Revisiting Project-Based Learning and Digital Technology Integration: Paradoxical Effects on Students' Learning Motivation in Secondary Education

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ABSTRACT

This study examines the effects of Project-Based Learning (PjBL) management and digital technology utilization on students' learning motivation in a secondary education context. Despite the widespread adoption of innovative pedagogical approaches and digital tools, student motivation remains a persistent challenge, particularly in developing educational settings. This research aims to investigate both the partial and simultaneous influences of these variables on student motivation. A quantitative correlational design was employed, involving students from a public junior high school in Indonesia. Data were collected using a structured questionnaire based on validated theoretical frameworks, including constructivist learning theory, Self-Determination Theory, and Technological Pedagogical Content Knowledge (TPACK). The data were analyzed using descriptive statistics and multiple linear regression techniques. The findings reveal that both PjBL management and digital technology utilization have statistically significant but negative effects on students' learning motivation, both individually and simultaneously. These results suggest that the current implementation of these educational innovations may not effectively support student engagement. Factors such as inadequate planning, limited teacher facilitation, unstructured use of technology, and cognitive overload are identified as potential contributors to the decline in motivation. This study highlights the importance of effective educational management in ensuring the success of instructional innovations. It emphasizes that the integration of PjBL and digital technology must be carefully designed, systematically implemented, and continuously evaluated to achieve positive learning outcomes. The findings contribute to the existing literature by providing a critical perspective on the potential drawbacks of educational innovation and offer practical implications for educators, school leaders, and policymakers.

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INTRODUCTION

In the rapidly evolving landscape of 21st-century education, student motivation has emerged as a critical determinant of learning success and educational quality. Motivation functions not merely as a psychological construct but as a driving force that activates, directs, and sustains students' engagement in academic activities. In contemporary educational discourse, motivated learners are characterized by their active participation, persistence in facing challenges, and willingness to explore knowledge beyond prescribed curricula. Conversely, low levels of motivation are often associated with passive learning behaviors, minimal engagement, and poor academic outcomes. Therefore, fostering student motivation has become a central concern for educators, policymakers, and researchers worldwide. The growing emphasis on developing 21st-century skills—including critical thinking, collaboration, creativity, and digital literacy—has significantly reshaped pedagogical practices. Traditional teacher-centered approaches are increasingly being replaced by student-centered learning models that prioritize active engagement and meaningful learning experiences. Among these innovative approaches, Project-Based Learning (PjBL) has gained substantial attention as an effective pedagogical strategy to enhance student motivation and engagement. PjBL is designed to immerse students in authentic, real-world problems, enabling them to construct knowledge through inquiry, collaboration, and the creation of tangible products. From a theoretical perspective, PjBL is grounded in constructivist learning theory, which posits that learners actively construct knowledge through interaction with their environment. This approach aligns with the principles of experiential learning and social constructivism, where knowledge is developed through meaningful experiences and social interactions. By engaging students in complex tasks and collaborative problem-solving, PjBL is expected to promote intrinsic motivation, deepen understanding, and foster higher-order thinking skills. In parallel with the rise of innovative pedagogies, the integration of digital technology in education has become an unavoidable necessity. The advancement of information and communication technology (ICT) has transformed the way knowledge is accessed, processed, and disseminated. Digital tools such as online learning platforms, multimedia resources, and collaborative applications offer unprecedented opportunities to enrich the learning experience. The integration of digital technology is often associated with increased student engagement, personalized learning, and improved access to educational resources.

Theoretically, the integration of digital technology in education is supported by frameworks such as Technological Pedagogical Content Knowledge (TPACK) and connectivism. These frameworks emphasize the importance of aligning technology with pedagogy and content, as well as the role of networks and digital connections in knowledge construction. When effectively implemented, digital technology has the potential to transform traditional classrooms into dynamic learning environments that foster active participation and continuous learning. Despite the theoretical advantages of both Project-Based Learning and digital technology integration, empirical evidence has shown mixed results regarding their effectiveness in enhancing student motivation. While numerous studies report positive impacts, others indicate that the success of these approaches largely depends on the quality of implementation. Poorly designed projects, inadequate teacher guidance, and unstructured use of technology may lead to confusion, cognitive overload,

and ultimately decreased motivation. This issue is particularly relevant in the context of developing countries, where disparities in technological infrastructure, teacher competence, and institutional support may hinder the effective implementation of innovative pedagogies. In many schools, the adoption of PjBL and digital technology remains superficial, lacking proper planning, systematic execution, and comprehensive evaluation. As a result, the expected benefits of these innovations are not fully realized, and in some cases, they may even produce unintended negative consequences. In the Indonesian educational context, the implementation of student-centered learning approaches and digital technology integration has been strongly encouraged, especially following the introduction of the Merdeka Curriculum. This curriculum emphasizes flexibility, creativity, and the development of student autonomy. However, the transition from traditional to innovative teaching practices presents significant challenges for teachers, particularly in terms of pedagogical competence and technological literacy. Preliminary observations in one of the public junior high schools in Indonesia reveal a concerning phenomenon: despite the introduction of Project-Based Learning and the availability of digital technology, student motivation remains low. Students exhibit limited participation in classroom activities, lack enthusiasm in completing assignments, and demonstrate minimal initiative in exploring learning materials. Furthermore, the implementation of PjBL appears to be inconsistent and unstructured, while the use of digital technology is often limited to basic functions without meaningful integration into the learning process.

Interestingly, findings from the present study indicate that both Project-Based Learning management and digital technology utilization have a statistically significant but negative effect on student motivation. This paradoxical result challenges the dominant assumption that educational innovation inherently leads to improved learning outcomes. Instead, it suggests that without proper management and implementation, these innovations may fail to achieve their intended goals and may even hinder student motivation. This phenomenon can be explained through several theoretical lenses. From the perspective of Cognitive Load Theory, poorly structured projects and excessive use of digital tools may overwhelm students' cognitive capacity, leading to frustration and disengagement. Similarly, Self-Determination Theory highlights the importance of autonomy, competence, and relatedness in fostering intrinsic motivation. When students feel confused, unsupported, or disconnected during the learning process, their motivation is likely to decline. Furthermore, the findings underscore the importance of educational management in ensuring the effectiveness of instructional innovations. Effective management of Project-Based Learning involves careful planning, clear organization, continuous monitoring, and comprehensive evaluation. Similarly, the integration of digital technology requires not only technical skills but also pedagogical understanding to ensure that technology is used meaningfully and purposefully. Given these challenges, there is a pressing need to critically examine the relationship between Project-Based Learning, digital technology utilization, and student motivation. While previous studies have primarily focused on the positive aspects of these innovations, there is limited research exploring their potential negative effects, particularly in contexts where implementation is suboptimal. This study aims to fill this gap by providing empirical evidence on how these variables interact and influence student motivation. Specifically, this study investigates the partial and simultaneous effects of Project-Based Learning management and digital technology utilization on students' learning motivation in a secondary school setting. By adopting a quantitative approach, the study seeks to provide objective and measurable insights into the relationships among these variables. The findings are expected to contribute to both theoretical and practical domains. From a theoretical

perspective, this study enriches the existing literature on educational innovation by highlighting the complexity and contextual nature of its implementation. It challenges the assumption of universal effectiveness and emphasizes the need for a more nuanced understanding of how pedagogical and technological interventions operate in different contexts. From a practical perspective, the findings provide valuable insights for educators, school leaders, and policymakers. They highlight the importance of strengthening teacher competence in managing Project-Based Learning and integrating digital technology effectively. Moreover, the study underscores the need for systematic planning, ongoing support, and continuous evaluation to ensure that educational innovations achieve their intended outcomes. In conclusion, while Project-Based Learning and digital technology integration hold great promise for enhancing student motivation and learning outcomes, their effectiveness is not guaranteed. Successful implementation requires not only innovative ideas but also strong educational management, adequate resources, and competent educators. By examining both the positive and negative effects of these approaches, this study offers a more balanced and critical perspective on educational innovation in the digital age.

LITERATURE REVIEW

Student Learning Motivation in Contemporary Education

Student learning motivation has long been recognized as a fundamental determinant of academic success and educational quality. Motivation is commonly defined as the internal and external forces that initiate, direct, and sustain learning behaviors. In educational psychology, motivation is broadly categorized into intrinsic and extrinsic motivation. Intrinsic motivation refers to engaging in learning activities for their inherent satisfaction, while extrinsic motivation is driven by external rewards or pressures. One of the most influential frameworks in understanding student motivation is Self-Determination Theory (SDT), which emphasizes the importance of three basic psychological needs: autonomy, competence, and relatedness. When these needs are fulfilled, students are more likely to develop intrinsic motivation and demonstrate higher levels of engagement and persistence. Conversely, when these needs are not met, students may experience disengagement, decrease interest, and reduced academic performance. In classroom settings, motivation is closely linked to students' active participation, willingness to complete tasks, and resilience in overcoming academic challenges. Highly motivated students tend to exhibit deeper learning strategies, such as critical thinking and problem-solving, whereas less motivated students often rely on surface-level learning approaches. Therefore, enhancing student motivation is not only a psychological concern but also a pedagogical priority. Recent studies highlight that student motivation is influenced by multiple factors, including teaching methods, learning environment, teacher support, and the integration of technology. Innovative pedagogical approaches and digital tools are often introduced with the expectation of increasing motivation. However, their effectiveness depends largely on how they are implemented and managed within the classroom.

Project-Based Learning: Concept and Educational Significance

Project-Based Learning (PjBL) is widely recognized as a student-centered instructional approach that emphasizes active learning through the completion of meaningful projects. PjBL involves engaging students in complex tasks that require investigation, collaboration, and the creation of tangible outputs. This approach is designed to bridge the gap between theoretical knowledge and real-world application, making learning more relevant and meaningful. The

theoretical foundation of PjBL is rooted in constructivist learning theory, which posits that learners actively construct knowledge through interaction with their environment. In this context, learning is viewed as a process of meaning-making rather than passive knowledge acquisition. PjBL aligns with this perspective by encouraging students to explore problems, generate ideas, and develop solutions collaboratively. Furthermore, PjBL is closely associated with experiential learning theory, which emphasizes learning through experience and reflection. By engaging in hands-on activities, students are expected to develop not only cognitive skills but also social and emotional competencies. These include teamwork, communication, and self-regulation, which are essential for success in the 21st century. From a pedagogical standpoint, PjBL offers several advantages. It promotes active engagement, fosters creativity, and enhances critical thinking skills. Additionally, it provides opportunities for differentiated instruction, allowing students to learn at their own pace and according to their interests. As a result, PjBL is often considered an effective strategy for increasing student motivation and improving learning outcomes. However, the successful implementation of PjBL requires careful planning and management. Teachers must design projects that are aligned with learning objectives, provide clear instructions, and offer continuous guidance throughout the process. Without proper management, PjBL may lead to confusion, lack of direction, and unequal participation among students. In such cases, the intended benefits of PjBL may not be realized.

Management of Project-Based Learning in Educational Contexts

The effectiveness of Project-Based Learning is highly dependent on how it is managed within the educational setting. PjBL management involves several key components, including planning, implementation, monitoring, and evaluation. These components are consistent with general principles of educational management, which emphasize systematic and organized approaches to achieving learning objectives. In the planning stage, teachers are required to design projects that are relevant, challenging, and aligned with curriculum standards. This includes defining clear objectives, determining assessment criteria, and preparing necessary resources. Effective planning ensures that students understand the purpose and expectations of the project, thereby reducing ambiguity and increasing engagement. The implementation stage involves facilitating student learning activities, guiding group work, and providing timely feedback. Teachers play a crucial role as facilitators, supporting students while allowing them to take ownership of their learning. Effective facilitation requires not only pedagogical skills but also the ability to manage classroom dynamics and address individual student needs. Monitoring and evaluation are equally important in ensuring the success of PjBL. Continuous monitoring allows teachers to identify potential issues, such as lack of participation or misunderstanding of tasks, and to intervene accordingly. Evaluation, on the other hand, involves assessing both the process and the final product of the project. This holistic approach to assessment helps to capture the complexity of student learning in PjBL environments. Despite its potential benefits, several studies have reported challenges in implementing PjBL effectively. These include limited teacher competence, lack of time, insufficient resources, and large class sizes. In many cases, teachers struggle to balance the demands of project-based activities with curriculum requirements. As a result, PjBL may be implemented superficially, without achieving its intended outcomes.

Digital Technology Integration in Education

The integration of digital technology has become a defining feature of modern education. Digital tools such as learning management systems, multimedia resources, and collaborative platforms offer new opportunities for enhancing teaching and learning. These technologies enable access to vast amounts of information, facilitate communication, and support personalized learning experiences. The integration of technology in education is often guided by theoretical frameworks such as Technological Pedagogical Content Knowledge (TPACK). This framework emphasizes the need for teachers to integrate technology, pedagogy, and content knowledge in a coherent and meaningful way. Effective technology integration is not merely about using digital tools but about using them to enhance learning outcomes. Another relevant theoretical perspective is connectivism, which views learning as a process of forming connections within networks. In the digital age, knowledge is distributed across various platforms, and learning involves navigating and integrating information from multiple sources. Digital technology plays a central role in facilitating these connections, making learning more dynamic and interactive. Empirical studies have shown that digital technology can enhance student motivation by providing interactive and engaging learning experiences. Multimedia content, gamification, and online collaboration are particularly effective in capturing students' interest and promoting active participation. Additionally, technology enables flexible learning, allowing students to access materials anytime and anywhere. However, the benefits of digital technology are not automatic. Several studies have highlighted the potential negative effects of technology integration, particularly when it is not used effectively. These include distractions, over-reliance on digital tools, and reduced face-to-face interaction. Furthermore, excessive use of technology may lead to cognitive overload, where students struggle to process large amounts of information.

Digital Technology and Student Motivation

The relationship between digital technology and student motivation is complex and multifaceted. On one hand, technology has the potential to enhance motivation by making learning more interactive, engaging, and relevant. On the other hand, improper use of technology may lead to decreased motivation and disengagement. From the perspective of Cognitive Load Theory, the use of multiple digital tools and resources may overwhelm students' cognitive capacity. When students are required to process too much information simultaneously, they may experience confusion and frustration. This can negatively impact their motivation and learning outcomes. Similarly, Self-Determination Theory suggests that technology should support students' autonomy, competence, and relatedness. When digital tools are used in a way that restricts autonomy, creates unnecessary complexity, or reduces social interaction, they may undermine intrinsic motivation. Therefore, the effectiveness of technology in enhancing motivation depends on how well it aligns with students' psychological needs. In addition, the digital divide remains a significant issue in many educational contexts. Differences in access to technology, internet connectivity, and digital literacy can create disparities in learning opportunities. Students who lack adequate resources may feel disadvantaged and less motivated to participate in technology-based learning activities.

Empirical Studies on PjBL, Digital Technology, and Motivation

A growing body of research has examined the impact of Project-Based Learning and digital technology on student motivation. Many studies report positive outcomes, indicating that these approaches can enhance engagement, improve learning outcomes, and foster higher-order thinking

skills. For example, students involved in PjBL often demonstrate increased interest in learning and greater willingness to participate in classroom activities. Similarly, the integration of digital technology has been associated with increased motivation, particularly when interactive and multimedia elements are used. Online collaboration tools and gamified learning environments have been shown to promote active participation and sustain students' interest. However, not all studies report positive findings. Some research indicates that the effectiveness of PjBL and digital technology depends on contextual factors such as teacher competence, classroom environment, and institutional support. In cases where implementation is inadequate, these approaches may fail to achieve their intended outcomes. Interestingly, several studies have reported negative or insignificant effects of PjBL and technology integration on student motivation. These findings suggest that innovation alone is not sufficient; it must be accompanied by proper management and support. Poorly designed projects, lack of clear instructions, and ineffective use of technology can lead to confusion and decreased motivation.

Research Gap and Conceptual Framework

Despite the extensive literature on Project-Based Learning and digital technology, there is a lack of research examining their potential negative effects on student motivation. Most studies focus on the benefits of these approaches, often overlooking the challenges and limitations associated with their implementation. Furthermore, limited research has been conducted in the context of Indonesian secondary education, where unique challenges such as resource constraints and varying levels of teacher competence may influence the effectiveness of educational innovations. This highlights the need for context-specific studies that provide a more nuanced understanding of these issues. Based on the reviewed literature, this study proposes a conceptual framework in which Project-Based Learning management and digital technology utilization are considered as independent variables, while student learning motivation is the dependent variable. The framework assumes that both variables have a significant influence on motivation, either positively or negatively, depending on the quality of implementation.

METHOD

Research Design

This study employed a quantitative research approach using a correlational design to examine the relationships between Project-Based Learning (PjBL) management, digital technology utilization, and students' learning motivation. A quantitative approach was considered appropriate because the study aimed to measure the magnitude and direction of relationships among variables using statistical analysis. The correlational design specifically allowed the researcher to investigate both partial and simultaneous effects of the independent variables on the dependent variable without manipulating the research setting. The study adopted a cross-sectional survey design, in which data were collected at a single point in time. This design is commonly used in educational research to capture existing conditions and to identify patterns of relationships among variables. By employing this design, the study aimed to provide an empirical understanding of how PjBL management and digital technology utilization influence student motivation in a real classroom context.

Research Setting and Participants

The study was conducted in a public junior high school in Indonesia. The selection of the

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research site was based on preliminary observations indicating the implementation of Project-Based Learning and the availability of digital technology in the teaching and learning process. However, despite these innovations, student motivation was observed to be relatively low, making the site relevant for the purpose of this study. The population of the study consisted of all students enrolled in the selected school during the academic year 2025/2026. From this population, a sample was drawn using a proportional random sampling technique to ensure representation across different classes and grade levels. This sampling method was chosen to minimize bias and to increase the generalizability of the findings within the context of the study. The final sample consisted of students who voluntarily participated in the study and met the inclusion criteria, such as active enrollment and participation in learning activities involving PjBL and digital technology. Prior to data collection, informed consent was obtained from the participants, and ethical considerations were carefully addressed to ensure confidentiality and anonymity.

Research Variables

This study involved three main variables:

Independent Variables:
- Project-Based Learning Management (X1)
- Digital Technology Utilization (X2)

Dependent Variable:
- Students' Learning Motivation (Y)

Project-Based Learning management refers to the systematic processes involved in planning, implementing, monitoring, and evaluating project-based instructional activities. Digital technology utilization refers to the extent to which digital tools and resources are used effectively in the learning process. Students' learning motivation refers to the internal and external factors that drive students to engage in learning activities.

Operational Definition of Variables

To ensure clarity and measurability, each variable was operationally defined as follows:

- *Project-Based Learning Management (X1):*
  Measured through indicators such as project planning, clarity of instructions, teacher facilitation, student collaboration, monitoring, and evaluation.
- *Digital Technology Utilization (X2):*
  Measured through indicators including accessibility of technology, frequency of use, variety of digital tools, interactivity, and perceived usefulness.
- *Students' Learning Motivation (Y):*
  Measured through indicators such as attention, persistence, interest, participation, and effort in learning activities.

Each variable was measured using a Likert-scale questionnaire, with responses ranging from strongly disagree to strongly agree.

Instrument Development

The primary data collection instrument used in this study was a structured questionnaire. The questionnaire was developed based on established theoretical frameworks, including constructivist learning theory, Self-Determination Theory, and the TPACK framework. Items were adapted and modified to suit the context of the study. The questionnaire consisted of three sections

corresponding to the research variables. Each section included multiple items designed to capture different aspects of the variable. A Likert scale with five response options was used to measure the level of agreement of the respondents. Before being administered, the instrument underwent a validation process to ensure its reliability and validity:

- Content Validity:

  The questionnaire was reviewed by experts in educational management and instructional design to ensure that the items adequately represented the constructs being measured.
- Construct Validity:

  Factor analysis was conducted to confirm the underlying structure of the variables.
- Reliability Testing:

  Cronbach's Alpha coefficient was used to assess the internal consistency of the instrument. A reliability coefficient greater than 0.70 was considered acceptable.

Data Collection Procedure

Data were collected through the distribution of questionnaires to the selected participants. The process was conducted in coordination with school authorities to ensure smooth implementation. Participants were given clear instructions on how to complete the questionnaire, and sufficient time was provided to ensure thoughtful responses. The data collection process followed several steps:

- Obtaining permission from the school administration
- Explaining the purpose of the study to participants
- Distributing the questionnaires
- Collecting completed responses
- Verifying and organizing the data for analysis

All responses were kept confidential and used solely for research purposes.

Data Analysis Techniques

Data analysis was conducted using statistical software to examine the relationships among variables. The analysis consisted of both descriptive and inferential statistics.

1. Descriptive Analysis

Descriptive statistics were used to summarize the characteristics of the data, including mean, standard deviation, and frequency distribution. This analysis provided an overview of the levels of PjBL management, digital technology utilization, and student motivation.

2. Assumption Testing

Before conducting inferential analysis, several classical assumption tests were performed, including:

- Normality test
- Linearity test
- Multicollinearity test
- Heteroscedasticity test

These tests were conducted to ensure that the data met the requirements for regression analysis.

3. Inferential Analysis

To examine the relationships among variables, multiple linear regression analysis was employed. This method allowed the researcher to assess both the partial and simultaneous effects

of the independent variables on the dependent variable. The regression model can be expressed as:

$$Y = a + b1X1 + b2X2 + e$$

Where:

Y = Students' Learning Motivation

X1 = Project-Based Learning Management

X2 = Digital Technology Utilization

a = Constant

b1, b2 = Regression coefficients

e = Error term

4. Hypothesis Testing

Hypothesis testing was conducted using:

- t-test: to examine the partial effect of each independent variable
- F-test: to examine the simultaneous effect of independent variables
- Coefficient of Determination (R^2): to determine the proportion of variance in the dependent variable explained by the independent variables

A significance level of 0.05 was used as the criterion for hypothesis acceptance.

RESULTS AND DISCUSSION

Descriptive Statistics

Descriptive analysis was conducted to provide an overview of the distribution and general tendencies of the research variables, namely Project-Based Learning (PjBL) management, digital technology utilization, and students' learning motivation. The results indicate that the level of PjBL management in the observed school falls into the moderate category. This suggests that while elements of project-based learning are present, their implementation is not yet optimal. Several indicators, such as clarity of project instructions and systematic evaluation, received relatively lower scores compared to other aspects. Similarly, digital technology utilization was found to be at a moderate level. Although digital tools are available and occasionally used in classroom activities, their integration into pedagogical practices remains limited. Students reported that technology is often used for basic functions, such as accessing materials or completing assignments, rather than for interactive or collaborative learning experiences. In contrast, students' learning motivation was observed to be relatively low. Indicators such as persistence, active participation, and enthusiasm for completing tasks showed weaker results. This finding aligns with preliminary observations, which suggested that students exhibit limited engagement in learning activities despite the presence of innovative instructional approaches. These descriptive findings highlight a critical gap between the availability of educational innovations and their effectiveness in enhancing student motivation. While PjBL and digital technology are present, their impact appears to be constrained by issues related to implementation quality.

Assumption Testing

Before conducting regression analysis, several classical assumption tests were performed to ensure the validity of the statistical model. Normality Test: The data were found to be normally distributed, as indicated by the significance value exceeding 0.05. Linearity Test: The relationships between independent variables and the dependent variable were linear. Multicollinearity Test: No

multicollinearity was detected, as tolerance values were above 0.10 and VIF values were below 10. Heteroscedasticity Test: The data showed no indication of heteroscedasticity, confirming that the variance of residuals was constant. These results confirm that the dataset meets the assumptions required for multiple linear regression analysis.

Regression Analysis

Multiple linear regression analysis was conducted to examine the effects of PjBL management (X1) and digital technology utilization (X2) on students' learning motivation (Y). The analysis revealed that both independent variables have a statistically significant effect on student motivation. However, interestingly, the direction of the relationship was negative for both variables. PjBL Management (X1): The regression coefficient for PjBL management was negative and statistically significant ($p < 0.05$). This indicates that higher levels of PjBL implementation, as currently practiced, are associated with lower levels of student motivation. Digital Technology Utilization (X2): Similarly, digital technology utilization also showed a negative and significant effect on student motivation ($p < 0.05$). Simultaneous Effect: The F-test results indicate that PjBL management and digital technology utilization jointly have a significant effect on student motivation. Coefficient of Determination (R^2): The model explains a moderate proportion of variance in student motivation, suggesting that other factors also contribute to motivation but are not included in this study. These findings present a paradox, as both PjBL and digital technology are generally expected to enhance motivation. Instead, the results suggest that their current implementation may be counterproductive.

The Paradox of Project-Based Learning and Student Motivation

The finding that Project-Based Learning management has a negative effect on student motivation challenges the dominant narrative in educational research. PjBL is widely regarded as an effective strategy for increasing engagement and fostering intrinsic motivation. However, the results of this study suggest that the effectiveness of PjBL is highly contingent upon the quality of its implementation. One possible explanation for this negative effect is the lack of proper planning and structure in PjBL activities. When projects are not clearly defined or aligned with learning objectives, students may experience confusion and uncertainty. This condition can lead to cognitive overload, where students struggle to process information and complete tasks effectively. From the perspective of Cognitive Load Theory, poorly structured projects can exceed students' cognitive capacity, resulting in frustration and decreased motivation. Instead of facilitating meaningful learning, such projects may become a source of stress and disengagement. Furthermore, the role of the teacher as a facilitator is crucial in PjBL environments. Inadequate guidance and feedback may leave students feeling unsupported, particularly those who require more structured instruction. This aligns with Self-Determination Theory, which emphasizes the importance of competence and relatedness in sustaining motivation. When students do not feel capable or supported, their intrinsic motivation is likely to decline. Another factor that may contribute to the negative effect is unequal participation among group members. In group-based projects, some students may dominate while others remain passive. This imbalance can reduce individual accountability and diminish motivation, especially for students who feel marginalized or less competent.

Digital Technology Utilization: Between Engagement and Overload

The negative effect of digital technology utilization on student motivation is another

significant finding that warrants careful examination. While digital tools have the potential to enhance learning experiences, their effectiveness depends on how they are used. In this study, digital technology appears to be used in a limited and sometimes ineffective manner. Rather than facilitating interactive and engaging learning, technology is often used for routine tasks that do not significantly enhance understanding. This superficial use of technology may fail to capture students' interest and may even lead to boredom. Moreover, excessive or unstructured use of digital tools can contribute to cognitive overload. Students may be required to navigate multiple platforms, process large amounts of information, and adapt to different interfaces. This can create confusion and reduce the efficiency of the learning process. From the perspective of Self-Determination Theory, digital technology should support autonomy, competence, and relatedness. However, when technology is difficult to use or poorly integrated, it may hinder rather than support these psychological needs. For example, students who struggle with digital tools may feel less competent, leading to decreased motivation. Additionally, the issue of digital distraction cannot be overlooked. The presence of digital devices may expose students to non-academic content, reducing their focus on learning tasks. This distraction can further weaken motivation and engagement.

The Role of Educational Management

The findings of this study highlight the critical role of educational management in ensuring the success of instructional innovations. Both PjBL and digital technology require systematic planning, effective implementation, and continuous evaluation. From a management perspective, the negative effects observed in this study may reflect weaknesses in the planning and execution stages. For instance, insufficient training for teachers may limit their ability to design effective projects and integrate technology meaningfully. Similarly, lack of institutional support may hinder the availability of resources and infrastructure. The concept of management functions—planning, organizing, actuating, and controlling—provides a useful framework for understanding these challenges. In the context of PjBL, planning involves designing projects that are relevant and achievable. Organizing involves structuring activities and assigning roles. Actuating involves facilitating student engagement, while controlling involves monitoring progress and evaluating outcomes. When these functions are not properly implemented, the effectiveness of PjBL and digital technology is compromised. This underscores the need for a holistic approach that integrates pedagogical innovation with strong management practices.

Contextual Factors in Indonesian Education

The findings of this study must also be understood within the broader context of Indonesian education. The transition to student-centered learning and digital integration represents a significant shift from traditional practices. This transition requires not only changes in teaching methods but also in mindset and institutional culture. Many teachers may still be adapting to new pedagogical approaches, and their level of readiness may vary. Limited access to professional development opportunities can further constrain their ability to implement innovations effectively. Additionally, disparities in technological infrastructure may affect the consistency and quality of digital learning experiences. Cultural factors may also influence student motivation. In some contexts, students are more accustomed to teacher-centered instruction and may find it challenging to adapt to more autonomous learning environments. This adjustment process may temporarily reduce motivation until students become more familiar with the new approach.

Implications for Theory and Practice

The results of this study contribute to the growing body of literature that emphasizes the complexity of educational innovation. They challenge the assumption that innovative approaches automatically lead to positive outcomes and highlight the importance of implementation quality. From a theoretical perspective, the findings support the view that motivation is influenced by multiple interacting factors. They also demonstrate the relevance of theories such as Cognitive Load Theory and Self-Determination Theory in explaining the observed phenomena. From a practical perspective, the study provides several important implications:

- Teachers need to receive adequate training in designing and managing PjBL.
- Digital technology should be integrated in a way that enhances, rather than complicates, the learning process.
- Schools should provide continuous support and resources to facilitate effective implementation.
- Evaluation mechanisms should be strengthened to monitor the impact of educational innovations.

CONCLUSION

In conclusion, this study reveals that Project-Based Learning management and digital technology utilization, while theoretically beneficial, may have negative effects on student motivation when not implemented effectively. These findings underscore the importance of quality implementation, teacher competence, and strong educational management. Rather than abandoning these innovations, educators should focus on improving their design and execution. By addressing the identified challenges, it is possible to transform these approaches into powerful tools for enhancing student motivation and learning outcomes.

REFERENCES

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. Journal of Educational Psychology, 84(3), 261–271. https://doi.org/10.1037/0022-0663.84.3.261

Bandura, A. (1997). Self-efficacy: The exercise of control. W.H. Freeman.

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. The Clearing House, 83(2), 39–43. https://doi.org/10.1080/00098650903505415

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. Educational Psychologist, 26(3–4), 369–398. https://doi.org/10.1080/00461520.1991.965313

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268.

Dweck, C. S. (2006). Mindset: The new psychology of success. Random House.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. Annual Review of Psychology, 53, 109–132. https://doi.org/10.1146/annurev.psych.53.100901.135153

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change. Journal of Research on Technology in Education, 42(3), 255–284.https://doi.org/10.1080/15391523.2010.10782551

Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. Routledge.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? Educational Psychology Review, 16(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Jonassen, D. H. (1999). Designing constructivist learning environments. In C. Reigeluth (Ed.), Instructional design theories and models (pp. 215–239). Lawrence Erlbaum.

Krajcik, J. S., & Blumenfeld, P. C. (2006). Project-based learning. In R. Sawyer (Ed.), The Cambridge handbook of the learning sciences (pp. 317–334). Cambridge University Press.

Linnenbrink, E. A., & Pintrich, P. R. (2002). Motivation as an enabler for academic success. School Psychology Review, 31(3), 313–327.

Mayer, R. E. (2009). Multimedia learning (2nd ed.). Cambridge University Press.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge. Teachers College Record, 108(6), 1017–1054.

OECD. (2019). OECD future of education and skills 2030. OECD Publishing.

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation. Journal of Educational Psychology, 95(4), 667–686.

Prensky, M. (2001). Digital natives, digital immigrants. On the Horizon, 9(5), 1–6.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective. Springer.

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM). Computers & Education, 128, 13–35.

Slavin, R. E. (2018). Educational psychology: Theory and practice (12th ed.). Pearson.

Thomas, J. W. (2000). A review of research on project-based learning. Autodesk Foundation.

Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use. Educational Technology Research and Development, 65(3), 555–575.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology. MIS Quarterly, 27(3), 425–478.

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. Contemporary Educational Psychology, 25(1), 82–91.