



OPEN ACCESS

EDITED BY

Gisela Cebrián,
University of Rovira i Virgili, Spain

REVIEWED BY

Larisa Loredana Dragolea,
1 Decembrie 1918 University, Romania
Omotayo Adewale Awodiji,
University of Johannesburg, South Africa

*CORRESPONDENCE

Li Jinke
✉ lijinkelovemy@163.com

RECEIVED 16 December 2024

ACCEPTED 08 April 2025

PUBLISHED 25 April 2025

CITATION

Jinke L, Abdul Aziz NA and Kadir SA (2025)
How significantly are principal and teacher
entrepreneurial leadership related to teacher
efficacy and organizational effectiveness in
China? *Front. Educ.* 10:1545888.
doi: 10.3389/feduc.2025.1545888

COPYRIGHT

© 2025 Jinke, Abdul Aziz and Kadir. This is an
open-access article distributed under the
terms of the [Creative Commons Attribution
License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or
reproduction in other forums is permitted,
provided the original author(s) and the
copyright owner(s) are credited and that the
original publication in this journal is cited, in
accordance with accepted academic practice.
No use, distribution or reproduction is
permitted which does not comply with these
terms.

How significantly are principal and teacher entrepreneurial leadership related to teacher efficacy and organizational effectiveness in China?

Li Jinke*, Nor Azni Abdul Aziz and Suhaida Abdul Kadir

Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

Entrepreneurial leadership has garnered increasing attention in educational contexts. While the positive impact of principals' entrepreneurial leadership on organizational advancement is well-documented, the role of teacher entrepreneurial leadership in organizational performance remains underexplored. This study aims to investigate the relationships among principal entrepreneurial leadership, teacher entrepreneurial leadership, teacher efficacy, and organizational effectiveness in Chinese schools. A quantitative research design was employed, utilizing structural equation modeling (SEM). Data were collected through paper-based questionnaires administered to 400 teachers in Shandong Province, China. Correlation and path analyses were conducted to examine the relationships between the variables. The findings reveal several significant relationships: principal entrepreneurial leadership is positively associated with teacher entrepreneurial leadership ($\beta = 0.084$, $p < 0.01$). Both principal entrepreneurial leadership ($\beta = 0.512$, $p < 0.001$) and teacher entrepreneurial leadership ($\beta = 0.096$, $p < 0.001$) are positively related to teacher efficacy. Similarly, both principal entrepreneurial leadership ($\beta = 0.572$, $p < 0.001$) and teacher entrepreneurial leadership ($\beta = 0.159$, $p < 0.001$) are positively related to organizational effectiveness. Additionally, teacher efficacy is positively associated with organizational effectiveness ($\beta = 0.168$, $p < 0.001$). This study provides a novel perspective on entrepreneurial leadership by examining the roles of both principals and teachers. The findings provide valuable insights for government educational policymakers, school principals, and teachers seeking to enhance organizational effectiveness and improve educational outcomes for the younger generation in China.

KEYWORDS

organizational effectiveness, principal entrepreneurial leadership, teacher entrepreneurial leadership, teacher efficacy, educational administration

1 Introduction

Leadership refers to one's ability to lead a team or organization toward common goals by influencing and motivating others (Zhang et al., 2020). Entrepreneurial leadership combines traditional leadership with an entrepreneurial spirit, emphasizing the creation of new value through innovation and risk-taking in uncertain environments. It requires both established leadership skills and entrepreneurial traits, such as innovative thinking and risk-taking ability (Liu et al., 2022; Thornberry, 2006). Cunningham and Lischeron (1991) first proposed the concept of entrepreneurial leadership. Roebuck (2011) defined

entrepreneurial leadership as the ability to minimize risks, continuously innovate, seize opportunities, take personal responsibility, and manage change in a dynamic environment (Roebuck, 2011). Entrepreneurial leadership plays a pivotal role in the development and success of an organization. In the business domain, entrepreneurial thinking and leadership are recognized as critical drivers of economic growth and recovery. Some studies indicate that in mature organizations, when leaders and staff demonstrate entrepreneurial leadership capabilities, they are better equipped to identify potential development opportunities and make goal-oriented decisions that enhance operations and services (Omer Attali and Yemini, 2017). Recently, entrepreneurial leadership has gained increased recognition in the educational realm (Zhu et al., 2023). Within the educational environment, entrepreneurial leadership behavior involves the ability to effectively explore innovative ideas, expand new instructional practices, inspire students to engage in critical and creative thinking, utilize various teaching models, and find necessary resources to support students in learning and applying knowledge, among other aspects.

Entrepreneurial leadership behavior can motivate principals to meet the developmental requirements of both students and teachers, allowing them to adapt and respond flexibly to the highly competitive and ever-changing social environment. Principals devise educational plans, conduct teaching research and reforms, and oversee student learning performance; these actions ensure the school's mission is fulfilled while enhancing management effectiveness (Hoang et al., 2024; Liu et al., 2022). Teachers identify and pursue opportunities in daily teaching activities and take proactive steps to explore more efficient ways to utilize educational resources, thereby promoting student learning performance. Teachers share knowledge and can apply entrepreneurial leadership behaviors to establish a more effective educational system. In this way, teacher entrepreneurial leadership empowers educators to drive educational innovation, school improvement, and student development through entrepreneurial thinking and leadership behavior. This concept merges educational leadership with an entrepreneurial spirit, highlighting that teachers are not only knowledge transmitters but also drivers and innovators of educational change. With China's education policy adjustments, the Ministry of Education has increasingly stressed the importance of teaching leadership and management leadership behavior (Zhu et al., 2023). Eshkaftaki et al. (2010) primarily researched the positive relationship between teacher entrepreneurship and principal transformational leadership in high schools. Subsequently, many Western countries have seen educational organizations implementing entrepreneurship education programs and training courses to foster entrepreneurial leadership skills and mindsets (Eesley and Lee, 2021; He et al., 2024; Zhu et al., 2023). However, research on entrepreneurial leadership among principals and teachers in China remains in its early stages (Li et al., 2024; Liu et al., 2022), with limited empirical investigations. This area has yet to be thoroughly studied or developed (Ho et al., 2021; Keddle, 2018; Keyhani and Kim, 2021).

The organizational management process involves integrating materials, as well as human and social relations, through the orchestration stage within organizations. This process ultimately

contributes to value creation for individuals, organizations, and society (Hitt et al., 2011). Zhang et al. (2020) elaborated that the organizational effectiveness of a school refers to the extent to which the school is effective in its operation and management. It entails coordination, cooperation, and the full utilization of resources at all levels and departments within the organization to achieve established goals and missions. Organizational effectiveness reflects the overall performance of all aspects of an organization and serves as an important indicator for evaluating the future growth and development of an organization (Tan and Olaore, 2022). According to the open social system theory, an organization's effectiveness can be measured by its ability to create and utilize resources effectively (Zhang et al., 2020; Zheng, 2002). Principals and teachers are critical elements in this process. Previous studies have explored the correlation between different leadership types and organizational effectiveness, emphasizing entrepreneurial leaders' ability to skillfully navigate resource integration and value creation (Croucher et al., 2017; Luo and Ye, 2012; Zhu et al., 2023). However, few scholars have verified the link between principal entrepreneurial leadership, teacher behaviors, and organizational effectiveness (Khan, 2021; Li et al., 2024; Liu and Hallinger, 2018). Nevertheless, several educational institutions struggle to adapt to shifting circumstances and societal requirements, resulting in diminished efficiency or obsolescence (Demir, 2021; Zhu et al., 2023). To date, limited research has examined the mechanisms through which principal entrepreneurial leadership and teacher entrepreneurial leadership influence organizational effectiveness. Identifying the factors that contribute to effective educational organizations has been a central objective of educational reforms in many countries. Therefore, this study prioritizes the measurement of educational organizational effectiveness to address this gap.

Teachers' self-efficacy refers to the belief in one's ability to effectively plan, create, and implement teaching activities in order to influence students' intended performance (Skaalvik and Skaalvik, 2007). Higher teacher efficacy indicates that educators are more inclined to continuously enhance their knowledge and instructional methods to provide better instruction, foster student involvement in the classroom, and ultimately improve students' learning performance while enhancing organizational effectiveness (Khanshan and Yousefi, 2020). Previous research has confirmed the importance of teacher efficacy across various school organizations and in multiple countries (Ding and Hong, 2023; Fackler et al., 2021; Kuang and Deng, 2010). Additionally, other researchers have established a positive correlation between principal leadership and teacher efficacy, as well as teacher behavior (Cansoy et al., 2022; Zainal and Matore, 2021), particularly the link between principal entrepreneurial leadership and teacher efficacy (Kalhor et al., 2020; Li et al., 2024). However, the interactions among teacher entrepreneurial leadership, teacher efficacy, and organizational effectiveness have seldom been examined, remaining an understudied area. This gap in the literature warrants further investigation.

To address the influencing factors and bridge the existing gap, this study analyzes the relationships among principal entrepreneurial leadership, teacher entrepreneurial leadership, teacher efficacy, and organizational effectiveness. On the one hand, the study aims to advance the integrated understanding

of open social system theory by exploring the relationship between entrepreneurial leadership and teacher efficacy within the context of organizational effectiveness. Additionally, the study's findings contribute to a deeper understanding of organizational performance and effectiveness for educational groups and government agencies. The study emphasizes the application of entrepreneurial leadership by principals, teachers, and school organizations. It also highlights the need to improve monitoring systems for school service quality. Ultimately, the study strives to provide better educational opportunities, improved learning conditions, and quality services for China's youth.

2 Literature review

The process of managing an organization is cyclical, evolving, and participatory. The open social system presumes that a school is an open organization (Scott and Davis, 2015), and the classroom is inherently considered an open social system. By exchanging resources with external entities and interacting with organizational elements, schools create value for individuals as well as the organization. Thus, this study investigates the relationships among principal entrepreneurial leadership, teacher entrepreneurial leadership, teacher efficacy, and organizational effectiveness to identify a dynamic mechanism.

2.1 Principal entrepreneurial leadership and teacher entrepreneurial leadership

Thornberry (2006) developed a five-dimensional scale to measure entrepreneurial leadership behavior. To respond promptly to market demands and enhance the organization's competitiveness, principals who exhibit accelerator behavior can take steps to expedite organizational development. These measures include swiftly promoting the implementation of new initiatives, strengthening marketing efforts, and accelerating the pace of curriculum transformation. Principals with explorer behavior aim to promote the growth of organizations by venturing into uncharted territory or new markets. Furthermore, the principal integrator behavior describes how integrating diverse stakeholders and resources can benefit organizational operations. Principals' broad entrepreneurial conduct is referred to as general entrepreneurial leadership behavior, which links miner, accelerator, explorer, and integrator behaviors together.

Based on Thornberry's (2006) framework, teacher entrepreneurial leadership involves actively pursuing minor behaviors to promote the advancement and improvement of academic knowledge. This is achieved by seeking opportunities for professional growth and development (Amorim Neto et al., 2019). Teacher accelerator behavior meets the needs of students and the demands of organizational development through differentiated instruction or various evaluation methods, enabling students to master the knowledge and skills necessary to survive in modern society (Schimmel, 2016). Teacher explorer behavior acquires the resources needed and proficiently uses and manages limited resources to strengthen schools' competitive advantages. Teacher integrator behavior emphasizes collaboration. Teachers collaborate

with students and communities to facilitate knowledge sharing (Shelton and Archambault, 2018) and create more and better learning opportunities for students. The general entrepreneurial leadership behavior encompasses all the entrepreneurial leadership actions that teachers can take to achieve positive social change.

Indeed, the focus of entrepreneurial leadership for principals and teachers differs. Principal entrepreneurial leadership targets the entire organizational level, while teacher entrepreneurial leadership emphasizes performance in middle management. Recent conceptual models indicate a shift in entrepreneurial leadership from exclusively stressing the implementation and performance of principals to acknowledging that school teachers also need to learn and develop entrepreneurial leadership to enhance effective school development (Liu and Xi, 2021). Additionally, some researchers have highlighted the importance of teachers possessing entrepreneurial leadership behaviors and skills (Huang et al., 2020) to cultivate entrepreneurial mindsets among their students.

Regarding the scope of teacher entrepreneurial leadership, teacher leaders contribute to professional growth, guide organizational planning and teaching strategies, and oversee teaching quality and evaluation. This helps them grasp innovation opportunities and expand school entrepreneurship (Ho et al., 2021). Additionally, it has been noted that although teachers can assume entrepreneurial leadership roles, they need to coordinate with the principal to be more effective (Diamond and Spillane, 2016). However, while principal entrepreneurial leadership occurs at the school level, teacher entrepreneurial leadership is more closely linked to the classroom level. Unlike principal entrepreneurial leadership, teacher entrepreneurial leadership has relatively limited functions. In the context of China, research on the relationship between entrepreneurial leadership among principals and teachers remains limited and incomplete (Walker et al., 2012; Zheng et al., 2019). Therefore, exploring the relationships and influences between principal and teacher entrepreneurial leadership is urgent.

2.2 Teacher efficacy and organizational effectiveness

The effectiveness of the organization is determined by how well it can apply its resources to accomplish its objectives (Das, 2011). Achieving this goal requires collaboration and coordination in resource application at various levels throughout the organization. The success resulting from the unique qualities and talents of an organization's human resources can be viewed as organizational effectiveness (Jacobsen et al., 2022; Youzi and Jian, 2022). Cameron (1978) examined a scale to measure organizational effectiveness based on faculty satisfaction, student performance, and the capability for resource integration. For instance, "student satisfaction with the educational services provided" refers to the evaluation of teaching quality or the recognition of additional academic support. "Faculty and staff satisfaction" is influenced by their assessment of the institutional management structure, employment conditions, and opportunities for professional development. "The academic progress of students encompasses learning performance, comprehension of knowledge,

the application of that knowledge, and academic skills. “The professional development of faculty” in teaching and academic fields, as well as the quality of their teaching, academic performance, and professional skills, affects student learning performance. “The personal and career development prospects of students” indirectly highlight the importance of educational services. Furthermore, strengthening “system openness and interaction” with the community supports the organization’s ability to secure funding and human and social resources for sustainable development.

Self-efficacy is a person’s ability to plan and execute actions required to navigate potential scenarios (Bandura, 1997). According to Gibson and Dembo (1984), a teacher’s sense of self-efficacy enables them to evaluate their capacity to effectively influence students’ behavior. To explore the circular nature of the teacher efficacy process, Tschannen-Moran et al. (1998) developed a comprehensive model that integrates Bandura’s self-efficacy concepts and Rotter’s locus of control theory. Teacher efficacy refers to the belief teachers have in their ability to implement effective teaching strategies, maintain influence over classroom dynamics, and enhance students’ academic success (Tschannen-Moran and Hoy, 2001). Instructional practice specifically encompasses the teaching strategies and techniques employed by teachers to educate students according to their abilities. Student engagement indicates the extent to which teachers can promote student participation and involvement in the knowledge transfer process. The ability of teachers to manage and structure student behavior, course progression, and classroom order during instruction is known as classroom management. Increasing excitement and awareness for teaching improvement, along with the creation of a supportive learning environment (Fackler and Malmberg, 2016; Xia, 2016), enhances organizational performance and effectiveness (Hu et al., 2019; Waweru et al., 2021). Previous research has confirmed a direct influence between teacher efficacy and organizational effectiveness in primary, junior, and high schools across various countries. However, research into the factors affecting teacher efficacy and organizational effectiveness within China’s educational institutions remains limited, highlighting the need for further exploration.

2.3 Principal entrepreneurial leadership and teacher entrepreneurial leadership are related to teacher efficacy

To provide high-quality services to students, principals in educational settings must identify future growth paths for the schools they oversee while coordinating and utilizing various resources. The organizational structure establishes a hierarchical link between principals and teachers, fostering positive relationships and collaboration between them, which are essential for the effectiveness of school organizations. Teachers’ behavior is significantly influenced by the entrepreneurial leadership of principals, motivating them to become more driven, effective, innovative, and imaginative (Brauckmann-Sajkiewicz and Pashiardis, 2022; Zainal and Matore, 2021). Previous research has explored the relationship between principal instructional

leadership and collective teacher efficacy (Al-Mahdy et al., 2018; Cansoy et al., 2022), the impact of transformational leadership practices on teachers’ self-efficacy (Zainal and Matore, 2021), as well as the connection between entrepreneurial leadership and teachers’ motivation (Wibowo and Saptono, 2018) and work performance (Kalhor et al., 2020). Investigating the potential impact of principal entrepreneurial leadership on teacher efficacy is both essential and imperative.

Teacher entrepreneurial leadership refers to the proactive actions taken by self-motivated individuals who are passionate and energetic middle-level leaders (Hanson, 2017; Omer Attali and Yemini, 2017). Teacher entrepreneurs strive for personal achievement because they desire interesting and challenging work (Martin et al., 2018), as well as deep self-development (Sanchez, 2014). Teachers exhibiting entrepreneurial leadership can innovate and learn from past experiences, moving toward opportunities for greater personal achievement (Bulger et al., 2016; Schimmel, 2016). Some scholars suggest that teachers excelling in entrepreneurial leadership possess strong theoretical and content knowledge, as well as rich teaching experience, enhancing their applications in content and instructional methods (Amorim Neto et al., 2017; Hunzicker, 2017; Martin et al., 2018). These behaviors, directly related to the classroom or educational environment, positively contribute to the development and enhancement of teachers’ self-efficacy. While some research has explored the relationship between teacher entrepreneurial attitudes and teaching performance (Hanson, 2017), other studies have highlighted the positive impact of teacher entrepreneurial leadership on knowledge dissemination (Bell, 2016; Ho et al., 2021). However, research in this area remains in its early stages, and the roles and performance of teacher entrepreneurial leadership are not yet clearly defined. Particularly in the field of education, the term entrepreneurial leadership often leads to confusion and hinders the understanding of the concept. To gain a comprehensive understanding and provide further clarity, examining the performance of entrepreneurial leadership among principals and teachers with respect to teacher efficacy is significant. Therefore, this study seeks to explore the relationship between the entrepreneurial leadership of principals and teachers and the dimensions of teacher efficacy.

2.4 Principal entrepreneurial leadership and teacher entrepreneurial leadership are related to organizational effectiveness

Entrepreneurial leadership can enhance the management capabilities and leadership behaviors of principals, enabling them to address the diverse needs of students and teachers while responding to the evolving demands of the social environment from three key perspectives. First, it encompasses the mindset and approach to school management. Second, it involves the ability to overcome obstacles and limitations, engage in continuous improvement, and adapt to competitive and rapidly changing environments. Third, it examines the development of strategic value and the enhancement of effectiveness. Entrepreneurial leadership fosters improvements in organizational performance, achievement, and effectiveness for

future growth (Fontana and Musa, 2017; Liu and Xi, 2021). Therefore, the primary objective of this study is to determine whether principal entrepreneurial leadership directly or indirectly influences educational organizational effectiveness.

Moreover, teachers' satisfaction and fulfillment promote better, more effective instruction, and teachers with high satisfaction are directly associated with educational achievement. Recently, the rapid increase in interest in teacher entrepreneurial leadership highlights the significance of entrepreneurial leadership behavior in the constantly changing educational environment and teaching system. Some studies focus on understanding the relationship between teacher entrepreneurship and job satisfaction (Rietveld et al., 2015) and the impact of teacher entrepreneurial leadership on educational outcomes (Martin et al., 2018). Heijden et al. (2015) stated that education entrepreneurs believe they have a significant responsibility to provide high-quality educational services for students in the classroom and at the school level. Keddie (2018) verified that present entrepreneurial professionalism can positively drive students toward high academic achievements and enhance the school's reputation. These findings indicate that entrepreneurial leadership behavior can be a significant factor in organizational development (Braunerhjelm et al., 2018), and research on entrepreneurial leadership behavior has been extended to educational organizations (Anderson et al., 2018; Grohs et al., 2015; Lurtz and Kreutzer, 2017), teaching performance (Hietanen, 2015; Amorim Neto et al., 2017), and schools' competitive advantages (Martin et al., 2018). However, the concept of teacher entrepreneurial behavior has not yet been clearly conceptualized or operationalized, and its influencing factors have been intensely debated in recent years (Keyhani and Kim, 2021).

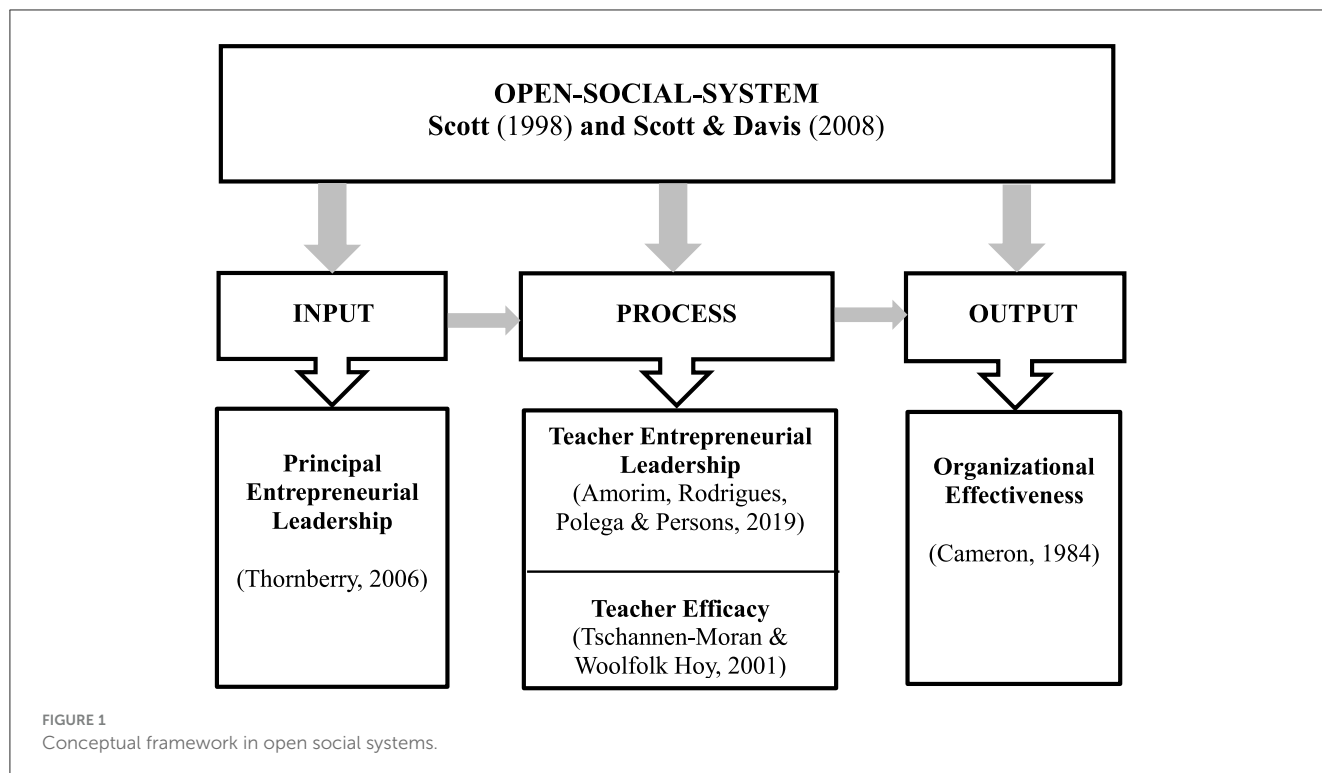
Scott and Davis (2015) presented open-social systems theory, which views organizations as systems that interact with and adapt to their external environment. Organizations are considered open entities that obtain resources, information, and energy from this external environment, maintaining their survival and development through adaptation and interaction. Schools operate as open systems, while classrooms are inherently regarded as social systems (Hoy, 2019). In this research model, the theory of open social systems provides a framework for understanding the functioning of educational organizations, particularly regarding how these organizations achieve their goals through three stages: input, process, and output. The theory emphasizes the importance of the interrelationships among various elements within an organization and their impact on the overall functioning of the school. Thus, effectiveness indicators can be derived from each stage of the input, process, and output within the open-social system cycle. The management of educational organizations is divided into these three stages. The resource input stage primarily involves the principals' entrepreneurial leadership, as described by Thornberry (2006). This leadership style gathers both internal and external resources by utilizing entrepreneurial capabilities. In schools, entrepreneurial leaders advocate for new teaching methods and technologies, enhancing the schools' adaptation to the evolving educational environment by fostering creative thinking among teachers and students. Entrepreneurial leaders tend to be more adaptable to change, thereby increasing the flexibility of school organizations to better address the changing

needs and expectations of pupils, parents, and the community. The orchestration process stage begins with teacher efficacy, as described by Tschannen-Moran and Hoy (2001), and incorporates teacher entrepreneurial leadership, as outlined by Amorim Neto et al. (2019). In the open-social system theory, teachers align their actions with the school development objectives by creating teaching syllabi and class management plans. They serve as role models through their behaviors, values, and interactions with students, establishing a positive school climate and promoting academic excellence and behavioral standards (Hoy, 2019). When teachers hold leadership positions, such as subject leaders, grade leaders, class teachers, or in other delegated roles, they can influence school decisions and direction. Teachers are integral members of the school community. They collaborate with students, parents, and other educators to foster a supportive school environment and build connections both inside and outside the school. Higher teacher efficacy and entrepreneurial leadership significantly contribute to school development and student performance during the integration process within school organizations. The value output stage employs organizational effectiveness metrics, based on Cameron (1978), to evaluate the overall performance of educational institutions. Organizational effectiveness emerges from the integration process and the interaction between entrepreneurial leadership and teacher efficacy.

Adeel et al. (2020) demonstrated that the open-systems perspective of schools is intricately linked to both structure and process, forming a dynamic system that encompasses instructional leadership and students' academic performance, with the mediating effects of teachers' organizational commitment. Murni et al. (2017) established that the proposed model delineates three interconnected subsystems within the school social system, which have been identified as significant contributors to transformational processes. This conceptual framework demonstrates substantial explanatory power in elucidating the complex relationships among instructional leadership, school culture, and academic achievement within organizational contexts. The model of this study emphasizes the impact of the interrelationships between various elements within the organization on the overall operation of the school. Therefore, the theoretical framework in the open social system posits that investing in principal entrepreneurial leadership at the input stage, through orchestrating teacher efficacy and entrepreneurial leadership activities, can achieve outputs of organizational effectiveness, incorporating social value, individual value, and organizational value. Figure 1 presents the study conceptual framework in open-social system.

Therefore, this study proposes four research questions:

- (1) What is the relationship between principal entrepreneurial leadership and teacher entrepreneurial leadership?
- (2) What is the relationship between teacher efficacy and the entrepreneurial leadership of both the principal and the teacher?
- (3) What is the relationship between organizational effectiveness and the entrepreneurial leadership of the principal and teacher?
- (4) What is the relationship between teacher efficacy and organizational effectiveness?



3 Methodology

3.1 Participants

A quantitative research design was employed to achieve research objectives. Data were collected from public primary, junior, and high schools in Shandong Province, China. As of the end of 2023, the total number of primary, middle, and high school teachers in Shandong Province is 959,900 (Shandong Provincial Department of Education, 2024). Among them, there are 77,813 teachers in the urban area of Jinan City (Jinan Education Statistics Bureau, 2023), 28,000 teachers in the urban area of Rizhao City (Rizhao Education Statistics Bureau, 2023), and 16,220 teachers in the urban area of Heze City (Heze Education Sports Statistics Bureau, 2023). The selection of research areas for investigation in Shandong Province is based on three main reasons. First, Shandong Province is the second largest province in China, with a population of over 100 million residents, and its urban and rural structure is diverse, including both economically developed coastal cities and underdeveloped rural areas. This diversity enables the teacher community in Shandong Province to better reflect the overall situation of the education system in various regions of China, demonstrating its representativeness. Second, Shandong Province is one of the largest provinces in China in terms of educational scale, with a significant number of primary and secondary schools and a large teacher population. Studying the teacher demographic in Shandong Province can provide valuable insights for the formulation of national education policies. Additionally, regarding data availability, the Shandong Provincial Government and Education Department are relatively transparent regarding

data disclosure, ensuring the scientific and reliable nature of the research. In summary, choosing Shandong Province as the research subject for the survey has academic rationality and representativeness, providing support for the formulation and implementation of national education policies.

The research used fishbowl sampling methods. Operationally, a total of 16 cities in Shandong Province were included. Jinan, the provincial capital, was chosen as a representative sample stratum for large cities. The selection of Jinan City for research is based on its significance as the capital of Shandong Province, reflecting its important political, economic, and cultural status and its capacity to represent the characteristics of the provincial capital. Therefore, the method used to select Jinan City is purposive sampling, and then two cities are randomly chosen from the 15 small and medium-sized cities using simple random sampling. The remaining 15 cities were processed in the following manner: (1) each city name was written in alphabetical order on standardized paper strips, (2) all strips were uniformly folded, (3) placed in a randomized cardboard container, and (4) two strips were randomly drawn, resulting in the selection of Rizhao and Heze cities. The schools from these three cities were classified into three strata in alphabetical order, and the names of these schools were entered into three Excel spreadsheets. The RAND function was subsequently utilized to randomly sort the schools, employing a stratified sampling method to choose schools from each city stratum. Finally, the fishbowl sampling method was utilized to randomly survey teachers from each stratum until the minimum sample size was exceeded.

This study outlined a three-step plan for the data collection procedure. Step one involved obtaining permission from each

of the schools included in the investigation. The researchers visited each school to explain the reasons and purpose of the study. Selected teachers were contacted to complete a paper-based questionnaire and were asked to recommend additional teachers. Step two consisted of distributing the research questionnaires to the teachers after receiving permission. To ensure high-quality responses, respondents initially received a detailed notification letter explaining the study's purpose, significance, and research objectives, along with the paper-based questionnaire. While respondents filled out the questionnaire, the investigators were available to provide timely explanations and clarifications if any questions arose. Completing the survey instrument took approximately 15 min, and participants were given a 10 CNY cash incentive in advance to encourage participation. Step three involved collecting the completed questionnaires. The answered questionnaires were collected immediately after the respondents completed them. All returned paper-based questionnaires were anonymous and kept confidential. The data collection procedure was based on voluntary participation; no participants were compelled to take part in the study. Starting in January 2024, the entire data collection process lasted about 4 months to complete. Additionally, in order to effectively control bias in the questionnaire data and ensure the accuracy and reliability of the analysis results, expanding the sample size can reduce selection bias and chance bias. Setting reasonable rewards can help mitigate non-response bias. The 10 CNY incentive ensures that the reward is appealing to all groups, thus avoiding bias toward any specific group and preventing over-attraction to particular demographics. Moreover, data analysis employs z-score data cleaning to eliminate invalid or incomplete answers and ensure data quality.

Based on the overall size and proportion mentioned above, this study used the Cochran sample size formula to calculate the required sample size. Cochran's formula is used when researchers deal with a large population and aim to ensure a sufficient sample size for making reliable inferences about the population proportion. It is suitable for various types of research and sample distributions, whether in finite or infinite populations. Here, Z denotes the confidence level (1.96, corresponding to a 95% confidence interval), p represents the expected proportion (0.5 to maximize sample size), and e signifies the error range (0.05). According to calculations, Cochran's (1991) correction formula determines a minimum sample size of 340. To ensure data reliability, it is crucial to expand the sample size beyond the minimum threshold required for statistical significance. Using the fishbowl sampling method, 437 teachers were selected from various educational institutions. Through systematic screening, invalid questionnaires were identified and eliminated based on established criteria, such as incomplete responses, uniform answer patterns, high response regularity, and evident errors. From the initial sample, 400 questionnaires were considered valid, resulting in an effective rate of 91.53%. The distribution was as follows: Jinan City (197), Rizhao City (144), and Heze City (59), with representatives from primary schools (21), junior schools (13), and high schools (15). Jinan City surveyed 15 schools, including five primary schools (118 teachers), six junior high schools (50 teachers), and four high schools (29 teachers). Rizhao City surveyed

16 schools, comprising seven primary schools (59 teachers), four junior high schools (61 teachers), and five high schools (24 teachers). Heze City surveyed 18 schools, including nine primary schools (26 teachers), three junior high schools (24 teachers), and six high schools (nine teachers). There were 158 men (39.5%) and 242 women (60.5%) respondents. The age distribution was as follows: 259 participants (64.75%) aged 21–30 years, 95 (23.75%) aged 31–40 years, 39 (9.75%) aged 41–50 years, and 7 (1.75%) over 50 years. Regarding educational backgrounds, the distribution was as follows: 26 teachers (6.5%) held college diplomas, 83 (20.75%) possessed bachelor's degrees, 246 (61.5%) had master's degrees, and 45 (11.25%) held PhD degrees.

3.2 Instruments and variables

The survey questionnaire consisted of Sections A and B. Section A included three demographic information items: gender, age, and educational background. Section B utilized a 5-point Likert scale (1 = Nothing; 2 = Very Little; 3 = Some Influence; 4 = Quite A Bit; 5 = A Great Deal) and contained 30 items on organizational effectiveness, 50 items on principal entrepreneurial leadership, 50 items on teacher entrepreneurial leadership, and 24 items on teacher efficacy. The organizational effectiveness scale, designed by Cameron (1978), referenced eight dimensions for teachers to evaluate the organizational management and operational effectiveness of their educational institutions. It also employed a 5-point Likert scale. A general assessment of the operational effectiveness and management of the participants' educational organizations was requested. The Thornberry (2006) entrepreneurial leadership questionnaire was used to assess the performance of both principal and teacher entrepreneurial leadership. This was a 5-point Likert scale with five dimensions. On the one hand, teachers were required to assess their principal's entrepreneurial leadership performance and management strategies within educational organizations. Conversely, participants were also asked to evaluate the entrepreneurial leadership behaviors they implemented themselves. Additionally, the teachers' sense of efficacy scale was developed by Tschannen-Moran and Hoy (2001). This scale included three dimensions. Teachers rated their capabilities and performance in terms of enhancing student engagement in their studies and exam outcomes. The study involved 30 teachers for a pilot test. The three instruments contained a total of 154 items, and all Cronbach's alpha scores exceeded the acceptable level of 0.60, indicating that the instruments are reliable.

3.3 Statistical analysis

The study used SPSS (25) and AMOS (24) for statistical analysis. SPSS evaluated reliability testing and correlation analysis, while AMOS used confirmatory factor analysis (CFA) to develop a measurement model and a structural model through path analysis, as well as the bootstrap method to validate the relationships among the variables. The specific analysis of structural equation modeling is as follows.

4 Results

4.1 Constructing latent measures

The goodness-of-fit evaluation metrics for structural equation models can be categorized into absolute fit indices (RMSEA), comparative fit indices (CFI/TLI), and parsimonious fit indices (χ^2/df). Kline (2011) indicated that χ^2/df values between 1 and 3 are considered acceptable. Hu and Bentler (1999) noted that if CFI/TLI > 0.9, the model is considered to fit well, while CFI/TLI > 0.8 is deemed acceptable. Byrne (2010) proposed that RMSEA < 0.08 is typically interpreted as indicating a reasonable error of approximation. Specifically, the organizational effectiveness instrument demonstrates internal consistency at an acceptable level, with a Cronbach's alpha of 0.918. The model fit indices are satisfactory (S=B $\chi^2 = 813.795$, $\chi^2/df = 3.085$, RMSEA = 0.076, CFI = 0.902, TLI = 0.875) as shown in Appendix 1. The entrepreneurial leadership instrument for principals also exhibits internal consistency at an acceptable level, with a Cronbach's alpha of 0.826. The model fit indices meet acceptable thresholds (S=B $\chi^2 = 2,613.577$, $\chi^2/df = 2.341$, RMSEA = 0.061, CFI = 0.873, TLI = 0.858) in Appendix 2. The entrepreneurial leadership instrument for teachers reflects internal consistency at an acceptable level, with a Cronbach's Alpha of 0.651. The model fit indices meet acceptable thresholds (S=B $\chi^2 = 2,507.372$, $\chi^2/df = 2.119$, RMSEA = 0.060, CFI = 0.872, TLI = 0.865) in Appendix 3. The teacher efficacy instrument also shows internal consistency at an acceptable level,

with a Cronbach's alpha of 0.932. The model fit indices are also acceptable (S=B $\chi^2 = 374.660$, $\chi^2/df = 3.183$, RMSEA = 0.079, CFI = 0.905, TLI = 0.894) in Appendix 4.

4.2 Structural models outcomes

After conducting confirmatory factor analysis (CFA) on the measurement models of all four variables, the results demonstrated satisfactory model fit and validity. Figure 2 shows the complete structural model results. The structural model comprises principal entrepreneurial leadership with five dimensions encompassing 48 items, teacher entrepreneurial leadership with five dimensions consisting of 45 items, teacher efficacy with three dimensions featuring 16 items, and organizational effectiveness with eight dimensions including 27 items. The model fit indices are at an acceptable level (S=B $\chi^2 = 365.792$, $\chi^2/df = 3.682$, RMSEA = 0.079, CFI = 0.904, TLI = 0.913).

The results of path analysis in Table 1 show that research question 1 is supported, indicating a positive relationship between principal entrepreneurial leadership and teacher entrepreneurial leadership ($\beta = 0.084$, $p < 0.01$). Research question 2 confirms that both principal entrepreneurial leadership and teacher entrepreneurial leadership are positively associated with teacher efficacy, with a significantly larger effect size for the relationship between principal entrepreneurial leadership and teacher efficacy ($\beta = 0.512$, $p < 0.001$) compared to teacher entrepreneurial leadership

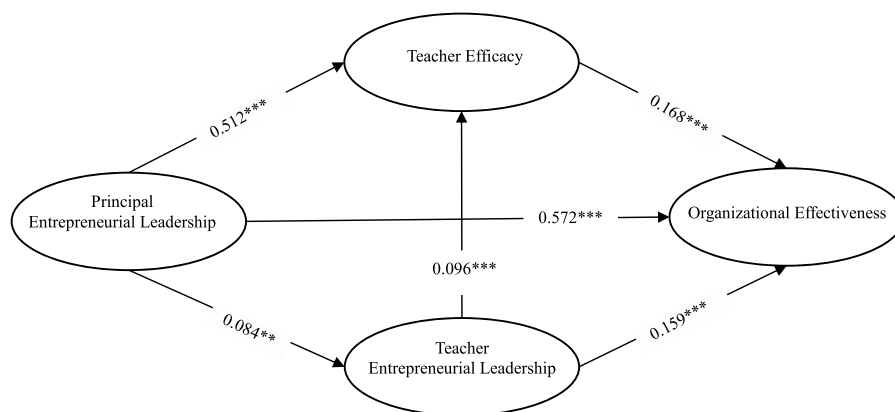


FIGURE 2
Structural model outcome. *** $P < 0.001$.

TABLE 1 Path relationship verification of the structural model.

Path relationship			Estimate	S.E.	C.R.	P
Principal entrepreneurial leadership	—>	Teacher entrepreneurial leadership	0.084	0.049	2.813	**
Principal entrepreneurial leadership	—>	Teacher efficacy	0.512	0.046	9.141	***
Teacher entrepreneurial leadership	—>	Teacher efficacy	0.096	0.060	2.864	***
Principal entrepreneurial leadership	—>	Organizational effectiveness	0.572	0.051	10.152	***
Teacher entrepreneurial leadership	—>	Organizational effectiveness	0.159	0.051	3.175	***
Teacher efficacy	—>	Organizational effectiveness	0.168	0.062	3.495	***

** $P < 0.01$, *** $P < 0.001$.

leadership and teacher efficacy ($\beta = 0.096, p < 0.001$). Research question 3 illustrates that both principal entrepreneurial leadership and teacher entrepreneurial leadership are positively related to organizational effectiveness, where the effect size between principal entrepreneurial leadership and organizational effectiveness ($\beta = 0.572, p < 0.001$) is greater than that between teacher entrepreneurial leadership and organizational effectiveness ($\beta = 0.168, p < 0.001$). Finally, research question 4 shows that teacher efficacy is positively related to organizational effectiveness ($\beta = 0.168, p < 0.001$).

5 Discussion

Based on the results, the study first finds that principal entrepreneurial leadership is positively related to teacher entrepreneurial leadership, with a standardized coefficient effect size of 0.084. This indicates that principals, as trailblazers in educational organizations, can motivate teachers to adopt innovative entrepreneurial practices in their teaching by implementing entrepreneurial leadership. This outcome resonates with past research that shows principal instructional leadership positively promotes the improvement of teacher instructional leadership and professional development (Liu et al., 2022). Principal entrepreneurial leadership assists in promoting educational reform and improvement within school organizations, providing more resource support and implementation opportunities for teacher-led instructional innovations. This impact is beneficial for improving the professional development and teaching effectiveness of teachers, simultaneously fostering the development and application of teacher entrepreneurial leadership.

The second finding is that principal entrepreneurial leadership is positively related to teacher efficacy, while teacher entrepreneurial leadership is related to teacher efficacy with a small effect size of 0.096 standardized coefficients. Based on previous research (Brauckmann-Sajkiewicz and Pashiardis, 2022; Cansoy et al., 2022; Wibowo and Saptono, 2018), strong relationships between different types of principal leadership and teacher efficacy have been consistently demonstrated. Principals possess a wider range of educational and leadership skills, such as financial management and human resource management, to ensure effective teaching activities for teachers and the smooth operation of the organization. Teacher entrepreneurial leadership motivates teachers to continuously explore and apply teaching practices, support their professional development, provide continuous feedback, and stimulate their innovation, self-reflection, and problem-solving abilities, enhancing their efficacy and elevating the teaching level and sense of work achievement of individual teachers. However, as a new concept, teacher entrepreneurial leadership has not been extensively studied or widely applied in practice, resulting in a less significant relationship between teacher entrepreneurial leadership and teacher efficacy.

Third, this study verified that both principal and teacher entrepreneurial leadership are linked to organizational effectiveness. However, the effect size of principal entrepreneurial leadership on organizational effectiveness is significantly greater than that of teacher entrepreneurial leadership. Indeed, whether as principals or teachers, entrepreneurial leadership emphasizes

innovation and exploration alongside the ability to drive innovation, management practices, and school operations to achieve educational goals and foster organizational development. This suggests that principals and teachers in organizations exhibiting a high level of entrepreneurial leadership behavior are more willing to enhance organizational adaptability to uncertain environments, discover and explore strategic value creation, conduct regular risk assessments to address uncertain challenges, and develop new operating models that lead to increased organizational effectiveness. This approach is more conducive to the sustainable development of school organizations. Both principal and teacher entrepreneurial leadership can enhance organizational effectiveness, though they play distinct roles in this area. First, differences in scope and influence mean that principal entrepreneurial leadership typically encompasses a broader range of levels and decision-making impacts. This includes strategies, resource allocation, and the formulation of educational policies at the institutional or school-wide level, while teacher entrepreneurial leadership usually focuses on classroom teaching, innovative teaching methods, and implementing personalized learning for students. Second, due to differences in power and responsibility, principals, as school leaders, generally possess more authority and responsibility, which can directly affect the direction and development of the school. Although teacher entrepreneurial leadership is also significant, its influence is mainly restricted to their specific teaching fields and direct interactions with students. While both teachers and principals can demonstrate entrepreneurial leadership, their differing roles and responsibilities within the education system lead to notable variations in the practice and impact of such leadership. Therefore, the study of principal and teacher entrepreneurial leadership is crucial and urgently requires scholars to conduct further in-depth exploration.

Fourth, there is a positive relationship between teacher efficacy and organizational effectiveness. Early studies have examined the relationships within different types of schools (Gowrie and Ramdass, 2014; Minghui et al., 2018; Ninković and Knezevic-Florici, 2018). This latest study aligns with these previous findings. Teachers enhance their knowledge reserves and update educational technology and teaching methods to support the learning needs of students, stimulate their potential, improve academic performance, and ultimately foster the overall development of school organizations.

The critical findings suggest that the priorities of school organizations include effective management, serving society, nurturing students, and developing a group of excellent teachers. The open social system theory provides a foundational perspective for understanding the dynamic interactions among the input, process, and output stages in this study. This framework is particularly relevant as it aligns with the relationship between principal entrepreneurial leadership (input), teacher entrepreneurial leadership and efficacy (process), and organizational effectiveness (output). Our findings show that principal entrepreneurial leadership, as an input factor, significantly influences teacher entrepreneurial leadership and efficacy, which, in turn, drives organizational effectiveness. This supports the open social system theory's emphasis on the interdependence of system components. This study extends the open social system theory by demonstrating its applicability in

the context of educational leadership. Specifically, our findings highlight the critical role of entrepreneurial leadership at both the principal and teacher levels, suggesting that the theory can be enriched by integrating entrepreneurial dynamics as a key element of system processes. Under the framework of open social system theory, the entrepreneurial leadership of the principal directly affects the input stage of the organization, determining what resources can be acquired from the external environment and how they can be utilized. Teacher entrepreneurial leadership is a crucial aspect of the organizational process stage, influencing how input resources are transformed into educational outcomes. Teacher efficacy serves as a key link in converting input resources into output results, directly affecting organizational effectiveness. Ultimately, organizational effectiveness results from the combined effects of principal entrepreneurial leadership, teacher entrepreneurial leadership, and teacher efficacy, which also functions as an important feedback mechanism for the interaction between the organization and its external environment.

Therefore, based on the open social system theory and the study outcome model, an educational organization that supports teachers' growth and development should also be responsible for fostering student growth. In the symbiotic and mutually beneficial relationship between organizations, principals, and teachers, school organizations and principals must assist in developing teachers, promote student growth, and ultimately achieve the goal of enhancing school development and effectiveness. To create an effective organizational operating system, greater emphasis should be placed on the growth and integration of teacher and principal entrepreneurial leadership throughout the development of the complete educational system. In summary, principals and teachers significantly influence the development of educational organizations. The importance of entrepreneurial leadership for principals and teachers lies in promoting educational innovation, improving teaching quality, enhancing teacher efficacy, establishing a positive school culture, and advancing the overall development of schools. This type of leadership fosters individual teachers' improvement and has a profound and positive impact on the educational mission and organizational effectiveness of schools.

6 Limitations

Firstly, this study examined the relationship between organizational effectiveness, principal entrepreneurial leadership, teacher entrepreneurial leadership, and teacher efficacy across various educational organizations in Shandong Province. Covering 9.6 million square kilometers, China is home to 1.4 billion people. While each teacher in the sample hails from the same Chinese province, variations in regulations, customs, and economic development may lead to differing perspectives on the same topic among respondents when answering questions. Therefore, it is important to consider the universal applicability of the research results. Second, all the research questions presented in the questionnaire are based on self-reported data from teachers. Qualitative research techniques are necessary to further explore principals' personal experiences in applying entrepreneurial leadership and to evaluate the entrepreneurial leadership and efficacy of teachers. Additionally, future studies could consider including other variables as potential influencing factors.

7 Conclusion

The study investigates the applicability of Western-developed models of entrepreneurial leadership, teacher efficacy, and organizational effectiveness within the Chinese educational context. It establishes several key relationships and reveals that principal entrepreneurial leadership is positively related to teacher entrepreneurial leadership and teacher efficacy, while teacher entrepreneurial leadership is associated with teacher efficacy. Furthermore, both principal entrepreneurial leadership and teacher entrepreneurial leadership are linked to organizational effectiveness, and a positive relationship exists between teacher efficacy and organizational effectiveness. Based on these relationships, a comprehensive model was developed and tested by integrating several theoretical frameworks, including principal entrepreneurial leadership, teacher entrepreneurial leadership, teacher efficacy, and organizational effectiveness. The findings demonstrate the adaptability of Western theoretical frameworks in the Chinese context and provide empirical evidence of the interconnected relationships among these critical educational factors.

8 Implication

8.1 Strengthening the application of principal entrepreneurial leadership within organizations

The advancement of global society necessitates the efficient utilization of abundant information and material resources, where principals' entrepreneurial leadership becomes crucial for educational organizations. This study expands the scope of research on entrepreneurial leadership, offering a theoretical foundation and support for subsequent studies in entrepreneurial educational management. It contributes to enhancing the practical effectiveness of educational leadership administration, fostering comprehensive development and innovation in the education system, and providing important support for achieving higher-quality education. By strengthening principals' entrepreneurial leadership in strategic educational development, school management, and social relations, school organizations can achieve greater development and growth.

8.2 Emphasize the education and cultivation of entrepreneurial leadership among teachers

Encouraging teachers to enhance their theoretical knowledge of entrepreneurial leadership as part of their personal and professional development is essential. By promptly understanding these concepts, teachers can more effectively cultivate entrepreneurial leadership in both practical and theoretical contexts. For example, offering training courses and dedicated study time can help teachers develop their entrepreneurial leadership capabilities. Teacher entrepreneurial leadership can stimulate teaching innovation and knowledge sharing among teachers, which helps them enhance

their self-efficacy, personal growth, and development and can promote educational innovation within school organizations as well.

8.3 Improve the supervision and management mechanism for organizational effectiveness

For sustainable development, educational organizations should establish a regulatory mechanism, enforce strict recruitment requirements, and implement review rules for evaluating their performance and effectiveness. Monitoring and regulating the service quality and operational effectiveness of these educational organizations, along with developing a pleasant, supportive, and flexible learning environment, are crucial for creating a more productive educational and learning atmosphere for China's youth.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants or participants legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

LJ: Investigation, Methodology, Resources, Writing – original draft, Writing – review & editing. NA: Supervision, Validation, Visualization, Conceptualization, Methodology, Writing – review

& editing. SK: Supervision, Validation, Visualization, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research and/or publication of this article.

Acknowledgments

We thank all the teachers who participated in this study.

Conflict 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.

Generative AI statement

The author(s) declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2025.1545888/full#supplementary-material>

References

- Adeel, A. K., Asimiran, S. B., Kadir, S. A., Alias, S. N., Atta, B., Bularafa, B. A., et al. (2020). Instructional leadership and students academic performance: mediating effects of teacher's organizational commitment. *Int. J. Learn. Teach. Educ. Res.* 19, 233–247. doi: 10.26803/ijlter.19.10.13
- Al-Mahdy, Y. F. H., Emam, M. M., and Hallinger, P. (2018). Assessing the contribution of principal instructional leadership and collective teacher efficacy to teacher commitment in Oman. *Teach. Teach. Educ.* 69, 191–201. doi: 10.1016/j.tate.2017.10.007
- Amorim Neto, R., Picanco Rodrigues, V., and Panzer, S. (2017). Exploring the relationship between entrepreneurial behavior and teachers' job satisfaction. *Teach. Teach. Educ.* 63, 254–262. doi: 10.1016/j.tate.2017.01.001
- Amorim Neto, R., Rodrigues, V. P., Polega, M., and Persons, M. (2019). Career adaptability and entrepreneurial behaviour in the K-12 classroom. *Teach. Teach.* 25, 90–109. doi: 10.1080/13540602.2018.1526783
- Anderson, L., Hibbert, P., Mason, K., and Rivers, C. (2018). Management education in turbulent times. *J. Manag. Educ.* 42, 423–440. doi: 10.1177/1052562918779421
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York, NY: WH Freeman/Times Books/Henry Holt and Co.
- Bell, D. (2016). The lady music teacher as entrepreneur: minnie sharp and the Victoria conservatory of music in the 1890s. *BC Studies* 85:191.
- Brauckmann-Sajkiewicz, S., and Pashiardis, P. (2022). Entrepreneurial leadership in schools: linking creativity with accountability. *Int. J. Leadersh. Educ.* 25, 787–801. doi: 10.1080/13603124.2020.1804624
- Braunerhjelm, P., Ding, D., and Thulin, P. (2018). The knowledge spillover theory of intrapreneurship. *Small Bus. Econ.* 51, 1–30. doi: 10.1007/s11187-017-9928-9
- Bulger, S. M., Jones, E. M., Katz, N., Shrewsbury, G., and Wood, J. (2016). Swimming with sharks: a physical educator's guide to effective crowd sourcing. *J. Phys. Educ. Recreat. Dance* 87, 21–26. doi: 10.1080/07303084.2016.1216487

- Byrne, B. M. (2010). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming (2nd ed.)*. New York: Taylor and Francis Group.
- Cameron, K. (1978). Measuring organizational effectiveness in institutions of higher education. *Adm. Sci. Q.* 23, 604–632. doi: 10.2307/2392582
- Cansoy, R., Parlar, H., and Polatcan, M. (2022). Collective teacher efficacy as a mediator in the relationship between instructional leadership and teacher commitment. *Int. J. Leadersh. Educ.* 25, 900–918. doi: 10.1080/13603124.2019.1708470
- Cochran, W. G. (1991). *Sampling Techniques*, 3rd Edn. Hoboken, NJ: Wiley Press.
- Croucher, R., Gooderham, P., and Rizov, M. (2017). Research performance and the organizational effectiveness of universities. *J. Organ. Eff. People Perform.* 5, 1–41. doi: 10.1108/JOEPP-06-2017-0057
- Cunningham, J. B., and Lischeron, J. (1991). Defining entrepreneurship. *J. Small Bus. Manag.* 29, 45–61.
- Das, D. (2011). 4C model: a new approach to determine and measure organizational effectiveness. *ERP. N.* doi: 10.2139/ssrn.1879413
- Demir, S. (2021). Organizational trust perception and innovative behaviours of teachers. *Eur. J. Educ. Manag.* 1, 25–33. doi: 10.12973/eujem.4.1.25
- Diamond, J. B., and Spillane, J. P. (2016). School leadership and management from a distributed perspective: a 2016 retrospective and prospective. *Manag. Educ.* 30, 147–154. doi: 10.1177/0892020616665938
- Ding, L., and Hong, Z. (2023). On the relationship between pre-service teachers' sense of self-efficacy and emotions in the integration of technology in their teacher developmental programs. *Asia-Pac. Educ. Res.* 1–10. doi: 10.1007/s40299-023-00758-6
- Eesley, C. E., and Lee, Y. S. (2021). Do university entrepreneurship programs promote entrepreneurship? *Strategic Manag. J.* 42, 833–861. doi: 10.1002/smj.3246
- Eshkaftaki, A., Elham, R., Saadat, G., and Mahmoodi, D. (2010). Study of relation between teachers entrepreneurship and principals transformational leadership style at Shahrekord high schools. *Intersci. Manag. Rev.* 137–140.
- Fackler, S., and Malmberg, L.-E. (2016). Teachers' self-efficacy in 14 OECD countries: teacher, student group, school and leadership effects. *Teach. Teach. Educ.* 56, 185–195. doi: 10.1016/j.tate.2016.03.002
- Fackler, S., Malmberg, L.-E., and Sammons, P. (2021). An international perspective on teacher self-efficacy: Personal, structural and environmental factors. *Teach. Teach. Educ.* 99:103255. doi: 10.1016/j.tate.2020.103255
- Fontana, A., and Musa, S. (2017). The impact of entrepreneurial leadership on innovation management and its measurement validation. *Int. J. Innov. Sci.* 9, 2–19. doi: 10.1108/IJIS-05-2016-0004
- Gibson, S., and Dembo, M. H. (1984). Teacher efficacy: a construct validation. *J. Educ. Psychol.* 76, 569–582. doi: 10.1037/0022-0663.76.4.569
- Gowrie, G., and Ramdass, M. (2014). Dimensions of teacher efficacy and student academic achievement in selected primary schools in Trinidad and Tobago. *Br. J. Educ. Soc. Behav. Sci.* 4, 1358–1371. doi: 10.9734/BJESBS/2014/10406
- Grohs, S., Schneiders, K., and Heinze, R. G. (2015). Social entrepreneurship versus intrapreneurship in the German social welfare state: a study of old-age care and youth welfare services. *Nonprofit Volunt. Sector Q.* 44, 163–180. doi: 10.1177/0899764013501234
- Hanson, J. (2017). Exploring relationships between K–12 music educators' demographics, perceptions of intrapreneuring, and motivation at work. *J. Res. Music Educ.* 65, 309–327. doi: 10.1177/0022429417722985
- He, L., Zheng, L. J., Sharma, P., and Leung, T. Y. (2024). Entrepreneurial education and established business activities: an international perspective. *Int. J. Manag. Educ.* 22, 1–12. doi: 10.1016/j.ijme.2023.100922
- Heijden, H. R. M. A., Geldens, J., Beijaard, D., and Popeijus, H. L. (2015). Characteristics of teachers as change agents. *Teach. Teach.* 21, 681–699. doi: 10.1080/13540602.2015.1044328
- Heze Education and Sports Statistics Bureau. (2023). *Statistics from the Education and Sports Bureau of Heze City in 2023*. Heze Bureau of Statistics. Available online at: <http://hzjy.heze.gov.cn/>
- Hietanen, L. (2015). Entrepreneurial learning environments: supporting or hindering diverse learners? *Educ. Train.* 57, 512–531. doi: 10.1108/ET-04-2014-0047
- Hitt, M. A., Ireland, R. D., Sirmon, D. G., and Trahms, C. A. (2011). Strategic entrepreneurship: creating value for individuals, organizations, and society. *Acad. Manag. Perspect.* 25, 57–75. doi: 10.5465/AMP.2011.61020802
- Ho, M. C. S., Lu, J., and Bryant, D. A. (2021). Understanding teacher entrepreneurial behavior in schools: conceptualization and empirical investigation. *J. Educ. Change* 22, 535–564. doi: 10.1007/s10833-020-09406-y
- Hoang, G., Hoang Luu, T., Tran, Q., and Yang, M. (2024). The impact of narcissism on entrepreneurial intentions: the roles of entrepreneurial alertness, entrepreneurial passion, and internal locus of control. *Int. J. Manag. Educ.* 22, 1–13. doi: 10.1016/j.ijme.2024.101021
- Hoy, W. K. (2019). *Theory of the School as a Open-Social System*. Available online at: <https://www.waynekhoy.com/> (accessed December 15, 2023).
- Hu, B., Li, Y., Wang, C., Reynolds, B., and Wang, S. (2019). The relation between school climate and preschool teacher stress: the mediating role of teachers' self-efficacy. *J. Educ. Adm.* 57, 748–767. doi: 10.1108/JEA-08-2018-0146
- Hu, L.-t., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model.* 6, 1–55. doi: 10.1080/10705519909540118
- Huang, Y., An, L., Liu, L., Zhuo, Z., and Wang, P. (2020). Exploring factors link to teachers' competencies in entrepreneurship education. *Front. Psychol.* 11:563381. doi: 10.3389/fpsyg.2020.563381
- Hunzicker, J. (2017). Using Danielson's framework to develop teacher leaders. *Kappa Delta Pi Record* 53, 12–17. doi: 10.1080/00228958.2017.1264814
- Jacobsen, C. B., Andersen, L. B., Bøllingtoft, A., and Eriksen, T. L. M. (2022). Can leadership training improve organizational effectiveness? Evidence from a randomized field experiment on transformational and transactional leadership. *Public Adm. Rev.* 82, 117–131. doi: 10.1111/puar.13356
- Jinan Education Statistics Bureau. (2023). *2023 Jinan Education Statistics Briefing*. Jinan Bureau of Statistics. Available online at: http://jnedu.jinan.gov.cn/art/2024/6/24/art_30353_4791935.html
- Kalhor, R., Hashemi, F., Neysari, N., Shahsavari, S., and Rafei, S. (2020). The mediating role of entrepreneurship behavior in the relationship between social capital and job performance: a study among faculty members of a medical university. *Health Scope* 9:e102691. doi: 10.5812/jhealthscope.102691
- Keddie, A. (2018). Supporting disadvantaged students in an English primary school: Matters of entrepreneurial and traditional professionalism. *Cambridge J. Educ.* 48, 197–212. doi: 10.1080/0305764X.2016.1270257
- Keyhani, N., and Kim, M. S. (2021). A systematic literature review of teacher entrepreneurship. *Entrepren. Educ. Pedagog.* 4, 376–395. doi: 10.1177/2515127420917355
- Khan, A. A. (2021). *Mediating effects of teachers' organisational commitment on relationship between instructional leadership, self-efficacy and primary school students' academic performance in Pakistan* [Doctoral Dissertations, Universiti Putra Malaysia]. Available online at: <http://psasir.upm.edu.my/id/eprint/98315>
- Khanshan, S. K., and Yousefi, M. H. (2020). The relationship between self-efficacy and instructional practice of in-service soft disciplines, hard disciplines and EFL teachers. *Asian-Pac. J. Second Foreign Lang. Educ.* 5:1. doi: 10.1186/s40862-020-0080-8
- Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling*. New York, NY: The Guilford Press.
- Kuang, H., and Deng, W. (2010). A survey of the measurement of teacher efficacy. *J. Guizhou Norm. Coll.* 26, 80–82.
- Li, J., Aziz, N., and Kadir, S. A. (2024). Harmonizing success: unraveling the interplay of principal entrepreneurial leadership, teacher efficacy, and organizational effectiveness in English training institutions of China. *Front. Educ.* 9:1414640. doi: 10.3389/feduc.2024.1414640
- Liu, S., and Hallinger, P. (2018). Principal instructional leadership, teacher self-efficacy, and teacher professional learning in China: testing a mediated-effects model. *Educ. Adm. Q.* 54, 1–28. doi: 10.1177/0013161X18769048
- Liu, Y., Li, L., and Huang, C. (2022). To what extent is shared instructional leadership related to teacher self-efficacy and student academic performance in China? *Sch. Effect. Sch. Improv.* 33, 381–402. doi: 10.1080/09243453.2022.2029746
- Liu, Y., and Xi, M. (2021). Linking CEO entrepreneurial orientation to firm performance: the perspective of middle managers' cognition. *Entrepren. Theory Pract.* 46, 1756–1781. doi: 10.1177/10422587211033571
- Luo, S., and Ye, A. (2012). *Educational Management*. China People's University Press: Beijing.
- Lurtz, K., and Kreutzer, K. (2017). Entrepreneurial orientation and social venture creation in nonprofit organizations: the pivotal role of social risk taking in collaboration. *Nonprofit Volunt. Sector Q.* 46, 92–115. doi: 10.1177/0899764016654221
- Martin, A., Abd-El-Khalick, F., Mustari, E., and Price, R. (2018). Effectual reasoning and innovation among entrepreneurial science teacher leaders: a correlational study. *Res. Sci. Educ.* 48, 1297–1319. doi: 10.1007/s11165-016-9603-1
- Minghui, L., Lei, H., Chen, X., and Potmšilc, M. (2018). Teacher efficacy, work engagement, and social support among Chinese special education school teachers. *Front. Psychol.* 9:648. doi: 10.3389/fpsyg.2018.00648
- Murni, M. Y., Mohd Adlan, R., Zaidatol Akmaliah, L. P., and Ramli, B. (2017). The mediating effect of school culture in the relationship between instructional leadership and school academic achievement. *Imp. J. Interdiscip. Res.* 3, 79–87
- Ninković, S., and Knezevic-Florici, O. (2018). Validation of the Serbian version of the teachers' sense of efficacy scale (TSES). *Zbornik Instituta za pedagogsku istraživanja* 50, 72–92. doi: 10.2298/ZIPI1801072N
- Omer Attali, M., and Yemini, M. (2017). Initiating consensus: stakeholders define entrepreneurship in education. *Educ. Rev.* 69, 140–157. doi: 10.1080/00131911.2016.1153457

- Rietveld, C. A., Hessels, J., and van der Zwan, P. (2015). The stature of the self-employed and its relation with earnings and satisfaction. *Econ. Hum. Biol.* 17, 59–74. doi: 10.1016/j.ehb.2015.02.001
- Rizhao Education Statistics Bureau. (2023). *Statistical Bulletin on Education in Rizhao City*. Rizhao Bureau of Statistics. Available online at: http://www.rizhao.gov.cn/art/2024/3/19/art_207449_10492907.html
- Roebuck, C. (2011). *Critical need for entrepreneurial leaders during turbulent times [Chris Roebuck: Transforming Organisational and Individual Performance via Entrepreneurial Leadership]*. Available online at: <http://chris.roebuck.co/blog/critical-need-for-entrepreneurial-leaders-during-turbulent-times> (accessed May 23, 2023).
- Sanchez, R. U. (2014). Education in action: an engine of change, creativity, innovation, leadership and social commitment. *Q. Rev. Dist. Educ.* 15:33.
- Schimmel, I. (2016). Entrepreneurial educators: a narrative study examining entrepreneurial educators in launching innovative practices for K-12 schools. *Contemp. Issues Educ. Res.* 9:53. doi: 10.19030/cier.v9i2.9615
- Scott, W. R., and Davis, G. F. (2015). *Rational, Natural, and Open System Perspectives*. Oxfordshire: Routledge.
- Shandong Provincial Department of Education. (2024). *Shandong Statistical Yearbook 2023*. Shandong Provincial Bureau of Statistics. Available online at: <http://tjj.shandong.gov.cn/col/col6293/index.html> (accessed December 15, 2023).
- Shelton, C., and Archambault, L. (2018). Discovering how teachers build virtual relationships and develop as professionals through online teacher entrepreneurship. *J. Interact. Learn. Res.* 29, 579–602.
- Skaalvik, E., and Skaalvik, S. (2007). Dimensions of teacher self-efficacy and relations with strain factors, perceived collective teacher efficacy, and teacher burnout. *J. Educ. Psychol.* 99, 611–625. doi: 10.1037/0022-0663.99.3.611
- Tan, F. Z., and Olaore, G. O. (2022). Effect of organizational learning and effectiveness on the operations, employees productivity and management performance. *Vilakshan-XIMB J. Manag.* 19, 110–127. doi: 10.1108/XJM-09-2020-0122
- Thornberry, N. (2006). *Lead like an Entrepreneur*. McGraw-Hill Press: New York.
- Tschannen-Moran, M., Hoy, A., and Hoy, W. (1998). Teacher efficacy: its meaning and measure. *Rev. Educ. Res.* 68, 202–248. doi: 10.3102/00346543068002202
- Tschannen-Moran, M., and Hoy, A. W. (2001). Teacher efficacy: capturing an elusive construct. *Teach. Teach. Educ.* 17, 783–805. doi: 10.1016/S0742-051X(01)00036-1
- Walker, A., Hu, R., and Qian, H. (2012). Principal leadership in China: an initial review. *Sch. Effect. Sch. Improv.* 23, 369–399. doi: 10.1080/09243453.2012.678863
- Waweru, N. M., Kihoro, J. M., and Gachunga, H. G. (2021). Does teachers' self-efficacy influence their organizational commitment? *Indep. J. Manag. Prod.* 12, 1537–1553. doi: 10.14807/ijmp.v12i5.1357
- Wibowo, A., and Saptono, A. (2018). Does entrepreneurial leadership impact on creativity and innovation of elementary teachers. *J. Entrepren. Educ.* 21, 1–9.
- Xia, L. (2016). A study on the strategies of improving college English teachers' sense of efficacy in China and Thailand. *Univ. Educ.* 3, 94–95.
- Youzi, W., and Jian, Z. (2022). "Theoretical research on the evaluation indicators of organizational effectiveness," in *Proceedings of the 2022 7th International Conference on Modern Management and Education Technology (MMET 2022)* (Atlantis Press), 425–430.
- Zainal, M. A., and Matore, M. E. E. (2021). The influence of teachers' self-efficacy and school leaders' transformational leadership practices on teachers' innovative behaviour. *Int. J. Environ. Res. Public Health* 18:6423. doi: 10.3390/ijerph18126423
- Zhang, D., Xu, Z., and Zhao, S. (2020). *Educational Management*. Higher Education Press: Beijing.
- Zheng, X., Yin, H., and Li, Z. (2019). Exploring the relationships among instructional leadership, professional learning communities and teacher self-efficacy in China. *Educ. Manag. Admin. Leadersh.* 47, 843–859. doi: 10.1177/1741143218764176
- Zheng, Y. (2002). *School Effectiveness and School-based Management*. Shanghai: Shanghai Education Press.
- Zhu, R., Liu, Z., Zhao, G., Huang, A., and Yu, Q. (2023). The impact of institutional management on teacher entrepreneurship competency: the mediating role of entrepreneurial behaviour. *Int. J. Manag. Educ.* 21:100794. doi: 10.1016/j.ijme.2023.100794