the Challenges of the Digital Economy

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ABSTRACT

The development of digital technology has changed the education paradigm from a passive, rote-based model to interactive learning that emphasizes digital literacy and 21st century skills. This research uses the Systematic Literature Review (SLR) method to explore the effectiveness of Project-Based Learning (PBL) in developing learners' digital skills to face the challenges of the digital economy. The SLR process involved identifying, selecting, and synthesizing 45 studies from academic databases (2020-2025) that addressed the principles, implementation, and barriers of PBL in the digital era. The synthesis results show that Project-Based Learning (PBL) promotes active and collaborative learning, enhances critical thinking, creativity, and digital communication and collaboration skills. However, its implementation is still constrained by the limitations of a flexible curriculum, educators' readiness to design projects, and uneven access to infrastructure and technology resources. For this reason, collaboration between the government, educational institutions, and the industry sector is needed to create an adaptive and inclusive education ecosystem.

Key words: *Problem Based Learning; Digital Economy; Digital Era; Student*

INTRODUCTION

The development of digital technology has brought significant changes to various aspects of life, including education. In the digital age, the traditional teacher-centered education paradigm and conventional learning methods are shifting towards a more interactive and technology-based approach. The world of education has undergone a digital transformation, which has changed traditional learning methods and redefined the essential skills required for effective teaching and learning (Judijanto, 2024).

Passive learning models that focus only on memorization and theory are becoming less relevant in preparing students to face the challenges of a dynamic digital economy. Today, the world of work demands graduates who not only have academic understanding but also practical skills such as problem solving, collaboration, creativity, and digital literacy. Students still do not use digital literacy in the learning process in the current education system, and there is no desire to improve digital literacy, especially in terms of linguistics and digital media. In the current 5.0 era, digital literacy skills are very important for students, not only for learning but also for overcoming problems they may encounter in the workplace (Wati et al., 2023).

It is crucial to create a responsive and adaptive education system that focuses not only on theoretical knowledge but also on the development of practical skills and soft skills. The skills required in today's job market often differ from those taught in educational institutions. One of the main impacts of digital transformation is the need to improve digital skills among the workforce. In the modern workplace, skills such as technological literacy, the ability to use digital devices, and the ability to analyze data are essential (Ilmi, 2024).

Therefore, innovation is needed in the education system that is capable of responding to these challenges, one of which is through Project-Based Learning (PBL). PBL is a learning approach that allows students to gain direct experience in solving real problems through collaborative and exploratory projects. In the context of the digital economy, this method is becoming increasingly important because it helps students develop the adaptive skills needed in technology-based industries. Through PBL, students not only learn theory, but also how to apply it in real-world situations, such as creating digital-based solutions and honing critical and innovative thinking skills.

Project-based learning is also an effective strategy for encouraging students to work together in groups and use digital tools for research, project development, and presentations. This learning model also enhances creativity, critical thinking skills, and collaboration skills (Munir & Zumrotus Su'ada, 2024). To improve students' competence in using digital technology to find, evaluate, and use information so that they can improve their academic performance and increase their interest in learning.

Digital literacy is a skill that educators and students must possess, which includes the ability to access, operate, and use digital technology (Septiani, 2024). Digital literacy enables students to become skilled in using various digital tools and applications effectively. Understanding data analytics provides students with the ability to

interpret data to support decision-making. It is emphasized that digital literacy and problem-solving skills are very important for work readiness. Digital skills, such as technological literacy, understanding data analytics, digital financial management, and digital collaboration and communication skills, are essential in facing the rapid changes in today's digital world.

It is crucial to understand the role of digital literacy in optimizing educational practices in the modern era. Digital literacy impacts the learning experiences of both educators and students. From basic skills to critical thinking, several factors must be considered for the successful integration of technology, including the beliefs of educators, access to resources, and professional development. Challenges such as lack of skills, experience, and access hinder the full use of technology to improve learning outcomes. As a result, to improve learning practices and outcomes in the digital age, it is essential to address the gap in digital literacy.

Learners need to be educated in digital economics to manage finances in a digital environment, such as digital payments, online transactions, and personal finance management with digital financial tools and applications. Because in the digital economy, collaboration and communication are often conducted online, students must be able to collaborate in virtual environments, use online collaboration tools, and understand digital communication ethics. Thus, PBL (Project-Based Learning) can serve as a bridge between the worlds of education and industry, ensuring that graduates are prepared to face rapid changes in the digital economy landscape (Yuangga, 2023).

However, the implementation of project-based learning in the digital age still faces various challenges. Some of these challenges are interrelated, such as the need for educators to be prepared to adopt this learning method, limited access to technology in some areas, and the need for a flexible curriculum that is relevant to industrial developments. Therefore, collaboration between the government, educational institutions, and the industrial sector is needed to ensure that PBL (Project-Based Learning) can be implemented effectively and evenly, so that it can be a real solution in preparing the younger generation to face the challenges of the digital economy.

Educational institutions, the government, and the private sector should work together to create an educational ecosystem that is in line with the demands of an increasingly modern era. The government must create policies such as curricula that are capable of responding to every challenge in facing the digital economy by supporting innovation and ensuring equal access to digital infrastructure. With the right adaptation, technology can help inclusive and sustainable economic growth. The existence of ideal education and equality in every field can help the younger generation, especially students, to be able to adapt to the times, especially in the digital era.

METHOD

This study uses the Systematic Literature Review (SLR) method. This method is used to reveal various theories related to the issue being studied. To reach the research conclusions, the literature findings obtained are then used as reference material when discussing the research results (Aji et al., 2023).

The first step is to formulate clear research questions regarding the effectiveness and challenges faced by project-based learning methods in improving students' digital skills for the challenges of the digital economy. Next, a search for relevant literature was conducted using academic databases such as Google Scholar, Scopus, and Sinta. A variety and combination of keywords were used in the search to maximize coverage and ensure that the literature obtained was relevant. These keywords included "Problem Based Learning," "Digital Economy," "Digital Era," and "Students."

After that, the literature was selected and filtered based on certain inclusion and exclusion criteria, such as year of publication, type of research, and relevance to the topics of PBL, PBL challenges, and the digital economy. The next step is the analysis and synthesis of findings, where information from various sources is compiled, compared, and evaluated to gain deeper insights into the effectiveness of PBL in the digital era and the challenges in its implementation

RESULTS AND DISCUSSION

After going through a rigorous selection process, 184 articles related to the keywords used were identified and included, resulting in a total of 45 articles. These articles varied in research design, ranging from case studies, surveys, experiments, to meta-analyses, covering the publication period from 2020 to 2025. A synthesis of several literature sources reveals that one of the main principles of Project-Based Learning (PBL) is active and collaborative learning. In PBL, students are not only passive recipients of information, but they are directly involved in exploring, analyzing, and solving real problems through projects completed individually or in groups. Students are guided from creating a framework, designing processes to achieve results, obtaining and managing the information collected, conducting continuous evaluations, and regularly reviewing what has been done. Students are also guided to assess products and evaluate their quality (Yuliana et al., 2021).

This learning method encourages students to develop critical thinking, communication, and collaboration skills, such as group work, which are very important in the professional world. By collaborating, students can exchange ideas, build solutions together, and improve their interpersonal skills. In addition, educators who can encourage collaborative and interactive learning tend to produce students who are better prepared to face global challenges. Students involved in collaborative projects show significant improvement in communication and collaboration skills. Project-based learning methods also help students develop problem-solving and creativity skills. This

approach creates a more dynamic and meaningful learning environment where students can see how the theories they learn in class can be applied in real-life contexts (Sidik et al., 2024).

In the digital age, technology plays an important role in supporting the successful implementation of PBL. The use of digital technology can enhance learning, improve analytical skills, and familiarize students with the use of technological tools relevant to their field of study (Kusmardiningsih, 2024). Various digital tools such as online learning platforms, artificial intelligence, interactive simulations, and collaborative software enable students to access information more broadly, communicate more efficiently, and develop technology-based solutions. For example, students can use Google Docs to collaborate on projects, YouTube to deepen their understanding of concepts, and design and programming software to create innovative digital products. By utilizing technology, PBL not only increases the effectiveness of learning but also equips students with the digital skills that are needed to face the challenges of the digital economy. Therefore, the integration of technology in PBL is a strategic step in preparing students to face the challenges of a modern, increasingly digitized world of work.

By utilizing technology optimally, PBL not only increases learning effectiveness but also strengthens students' digital skills, which are key assets in an increasingly digitized world of work. Therefore, the implementation of technology in PBL must be strategically designed, ensuring that students are not only passive users but also creators capable of developing technology-based innovations in the context of a growing digital economy.

Although Project-Based Learning (PBL) has been proven effective in improving student skills in the digital age, its implementation still faces various challenges. Some of the main challenges include limitations in the curriculum, education policies, the readiness of educators, and a lack of available resources and inadequate infrastructure.

One of the biggest challenges in implementing PBL is the lack of flexibility in the curriculum, such as limited availability of human resources, facilities, and budget. A large number of qualified educators and adequate classrooms are needed, as well as a curriculum that meets the requirements of the current digital economy. Inconsistent implementation of the curriculum in each region is a serious challenge. The same curriculum may be implemented differently in each region, resulting in inconsistent and difficult-to-evaluate outcomes. The curriculum must be adaptable and flexible to meet the needs of the modern workplace. The curriculum is expected to adopt technology for effective and efficient use to aid the learning process and improve the quality of education.

The reality is that many education systems are still oriented towards theory-based learning and standard test-based evaluation, making it difficult to integrate PBL, which emphasizes exploration, research, and long-term projects. In addition, policies that prioritize test results over processes and practical skills also pose a challenge for schools and universities in widely adopting PBL. The absence of national standards that support PBL also means that the implementation of this method often depends on the initiative of each educational institution, resulting in disparities in its application.

Another significant challenge is the readiness of educators to implement PBL. Not all educators have sufficient understanding or skills in designing and managing project-based learning. PBL requires a different approach from traditional teaching methods, where educators must be able to act as facilitators who guide students in exploring problems, finding solutions, and applying concepts independently. However, many educators have not received adequate training in using project-based learning strategies, especially in utilizing digital technology as a tool. This lack of training and professional support causes many educators to find it difficult to adapt PBL, both in terms of project planning, monitoring student progress, and evaluating learning outcomes.

Effective implementation of PBL also requires sufficient resources and supporting infrastructure, especially in the context of the digital economy. These challenges often arise in schools with limited technological facilities, such as lack of access to computers, educational software, or stable internet connections. In addition, PBL often requires adequate materials, laboratories, or collaborative workspaces for students to develop projects optimally. In many areas, especially in remote areas or those with limited budgets and access to technological resources, this is a major challenge in implementing PBL.

Furthermore, not all institutions have a learning management system (LMS) that enables digital project implementation, making it difficult for students to access materials, share documents, or communicate with their teammates. Without supporting infrastructure, the effectiveness of PBL can be reduced, especially when the designed project requires access to the latest technology such as big data, artificial intelligence, or virtual reality-based simulations.

The implementation of PBL cannot rely solely on educational institutions, but also requires support from various stakeholders, including the government, industry, and the educational community. The government needs to design policies that support PBL, such as incentives for schools that implement this method or collaboration programs with the digital industry. In addition, there should be fair and objective curriculum evaluations to determine whether the curriculum is effective and in line with educational objectives (Lai et al., 2024). Meanwhile, the involvement of industry is crucial to ensure that the projects undertaken by students are relevant to the needs of the workplace. Companies can act as mentors or partners in PBL programs, providing real challenges to be solved, as well as opening up internship or job opportunities for graduates who have been trained in this learning method.

CONCLUSION

Based PBL (Project-Based Learning) has been consistently proven to encourage active and meaningful learning by connecting theory to real-world practice. Through projects that require the application of digital concepts, students are more motivated to master the material and develop problem-solving skills relevant to today's digital economy challenges. In addition to improving critical thinking skills, PBL also facilitates the development of students' creativity.

In each stage of the project, from planning and execution to presentation, students are encouraged to innovate, experiment with various digital tools and platforms, and adapt their solutions based on feedback. Digital communication and collaboration are key skills that grow through PBL. The use of online collaborative tools, virtual group discussions, and multimedia presentations not only improve technical skills but also familiarize students with working in teams.

The implementation of PBL is greatly influenced by the flexibility of the curriculum and education policies. An overly rigid curriculum hinders project integration, so policies that explicitly support a project-based approach and provide space for educators to innovate in designing learning experiences are needed. The readiness of educators plays a crucial role in the implementation of PBL.

The review results indicate a need for ongoing training for educators, not only in the technical aspects of technology use, but also in project instructional design, authentic assessment, and guiding students' critical thinking processes. Technology infrastructure and access to resources remain significant challenges. Disparities in internet access, device availability, and adequate Learning Management System (LMS) support must be addressed to ensure that all students can participate equally and reap the full benefits of PBL.

Collaboration between stakeholders, including the government, educational institutions, and industry, is key to ensuring the relevance of projects to the needs of the world of work. Support from the industrial sector in the form of mentoring, real-world case studies, and infrastructure funding enriches the learning experience and prepares graduates to compete in the global digital economy.

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