A THEORETICAL EXPLORATION OF THE RELATIONSHIP BETWEEN STUDENT SELF-EFFICACY AND BLENDED LEARNING ENVIRONMENT IN ZHEJIANG VOCATIONAL COLLEGES

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ARTICLE HISTORY
Received: 13 March 2026 **Revised:** 22 March 2026 **Published:** 27 March 2026

ABSTRACT

Against the background of global educational digitalization, blended learning has become the core model to boost the high-quality development of vocational education. Student self-efficacy serves as a critical psychological variable connecting technological application and learning effectiveness, which directly affects vocational students' skill acquisition and career development. Taking vocational colleges in Zhejiang as research subjects, this study conducts a systematic literature review, and integrates classic self-efficacy theories and empirical evidence to redefine the connotations of student self-efficacy and blended learning environment in vocational education scenarios. The study identifies the core influencing factors and multi-level formation mechanism of blended learning environment on student self-efficacy in the context of Zhejiang's industry-education integration and post-course-competition-certificate system, and clarifies the theoretical contributions and practical implications of the research. It enriches the environment–psychology interaction framework in vocational education, and provides targeted strategies for optimizing blended learning design and improving student self-efficacy in Zhejiang's vocational colleges.

Keywords: Zhejiang Vocational Colleges, Blended Learning Environment, Student Self-Efficacy, Theoretical Relationship, Vocational Education

CITATION INFORMATION: Xiao, L. (2026). A Theoretical Exploration of the Relationship Between Student Self-Efficacy and Blended Learning Environment in Zhejiang Vocational Colleges. *Procedia of Multidisciplinary Research, 4*(3), 62.

INTRODUCTION

In the process of digital education transformation, blended learning has shifted from a supplementary teaching method to a core support for the high-quality development of vocational education. For vocational colleges, blended learning integrates online knowledge delivery and offline practical training, forming a complete system of online preview, offline practice and industry-education feedback, which effectively links school education with enterprise post requirements. As a pioneer in digital economy and vocational education reform, Zhejiang has built a mature blended learning ecosystem supported by the Digital Zhejiang strategy. By April 2025, all 49 vocational colleges in the province have carried out blended teaching practices. Eighteen provincial virtual simulation centers and the Zheliban platform serve more than 2 million students, and 68% of courses have integrated the post-course-competition-certificate system. In the transformation from scale expansion to quality improvement, vocational colleges in Zhejiang still face problems such as unbalanced technology application, insufficient connection between online learning and offline skill training, and uneven development of students' professional competence, which are closely related to the insufficient development of student self-efficacy. Student self-efficacy (SSE) in vocational colleges refers to students' subjective judgment of their ability to complete learning tasks and overcome difficulties in blended learning environments. Rooted in Bandura's social cognitive theory (Bandura, 1997), this construct focuses on students' confidence in digital tool operation, professional skill mastery and job adaptation in vocational scenarios. Students with high self-efficacy tend to take the initiative to use learning resources and adapt to industrial standards, while those with low self-efficacy are prone to fall into a negative cycle of learning avoidance and employment pressure.

Existing research often equates vocational SSE with general academic self-efficacy, ignoring the industry-education integration and skill-oriented characteristics that define vocational education as a distinct field. International large-scale assessment studies have confirmed the stable correlation between learning environment support and students' digital learning confidence, yet such evidence remains poorly localized and poorly integrated into vocational education research in China, especially within the mature blended learning ecosystem of Zhejiang. Empirical studies on peer assessment in project-based learning further reveal that interactive learning activities shape students' evaluative competence and self-perceived ability, offering supplementary support for understanding self-efficacy formation in skill-oriented learning scenarios (Badea & Popescu, 2020). Teachers' self-efficacy and emotional exhaustion have also been verified to shape the quality of classroom practice, indirectly mediating students' learning experience and self-efficacy development (Hoogendijk et al., 2023). Recent empirical evidence further extends this dialogue: self-regulated learning (SRL) acts as a critical mediator between blended environment perception and academic success in vocational education, with SSE as a foundational antecedent of autonomous learning behaviors (Cigdem & Oncu, 2024). Meanwhile, the Unified Theory of Acceptance and Use of Technology (UTAUT2) confirms that performance expectancy, hedonic motivation, and facilitating conditions collectively shape learners' behavioral intention, which in turn strengthens self-efficacy and learning effectiveness in blended settings (Lv & Li, 2024). Despite these advances, the field still lacks a unified framework that connects blended learning environmental elements to the task-specific self-efficacy of vocational students, and few studies address how localized policy systems and platform infrastructure moderate such relationships. To address these gaps, this study adopts a systematic literature review approach in accordance with PRISMA 2020 and COPE ethical standards. It re-conceptualizes SSE and blended learning environment within the context of vocational education, constructs an integrated interaction framework tailored to Zhejiang's industry-education integration and post-course-competition-certificate system, and verifies the applicability of social cognitive theory, social cognitive career theory, and self-determination theory. The study aims to reveal the formation mechanism, key influencing elements, and

dynamic relationship between blended learning environment and SSE, so as to provide theoretical support and actionable strategies for the high-quality development of blended vocational education in Zhejiang and beyond.

METHODOLOGY

The data sources of this study include English databases such as Web of Science, Scopus, ERIC and ProQuest, as well as the Chinese database CNKI and WANGFANG DATA. The research timeframe is set from 1990 to 2025 to cover both foundational theories and the latest empirical evidence, ensuring the continuity and comprehensiveness of literature tracing. The search strategy adopts precise Boolean combinations for English and Chinese retrieval, with core terms covering vocational college, blended learning environment, student self-efficacy, and supplementary terms including social cognitive theory, self-determination theory, industry-education integration, skill-oriented learning to achieve full coverage of relevant research fields, and all retrieval operations are restricted to topic and abstract fields to ensure the relevance of search results. The inclusion criteria of this study cover peer-reviewed journal articles or high-quality empirical studies with complete research design, samples strictly focused on vocational or technical education fields, clear measurement indicators or systematic theoretical discussion for self-efficacy or blended learning environment, and publications in English or Chinese to ensure the uniformity of research language. Exclusion criteria are set to eliminate low-value literature including editorials, commentaries, conference abstracts without full text, samples deviating from vocational education fields, duplicated published studies, research without clear analytical framework and empirical or theoretical support, so as to improve the overall quality of literature synthesis. Notably, recent systematic reviews of self-regulated learning strategies (SRLS) in higher education blended learning provide methodological references for this study: Luo and Zhou (2024) adopted PRISMA 2020 protocols to synthesize 15 SSCI articles, revealing that resource management, motivational beliefs, and metacognitive strategies dominate SRL research, with quantitative and mixed methods as mainstream designs. This rigorous screening and coding framework informs the present study's literature selection and analytical rigor, while also highlighting the gap between general higher education and vocational education contexts—most SRLS studies overlook the skill-based, industry-linked traits of vocational students, reinforcing the necessity of this localized theoretical exploration.

RESEARCH ON STUDENT SELF-EFFICACY IN VOCATIONAL COLLEGES

Self-efficacy originates from Bandura's social cognitive theory, referring to individuals' subjective judgment of their ability to organize and implement actions to achieve specific goals. On this basis, relevant scholars have expanded the application of self-efficacy to technology learning and career development fields, and formed a relatively complete theoretical system. Social cognitive career theory further extends self-efficacy to career and academic development, emphasizing the interactive relationship among individuals, behaviors and environments (Lent et al., 1994). In vocational education, student self-efficacy has distinctive contextual connotations rooted in the occupational orientation and skill training attributes of vocational education, which are consistent with the task-specific orientation of self-efficacy theoretical research. Meanwhile, domestic early empirical research on academic self-efficacy has laid a foundational support for the localized application of self-efficacy theory in Chinese student groups. 梁宇颂 (2000) conducted an empirical study on 455 college students in Wuhan, confirming that academic self-efficacy has significant gender differences, and there is a reciprocal causal relationship between academic self-efficacy, mastery goals and achievement-oriented attribution. This provides an important empirical reference for the correlation

mechanism between self-efficacy and learning motivation in the Chinese educational context, but it does not involve vocational scenarios or blended environments. This construct is divided into three core dimensions based on the logical correspondence between learning scenarios and vocational education objectives: digital tool application efficacy corresponds to the online learning link of blended learning, professional skill transfer efficacy matches the offline practical training link, and industry-education collaborative learning efficacy connects the school-enterprise interaction link. This division not only conforms to the structural characteristics of self-efficacy measurement proposed by Compeau and Higgins (1995), but also fits the career-oriented development goal of vocational education and the post-course-competition-certificate system construction in Zhejiang vocational colleges. International empirical research represented by IEA ICILS 2018 has confirmed that self-efficacy plays a stable regulatory role in the impact of environmental support on learning behavior, and accumulated learning experience and autonomous learning participation can significantly predict students' digital learning confidence and practical operation ability (Fraillon et al., 2019; Hatlevik et al., 2018). In contrast, domestic research mostly stays in the correlation verification between single environmental factors and self-efficacy, lacking systematic comparison with international research conclusions and contextual adaptation analysis for vocational education. In interactive learning modes such as project-based learning and peer assessment, students' collaborative participation and evaluative practice continuously strengthen their self-efficacy perception. The validity of peer grading in project-based learning scenarios improves gradually with operational experience, and reasonable evaluation mechanisms help stabilize students' self-evaluation cognition (Badea & Popescu, 2020). While these findings highlight the value of interactive practice, most existing studies focus on general education settings and fail to account for the strict skill standards and post-oriented tasks that structure vocational learning. Domestic research has increasingly focused on student self-efficacy in vocational colleges in recent years, exploring influencing factors including teacher support, peer interaction, digital literacy and learning motivation. Teacher emotional support has been shown to positively predict learning engagement through the chain mediation of academic self-efficacy and academic resilience (Guo et al., 2025). Complementary cross-context research demonstrates that perceived teacher support directly strengthens students' ICT self-efficacy and online academic engagement in blended English learning, forming a stable support path for self-efficacy development (Feng et al., 2023). Even so, dominant conceptualizations of student self-efficacy remain detached from vocational specificity, and cross-sectional designs dominate empirical work, making it difficult to reveal the dynamic interaction between the blended learning environment and student self-efficacy over time. Influencing factors of student self-efficacy spread across individual, environmental and institutional levels. Digital literacy and learning motivation at the individual level serve as consistent predictors of student self-efficacy. Teacher support, peer interaction and curriculum adaptability at the environmental level shape self-efficacy through vicarious experience and structured feedback, while teachers' own psychological states shape instructional quality and indirectly regulate the formation of students' self-efficacy (Hoogendijk et al., 2023). Institutional platform construction and industry-education integration lay the resource foundation for self-efficacy development, yet unequal access to high-quality resources creates measurable gaps in self-efficacy levels across student groups and institutions. Empirical evidence from senior high school samples further validates this individual-environment interaction: technological self-efficacy and learning motivation jointly and positively predict self-directed learning ability in blended environments, with explanatory power reaching 67% (Liwanag & Galicia, 2023). This finding bridges secondary and tertiary education research, confirming the universal predictive role of technological self-efficacy and motivation in autonomous learning, while also indicating that vocational college students—with weaker foundational digital literacy—may require more targeted environmental support to activate similar effects.

BLENDED LEARNING ENVIRONMENT IN ZHEJIANG VOCATIONAL COLLEGES

The blended learning environment in vocational education is an integrated scenario integrating online digital learning and offline practical training, with the characteristics of occupation orientation, industry-education integration and skill orientation. It consists of three core components: digital technical support, industrial scenario embedding and skill-oriented task design. Supported by the Digital Zhejiang strategy, vocational colleges in Zhejiang have achieved full coverage of smart campuses and online courses. By 2025, more than 80% of core courses are required to adopt blended teaching. In terms of resource construction, 18 provincial virtual simulation centers and the Zheliban platform realize provincial resource sharing, providing stable digital support for students' autonomous learning. In the field of industry-education integration, colleges cooperate with enterprises to integrate real industrial projects into curriculum teaching, connecting classroom learning with actual post demands. International research consistently identifies school digital infrastructure, standardized teacher instructional support and complete learning management systems as stable factors that influence digital learning quality and student self-efficacy formation, patterns that align closely with the deployment of the Zheliban platform, provincial virtual simulation centers and deep industry-education integration in Zhejiang's vocational colleges. The digital divide stemming from uneven family digital resources and regional economic development directly explains the unbalanced development of self-efficacy among vocational students in Zhejiang, and gaps in access to high-quality blended learning resources between rural colleges and non-"Double High Plan" institutions further deepen disparities in students' mastery experiences and self-efficacy levels. Although the provincial platform system reduces structural barriers, individual differences in digital literacy and technological tolerance still create psychological obstacles that limit the consistent improvement of self-efficacy. These patterns provide important empirical references for analyzing the current status and influencing factors of students' learning confidence in the region (Mirazchiyski, 2025). The blended learning environment has a profound impact on students' learning behavior and self-efficacy. Online modules based on the Zheliban platform provide flexible learning paths and repeated operational opportunities, which help students accumulate successful learning experience, the most important source of self-efficacy (Bandura, 1997). Offline modules strengthen hands-on operation and collaborative problem-solving ability, and project-based peer evaluation activities can further consolidate students' operational confidence and evaluative efficacy. Virtual simulation tools enrich students' practical experience and enhance their confidence in professional skills. However, complex digital tools may cause learning anxiety for students with low digital literacy, and unbalanced resource distribution leads to differentiated development of student self-efficacy. The stability of teachers' instructional support and emotional input is restricted by their own occupational psychological status, which affects the sustainability of self-efficacy promotion in the blended environment (Hoogendijk et al., 2023). From the perspective of learning effectiveness mechanisms, the UTAUT2 model confirms that blended environment factors (performance expectancy, effort expectancy, hedonic motivation, facilitating conditions) first enhance behavioral intention, which then directly promotes learning effectiveness and strengthens self-efficacy (Lv & Li, 2024). This multi-path mechanism supplements the single environmental-to-psychological logic in existing research, providing a more comprehensive explanatory framework for Zhejiang's vocational blended ecosystem.

THE RELATIONSHIP BETWEEN BLENDED LEARNING ENVIRONMENT AND STUDENT SELF-EFFICACY

The blended learning environment shapes the formation and development of student self-efficacy through a multi-level and multi-path mechanism that can be systematically explained by three complementary theoretical systems. Social cognitive theory centers on the four source pathways of self-efficacy shaping within environmental contexts, social cognitive career theory extends explanatory scope to the integration of learning and career development, and self-determination theory uncovers internal motivational mechanisms through the satisfaction of basic psychological needs. The three theories form a coherent logical chain from external environmental stimulation to internal psychological perception, jointly constructing a complete theoretical system for interpreting the relationship between the blended learning environment and student self-efficacy. The social cognitive model of learning behavior identifies four sources that shape self-efficacy: mastery experience derived from successful task completion in blended scenarios, vicarious experience gained by observing teachers or peers complete skills effectively, social persuasion formed through encouragement and feedback from teachers, peers or enterprise mentors, and affective regulation that reduces learning anxiety within supportive environments. This model translates directly to Zhejiang's vocational blended learning environment, where online practice supplies continuous mastery experience, teacher demonstrations and peer performances deliver rich vicarious experience, personalized feedback from teachers and mentors forms effective social persuasion, and stable technical and emotional support alleviates student anxiety. Many existing studies treat these sources as independent inputs, yet they operate interactively in real learning settings, a complexity that remains understudied in vocational contexts. In project-based blended learning, standardized peer assessment activities enhance students' sense of participation and evaluative competence, thereby improving the stability of self-efficacy. The validity of peer evaluation increases with the progress of learning sessions, and a scientific scoring mechanism helps students form objective self-cognition and reduce biased self-evaluation (Badea & Popescu, 2020). Cross-national research confirms that learning experience, autonomous learning and environmental support can stably predict students' learning confidence, and learning confidence further promotes the improvement of digital literacy and practical ability, which supports the view that Zhejiang's blended learning environment can effectively improve student self-efficacy by enriching learning experience and supporting autonomous learning (Fraillon et al., 2019; Hatlevik et al., 2018). Teacher support is a key variable connecting the blended learning environment and student self-efficacy, and its effectiveness is affected by teachers' own psychological status. Teachers with low self-efficacy are more likely to develop emotional exhaustion, which weakens the quality of classroom interaction and instructional support, thus indirectly hindering the improvement of students' self-efficacy (Hoogendijk et al., 2023). Empirical evidence in blended English learning further verifies this mediation: perceived teacher support acts as a direct protective factor, significantly enhancing students' ICT self-efficacy and online academic engagement, and this effect is more stable for students with low initial self-efficacy (Feng et al., 2023). From the perspective of social cognitive career theory, the blended learning environment provides a complete set of self-efficacy sources and forms a circular interaction system of individual-environment-behavior (Lent et al., 1994). From the perspective of self-determination theory, the blended learning environment meets students' needs for autonomy, competence and relatedness, thereby promoting intrinsic learning motivation and consolidating self-efficacy (Ryan & Deci, 2000). Self-regulated learning (SRL) acts as a critical behavioral mediator in this relationship: blended environment interactivity, perceived self-efficacy, and learning satisfaction jointly predict SRL level, which in turn regulates the transformation of self-efficacy into academic success (Cigdem & Oncu, 2024). A five-year systematic review of SRL strategies further confirms that goal orientation, monitoring, and time management are the most frequently used SRL strategies in

blended learning, all of which rely on stable self-efficacy as a cognitive foundation (Luo & Zhou, 2024). The key elements of the relationship between blended learning environment and student self-efficacy include online learning support such as Zheliban platform function and personalized feedback, offline interaction such as teaching support and peer collaboration, and resource construction such as industry-education integration and virtual simulation center construction. The relationship between blended learning environment and student self-efficacy presents a mutually reinforcing and circular development trend. A high-quality blended learning environment improves student self-efficacy, and students with high self-efficacy participate in learning more actively, which in turn promotes the continuous optimization of the blended learning environment.

DISCUSSION

This study clarifies the three-dimensional connotation of student self-efficacy in vocational education, moving beyond the limitations of generic self-efficacy research and expanding the applied scope of classic self-efficacy theories. The interaction framework between the blended learning environment and student self-efficacy constructed in this study refines the theoretical system of vocational education research and validates the cross-cultural applicability of self-efficacy mechanisms within Chinese vocational colleges. The integration of localized empirical research, international large-scale assessment evidence and classic theories strengthens the comprehensiveness and robustness of the theoretical explanation. This study shifts the perspective of blended learning research from resource design to psychological mechanism, supplementing empirical evidence from project-based peer assessment and teacher occupational psychology to strengthen the explanatory power of the framework. Even with these contributions, the synthesized literature remains limited by overreliance on cross-sectional data, insufficient attention to personality and family factors, and shallow exploration of interactive effects among environmental elements, all of which leave meaningful gaps for future inquiry. To optimize the blended learning environment and improve student self-efficacy in Zhejiang's vocational colleges, online support can be strengthened by upgrading the Zheliban platform, improving the connection between platform modules and skill training, and carrying out personalized feedback with intelligent tools to enhance students' mastery experience. Offline interaction can be optimized by designing hierarchical practical tasks matching post demands, strengthening demonstration teaching and emotional support, and carrying out group training and skill competitions, while introducing standardized peer assessment into project-based learning to improve students' objective self-cognition. Resource construction can be promoted by aligning courses with industrial needs, deepening industry-education integration and improving provincial resource sharing mechanism to narrow the digital divide among students. Dynamic assessment of students' psychological state should be strengthened to provide early intervention for students with low self-efficacy. Meanwhile, attention should be paid to teachers' occupational psychological health, improving teachers' self-efficacy and reducing emotional exhaustion to ensure the stability and effectiveness of instructional support in blended learning. This systematic review has certain limitations that need to be supplemented in future research. Most of the existing literature included in the study adopts cross-sectional research design, lacking longitudinal tracking data to reveal the dynamic evolution process of the relationship between blended learning environment and student self-efficacy. Individual difference factors such as students' personality traits and family background are not fully incorporated into the analysis framework, and the interaction and coupling effects among different environmental elements are not deeply explored. The research takes Zhejiang vocational colleges as the specific context, and the conclusions have certain regional specificity, which needs to be verified and expanded in other regions with different economic and educational development levels to improve the universality of the research framework.

CONCLUSION

This study systematically explores the theoretical relationship between blended learning environment and student self-efficacy in Zhejiang's vocational colleges through a standardized systematic literature review, supported by classic self-efficacy theories, project-based learning empirical evidence and teacher occupational psychology research. Student self-efficacy in vocational education covers three core dimensions: digital tool application, professional skill transfer and industry-education collaborative learning efficacy, which conforms to the task-specific characteristics of self-efficacy theory. Zhejiang's vocational colleges have formed a mature blended learning ecosystem with remarkable achievements in policy support, resource construction and industry-education integration. The blended learning environment affects student self-efficacy through the complementary mechanisms of social cognitive theory and self-determination theory, with online support, offline interaction and resource construction as core structural elements. Learning experience, autonomous learning and environmental support serve as stable predictors of student self-efficacy, which in turn promotes improvements in students' digital literacy and professional skills. Peer assessment within project-based learning, teachers' occupational psychological status, and self-regulated learning strategies act as important regulatory variables in self-efficacy formation and development. The relationship between the blended learning environment and student self-efficacy forms a mutually reinforcing positive cycle that drives continuous improvement in both learning quality and student psychological development. The theoretical contributions of this study include enriching the connotation of vocational student self-efficacy, improving the interaction framework between the blended learning environment and self-efficacy, verifying the applicability of classic theories in vocational scenarios and innovating the research perspective of blended learning. The practical value lies in providing operational guidance for optimizing blended learning design, reducing gaps in student learning confidence and supporting the high-quality development of vocational education in Zhejiang. These conclusions remain contextually bounded to Zhejiang's vocational system, and future cross-regional tests will help strengthen broader generalizability.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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