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# Designing a framework for entrepreneurship education in Chinese higher education: a theoretical exploration and empirical case study

Luning Shao<sup>1</sup>, Yuxin Miao<sup>2</sup>, Shengce Ren<sup>3</sup>, Sanfa Cai<sup>4</sup> & Fei Fan<sup>5,6</sup>  [✉](mailto:04050@tongji.edu.cn)

Entrepreneurship education (EE) has rapidly evolved within higher education and has emerged as a pivotal mechanism for cultivating innovative and entrepreneurial talent. In China, while EE has made positive strides, it still faces a series of practical challenges. These issues cannot be effectively addressed solely through the efforts of universities. Based on the triple helix (TH) theory, this study delves into the unified objectives and practical content of EE in Chinese higher education. Through a comprehensive literature review on EE, coupled with educational objectives, planned behavior, and entrepreneurship process theories, this study introduces the 4H objective model of EE. 4H stands for Head (mindset), Hand (skill), Heart (attitude), and Help (support). Additionally, the research extends to a corresponding content model that encompasses entrepreneurial learning, entrepreneurial practice, startup services, and the entrepreneurial climate as tools for achieving the objectives. Based on a single-case approach, this study empirically explores the application of the content model at T-University. Furthermore, this paper elucidates how the university plays a role through the comprehensive development of entrepreneurial learning, practices, services, and climate in nurturing numerous entrepreneurs and facilitating the flourishing of the regional entrepreneurial ecosystem. This paper provides important contributions in its application of TH theory to develop EE within the Chinese context, and it provides clear guidance by elucidating the core objectives and practical content of EE. The proposed conceptual framework serves not only as a guiding tool but also as a crucial conduit for fostering the collaborative development of the EE ecosystem. To enhance the robustness of the framework, this study advocates strengthening empirical research on TH theory through multiple and comparative case studies.

<sup>1</sup>School of Economics and Management, Tongji University, Shanghai, China. <sup>2</sup>Shanghai International College of Design & Innovation, Tongji University, Shanghai, China. <sup>3</sup>Shanghai International College of Intellectual Property, Tongji University, Shanghai, China. <sup>4</sup>Institute of Higher Education, Tongji University, Shanghai, China. <sup>5</sup>College of Design and Innovation, Tongji University, Shanghai, China. <sup>6</sup>Shanghai Industrial Innovation Ecosystem Research Center, Tongji University, Shanghai, China. ✉email: [04050@tongji.edu.cn](mailto:04050@tongji.edu.cn)

## Introduction

In the era of the knowledge economy, entrepreneurship has emerged as a fundamental driver of social and economic development. As early as 1911, Schumpeter proposed the well-known theory of economic development, wherein he first introduced the concepts of entrepreneurship and creative destruction as driving forces behind socioeconomic development. Numerous endogenous growth theories, such as the entrepreneurial ecosystem mechanism of Acs et al. (2018), which also underscores the pivotal role of entrepreneurship in economic development, are rooted in Schumpeter's model. Recognized as a key means of cultivating entrepreneurs and enhancing their capabilities (Jin et al., 2023), entrepreneurship education (EE) has received widespread attention over the past few decades, especially in the context of higher education (Wong & Chan, 2022).

Driven by international trends and economic demands, China places significant emphasis on nurturing innovative talent and incorporating EE into the essential components of its national education system. The State Council's "Implementation Opinions on Deepening the Reform of Innovation and Entrepreneurship Education in Higher Education" (hereafter referred to as the report) underscores the urgent necessity for advancing reforms in innovation and EE in higher education institutions. This initiative aligns with the national strategy of promoting innovation-driven development and enhancing economic quality and efficiency. Furthermore, institutions at various levels are actively and eagerly engaging in EE.

Despite the positive strides made in EE in China, its development still faces a series of formidable practical challenges. As elucidated in the report, higher education institutions face challenges such as a delay in the conceptualization of EE, inadequate integration with specialized education, and a disconnect from practical applications. Furthermore, educators exhibit a deficiency in awareness and capabilities, which manifests in a singular and less effective teaching methodology. The shortage of practical platforms, guidance, and support emphasizes the pressing need for comprehensive innovation and EE systems. These issues necessitate collaborative efforts from universities, industry, and policymakers.

Internationally established solutions for the current challenges have substantially matured, providing invaluable insights and guidance for the development of EE in the Chinese context. In the late 20th century, the concept of the entrepreneurial university gained prominence (Etzkowitz et al., 2000). Then, entrepreneurial universities expanded their role from traditional research and teaching to embrace a "third mission" centered on economic development. This transformation entailed fostering student engagement in entrepreneurial initiatives by offering resources and guidance to facilitate the transition of ideas into viable entrepreneurial ventures. Additionally, these entrepreneurial universities played a pivotal role in advancing the triple helix (TH) model (Henry, 2009). The TH model establishes innovation systems that facilitate knowledge conversion into economic endeavors by coordinating the functions of universities, government entities, and industry. The robustness of this perspective has been substantiated through comprehensive theoretical and empirical investigations (Mandrup & Jensen, 2017).

Therefore, this study aims to explore how EE in Chinese universities can adapt to new societal trends and demands through the guidance of TH theory. This research involves two major themes: educational objectives and content. Educational objectives play a pivotal role in regulating the entire process of educational activities, ensuring alignment with the principles and norms of education (Whitehead, 1967), while content provides a practical pathway to achieving these objectives. Specifically, the study has three pivotal research questions:

**RQ1:** What is the present landscape of EE research?

**RQ2:** What unified macroscopic goals should be formulated to guide EE in Chinese higher education?

**RQ3:** What specific EE system should be implemented to realize the identified goals in Chinese higher education?

The structure of this paper is as follows: First, we conduct a comprehensive literature review on EE to answer RQ1, thereby establishing a robust theoretical foundation. Second, we outline our research methodology, encompassing both framework construction and case studies and providing a clear and explicit approach to our research process. Third, we derive the objectives and content model of EE guided by educational objectives, entrepreneurial motivations, and entrepreneurial process theories. Fourth, focusing on a typical university in China as our research subject, we conduct a case study to demonstrate the practical application of our research framework. Finally, we end the paper with the findings for RQ2 and RQ3, discussions on the framework, and conclusions.

## Literature review

**TH theory.** The notion of TH first appeared in the early 1980s, coinciding with the global transition from an industrial to a knowledge-based economy (Cai & Etzkowitz, 2020). At that time, the dramatic increase in productivity led to overproduction, and knowledge became a valuable mechanism for driving innovation and economic growth (Mandrup & Jensen, 2017). Recognizing the potential of incorporating cutting-edge university technologies into industry and facilitating technology transfer and innovation, the US government took proactive steps to enhance the international competitiveness of American industries. This initiative culminated in the enactment of relevant legislation in 1980, which triggered a surge in technology transfer, patent licensing, and the establishment of new enterprises within the United States. Subsequently, European and Asian nations adopted similar measures, promoting the transformation of universities' identity (Grimaldi et al., 2011). Universities assumed a central role in technology transfer, the formation of businesses, and regional revitalization within the knowledge society rather than occupying a secondary position within the industrial community. The conventional one-to-one relationships between universities, companies, and the government evolved into a dynamic TH model (Cai & Etzkowitz, 2020). Beyond their traditional roles in knowledge creation, wealth production, and policy coordination, these sectors began to engage in multifaceted interactions, effectively "playing the role of others" (Ranga & Etzkowitz, 2013).

The TH model encompasses three fundamental elements: 1) In a knowledge-based society, universities assume a more prominent role in innovation than in industry; 2) The three entities engage in collaborative relationships, with innovation policies emerging as a result of their mutual interactions rather than being solely dictated by the government; and 3) Each entity, while fulfilling its traditional functions, also takes on the roles of the other two parties (Henry, 2009). This model is closely aligned with EE.

On the one hand, EE can enhance the effectiveness of TH theory by strengthening the links between universities, industry, and government. The TH concept was developed based on entrepreneurial universities. The emerging entrepreneurial university model integrates economic development as an additional function. Etzkowitz's research on the entrepreneurial university identified a TH model of academia-industry-government relations implemented by universities in an increasingly knowledge-based society (Galvao et al., 2019). Alexander and Evgeniy (2012) articulated that entrepreneurial universities are crucial to the

implementation of triple-helix arrangements and that by integrating EE into their curricula, universities have the potential to strengthen triple-helix partnerships and boost the effectiveness of the triple-helix model.

On the other hand, TH theory also drives EE to achieve high-quality development. Previously, universities were primarily seen as sources of knowledge and human resources. However, they are now also regarded as reservoirs of technology. Within EE and incubation programs, universities are expanding their educational capabilities beyond individual education to shaping organizations (Henry, 2009). Surpassing their role as sources of new ideas for existing companies, universities blend their research and teaching processes in a novel way, emerging as pivotal sources for the formation of new companies, particularly in high-tech domains. Furthermore, innovation within one field of the TH influences others (Piqué et al., 2020). An empirical study by Alexander and Evgeniy (2012) outlined how the government introduced a series of initiatives to develop entrepreneurial universities, construct innovation infrastructure, and foster EE growth.

**Overview of EE.** EE occupies a crucial position in driving economic advancement, and this domain has been the focal point of extensive research. Fellnhöfer (2019) examined 1773 publications from 1975 to 2014, introducing a more closely aligned taxonomy of EE research. This taxonomy encompasses eight major clusters: social and policy-driven EE, human capital studies related to self-employment, organizational EE and TH, (Re)design and evaluation of EE initiatives, entrepreneurial learning, EE impact studies, and the EE opportunity-related environment at the organizational level. Furthermore, Mohamed and Sheikh Ali (2021) conducted a systematic literature review of 90 EE articles published from 2009 to 2019. The majority of these studies focused on the development of EE (32%), followed by its benefits (18%) and contributions (12%). The selected research also addressed themes such as the relationship between EE and entrepreneurial intent, the effectiveness of EE, and its assessment (each comprising 9% of the sample).

Spanning from 1975 to 2019, these two reviews offer a comprehensive landscape of EE research. The perspective on EE has evolved, extending into multiple dimensions (Zaring et al., 2021). However, EE does not always achieve the expected outcomes, as challenges such as limited student interest and engagement as well as persistent negative attitudes are often faced (Mohamed & Sheikh Ali, 2021). In fact, the challenges faced by EE in most countries may be similar. However, the solutions may vary due to contextual differences (Fred Awaah et al., 2023). Furthermore, due to this evolution, there is a need for a more comprehensive grasp of pedagogical concepts and the foundational elements of modern EE (Hägg & Gabrielsson, 2020). Based on the objectives of this study, four specific themes were chosen for an in-depth literature review: the objectives, contents and methods, outcomes, and experiences of EE.

**Objectives of EE.** The objectives of EE may provide significant guidance for its implementation and the assessment of its effectiveness, and EE has evolved to form a diversified spectrum. Mwasalwiba (2010) presented a multifaceted phenomenon in which EE objectives are closely linked to entrepreneurial outcomes. These goals encompass nurturing entrepreneurial attitudes (34%), promoting new ventures (27%), contributing to local community development (24%), and imparting entrepreneurial skills (15%). Some current studies still emphasize particular dimensions of these goals, such as fostering new ventures or value creation (Jones et al., 2018; Ratten & Usmanij, 2021). These authors further stress the significance of incorporating practical

considerations related to the business environment, which prompts learners to contemplate issues such as funding and resource procurement. This goal inherently underscores the importance of entrepreneurial thinking and encourages learners to transition from merely being students to developing entrepreneurial mindsets.

Additionally, Kuratko and Morris (2018) posit that the goal of EE should not be to produce entrepreneurs but to cultivate entrepreneurial mindsets in students, equipping them with methods for thinking and acting entrepreneurially and enabling them to perceive opportunities rapidly in uncertain conditions and harness resources as entrepreneurs would. While the objectives of EE may vary based on the context of the teaching institution, the fundamental goal is increasingly focused on conveying and nurturing an entrepreneurial mindset among diverse stakeholders. Hao's (2017) research contends that EE forms a comprehensive system in which multidimensional educational objectives are established. These objectives primarily encompass cultivating students' foundational qualities and innovative entrepreneurial personalities, equipping them with essential awareness of entrepreneurship, psychological qualities conducive to entrepreneurship, and a knowledge structure for entrepreneurship. Such a framework guides students towards independent entrepreneurship based on real entrepreneurial scenarios.

Various studies and practices also contain many statements about entrepreneurial goals. The Entrepreneurship Competence Framework, which was issued by the EU in 2016, delineates three competency domains: ideas and opportunities, resources and action. Additionally, the framework outlines 15 specific entrepreneurship competencies (Jun, 2017). Similarly, the National Content Standards for EE published by the US Consortium encompass three overarching strategies for articulating desired competencies for aspiring entrepreneurs: entrepreneurial skills, ready skills, and business functions (Canziani & Welsh, 2021). First, entrepreneurial skills are unique characteristics, behaviors, and experiences that distinguish entrepreneurs from ordinary employees or managers. Second, ready skills, which include business and entrepreneurial knowledge and skills, are prerequisites and auxiliary conditions for EE. Third, business functions help entrepreneurs create and operate business processes in business activities. These standards explain in the broadest terms what students need to be self-employed or to develop and grow a new venture. Although entrepreneurial skills may be addressed in particular courses offered by entrepreneurship faculties, it is evident that business readiness and functional skills significantly contribute to entrepreneurial success (Canziani & Welsh, 2021).

**Contents and methods of EE.** The content and methods employed in EE are pivotal factors for ensuring the delivery of high-quality entrepreneurial instruction, and they have significant practical implications for achieving educational objectives. The conventional model of EE, which is rooted in the classroom setting, typically features an instructor at the front of the room delivering concepts and theories through lectures and readings (Mwasalwiba, 2010). However, due to limited opportunities for student engagement in the learning process, lecture-based teaching methods prove less effective at capturing students' attention and conveying new concepts (Rahman, 2020). In response, Okebukola (2020) introduced the Culturo-Techno-Contextual Approach (CTCA), which offers a hybrid teaching and learning method that integrates cultural, technological, and geographical contexts. Through a controlled experiment involving 400 entrepreneurship development students from Ghana, CTCA has been demonstrated to be a model for enhancing

students' comprehension of complex concepts (Awaah, 2023). Furthermore, learners heavily draw upon their cultural influences to shape their understanding of EE, emphasizing the need for educators to approach the curriculum from a cultural perspective to guide students in comprehending entrepreneurship effectively.

In addition to traditional classroom approaches, research has highlighted innovative methods for instilling entrepreneurial spirit among students. For instance, students may learn from specific university experiences or even engage in creating and running a company (Kolb & Kolb, 2011). Some scholars have developed an educational portfolio that encompasses various activities, such as simulations, games, and real company creation, to foster reflective practice (Neck & Greene, 2011). However, some studies have indicated that EE, when excessively focused on applied and practical content, yields less favorable outcomes for students aspiring to engage in successful entrepreneurship (Martin et al., 2013). In contrast, students involved in more academically oriented courses tend to demonstrate improved intellectual skills and often achieve greater success as entrepreneurs (Zaring et al., 2021). As previously discussed, due to the lack of a coherent theoretical framework in EE, there is a lack of uniformity and consistency in course content and methods (Ribeiro et al., 2018).

**Outcomes of EE.** Research on the outcomes of EE is a broad and continually evolving field, with most related research focusing on immediate or short-term impact factors. For example, Anosike (2019) demonstrated the positive effect of EE on human capital, and Chen et al. (2022) proposed that EE significantly moderates the impact of self-efficacy on entrepreneurial competencies in higher education students through an innovative learning environment. In particular, in the comprehensive review by Kim et al. (2020), six key EE outcomes were identified: entrepreneurial creation, entrepreneurial intent, opportunity recognition, entrepreneurial self-efficacy and orientation, need for achievement and locus of control, and other entrepreneurial knowledge. One of the more popular directions is the examination of the impact of EE on entrepreneurial intentions. Bae et al. (2014) conducted a meta-analysis of 73 studies to examine the relationship between EE and entrepreneurial intention and revealed little correlation. However, a meta-analysis of 389 studies from 2010 to 2020 by Zhang et al. (2022) revealed a positive association between the two variables.

Nabi et al. (2017) conducted a systematic review to determine the impact of EE in higher education. Their findings highlight that studies exploring the outcomes of EE have primarily concentrated on short-term and subjective assessments, with insufficient consideration of longer-term effects spanning five or even ten years. These longer-term impacts encompass factors such as the nature and quantity of startups, startup survival rates, and contributions to society and the economy. As noted in the Eurydice report, a significant impediment to advancing EE is the lack of comprehensive delineation concerning education outcomes (Bourgeois et al., 2016).

**Experiences in the EE system.** With the deepening exploration of EE, researchers have turned to studying university-centered entrepreneurship ecosystems (Allahar and Sookram, 2019). Such ecosystems are adopted to fill gaps in "educational and economic development resources", such as entrepreneurship curricula. A growing number of universities have evolved an increasingly complex innovation system that extends from technology transfer offices, incubators, and technology parks to translational research and the promotion of EE across campuses (Cai & Etzkowitz, 2020). In the university context, the entrepreneurial ecosystem aligns with TH theory, in which academia, government, and

industry create a trilateral network and hybrid organization (Ranga & Etzkowitz, 2013).

The EE system is also a popular topic in China. Several researchers have summarized the Chinese experience in EE, including case studies and overall experience, such as the summary of the progress and system development of EE in Chinese universities over the last decade by Weiming et al. (2013) and the summary of the Chinese experience in innovation and EE by Maoxin (2017). Other researchers take an in-depth look at the international knowledge of EE, such as discussions on the EE system of Denmark by Yuanyuan (2015), analyzes of the ecological system of EE at the Technical University of Munich by Yubing and Ziyang (2015), and comparisons of international innovation and EE by Ke (2017).

In general, although there has been considerable discussion on EE, the existing body of work has not properly addressed the practical challenges faced by EE in China. On the one hand, the literature is fragmented and has not yet formed a unified and mature theoretical framework. Regarding what should be taught and how it can be taught and assessed, the answers in related research are ambiguous (Hoppe, 2016; Wong & Chan, 2022). On the other hand, current research lacks empirical evidence in the context of China, and guidance on how to put the concept of EE into practice is relatively limited. These dual deficiencies impede the effective and in-depth development of EE in China. Consequently, it is imperative to comprehensively redefine the objectives and contents of EE to provide clear developmental guidance for Chinese higher education institutions.

### Research methodology

To answer the research questions, this study employed a comprehensive approach by integrating both literature-based and empirical research methods. The initial phase focused on systematically reviewing the literature related to entrepreneurial education, aiming to construct a clear set of frameworks for the objectives and content of EE in higher education institutions. The second phase involved conducting a case study at T-University, in which the theoretical frameworks were applied to a real-world context. This case not only contributed to validating the theoretical constructs established through the literature review but also provided valuable insights into the practical operational dynamics of entrepreneurial education within the specific university setting.

**Conceptual framework stage.** This paper aims to conceptualize the objective and content frameworks for EE. The methodology sequence is as follows: First, we examine the relevant EE literature to gain insights into existing research themes. Subsequently, we identify specific research articles based on these themes, such as "entrepreneurial intention", "entrepreneurial self-efficacy", and "entrepreneurial approach", among others. Third, we synthesize the shared objectives of EE across diverse research perspectives through an analysis of the selected literature. Fourth, we construct an objective model for EE within higher education by integrating Bloom's educational objectives (1956) and Gagne's five learning outcomes (1984), complemented by entrepreneurship motivation and process considerations. Finally, we discuss the corresponding content framework.

**Case study stage.** To further elucidate the conceptual framework, this paper delves into the methods for the optimization of EE in China through a case analysis. Specifically, this paper employs a single-case approach. While a single case study may have limited external validity (Onjewu et al., 2021), if a case study informs current theory and conceptualizes the explored issues, it can still



provide valuable insights from its internal findings (Buchanan, 1999).

T-University, which is a comprehensive university in China, is chosen as the subject of the case study for the following reasons. First, T-University is located in Shanghai, which is a Chinese international technological innovation center approved by the State Council. Shanghai's "14th Five-Year Plan" proposes the establishment of a multichannel international innovation collaboration platform and a global innovation cooperation network. Second, T-University has initiated curriculum reforms and established a regional knowledge economy ecosystem by utilizing EE as a guiding principle, which aligns with the characteristics of its geographical location, history, culture, and disciplinary settings. This case study will showcase T-University's experiences in entrepreneurial learning, entrepreneurial practice, startup services, and the entrepreneurial climate, elucidating the positive outcomes of this triangular interaction and offering practical insights for EE in other contexts.

The data collection process of this study was divided into two main stages: field research and archival research. The obtained data included interview transcripts, field notes, photos, internal documents, websites, reports, promotional materials, and published articles. In the initial stage, we conducted a 7-day field trip, including visits to the Innovation and Entrepreneurship Institute, the Career Development Centre, the Academic Affairs Office, and the Graduate School. Moreover, we conducted semistructured interviews with several faculty members and students involved in entrepreneurship education at the university to understand the overall state of implementation of entrepreneurship education at the university. In the second stage, we contacted the Academic Affairs Office and the Student Affairs Office at the university and obtained internal materials related to entrepreneurship education. Additionally, we conducted a comprehensive collection and created a summary of publicly available documents, official school websites, public accounts, and other electronic files. To verify the validity of the multisource data, we conducted triangulation and ultimately used consistent information as the basis for the data analysis.

For the purpose of our study, thematic analysis was employed to delve deeply into the TH factors, the objective and content frameworks, and their interrelationships. Thematic analysis is a method for identifying, analyzing, and reporting patterns within data. This approach emphasizes a comprehensive interpretation of the data, as it extracts information from multiple perspectives and derives valuable conclusions through summary and induction (Onjewu et al., 2021). Therefore, thematic analysis likely serves as the foundation for most other qualitative data analysis methods (Willig, 2013). In this study, three researchers individually conducted rigorous analyses and comprehensive reviews to ensure the accuracy and reliability of the data. Subsequently, they engaged in collaborative discussions to explore their differences and ultimately reach a consensus.

## Framework construction

**Theoretical basis of EE in universities.** The study is grounded in the theories of educational objectives, planned behavior, and the entrepreneurial process. Planned behavior theory can serve to elucidate the emergence of entrepreneurial activity, while entrepreneurial process theory can be used to delineate the essential elements of successful entrepreneurship.

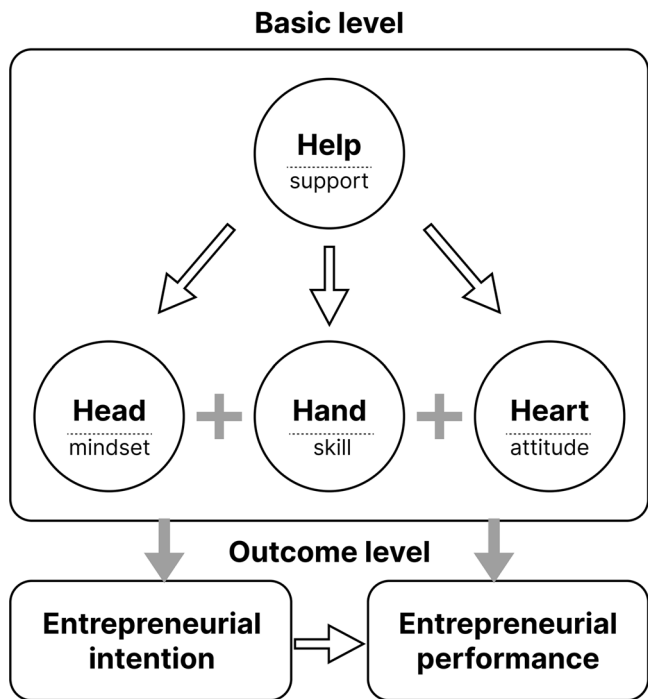
- (1) Theory of educational objectives. The primary goal of education is to assist students in shaping their future. Furthermore, education should directly influence students and facilitate their future development. Education can significantly enhance students' prospects by imparting

specific skills and fundamental principles and cultivating the correct attitudes and mindsets (Bruner, 2009). According to "The Aims of Education" by Whitehead, the objective of education is to stimulate creativity and vitality. Gagne identifies five learning outcomes that enable teachers to design optimal learning conditions based on the presentation of these outcomes, encompassing "attitude," "motor skills," "verbal information," "intellectual skills," and "cognitive strategies". Bloom et al. (1956) argue that education has three aims, which concern the cognitive, affective, and psychomotor domains. Gedeon (2017) posits that EE involves critical input and output elements. The key objectives encompass mindset (Head), skill (hand), attitude (heart), and support (help). The input objectives include EE teachers, resources, facilities, courses, and teaching methods. The output objectives encompass the impacts of the input factors, such as the number of students, the number of awards, and the establishment of new companies. The primary aims of Gedeon (2017) correspond to those of Bloom et al. (1956).

- (2) Theory of planned behavior. The theory of planned behavior argues that human behavior is the outcome of well-thought-out planning (Ajzen, 1991). Human behavior depends on behavioral intentions, which are affected by three main factors. The first is derived from the individual's "attitude" towards taking a particular action; the second is derived from the influence of "subjective norms" from society; and the third is derived from "perceived behavioral control" (Ajzen, 1991). Researchers have adopted this theory to study entrepreneurial behavior and EE.
- (3) Theory of the entrepreneurship process. Researchers have proposed several entrepreneurial models, most of which are processes (Baoshan & Baobao, 2008). The theory of the entrepreneurship process focuses on the critical determinants of entrepreneurial success. The essential variables of the entrepreneurial process model significantly impact entrepreneurial performance. Timmons et al. (2004) argue that successful entrepreneurial activities require an appropriate match among opportunities, entrepreneurial teams, resources, and a dynamic balance as the business develops. Their model emphasizes flexibility and equilibrium, and it is believed that entrepreneurial activities change with time and space. As a result, opportunities, teams, and resources will be unbalanced and need timely adjustment.

**4H objective model of EE.** Guided by TH theory, the objectives of EE should consider universities' transformational identity in the knowledge era and promote collaboration among students, faculty, researchers, and external players (Mandrup & Jensen, 2017). Furthermore, through a comprehensive analysis of the literature and pertinent theoretical underpinnings, the article introduces the 4H model for the EE objectives, as depicted in Fig. 1.

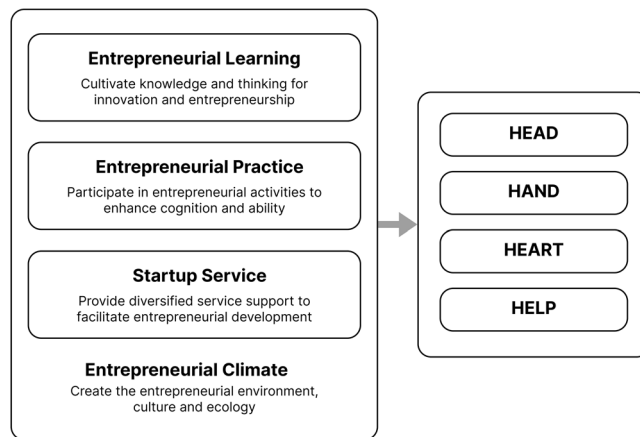
The model comprises two levels. The first level pertains to outcomes at the entrepreneurial behavior level, encompassing entrepreneurial intention and entrepreneurial performance. These two factors support universities' endeavors to nurture individuals with an entrepreneurial mindset and potential and contribute to the region's growth of innovation and entrepreneurship. The second level pertains to fundamentals, which form the foundation of the first level. The article defines these as the 4H model, representing mindset (Head), skill (Hand), attitude (Heart), and support (Help). This model integrates key theories, including educational objectives, the entrepreneurship process, and planned behavior.



**Fig. 1 Objective model.** The 4H objective model of entrepreneurship education.

First, according to the theory of educational objectives, the cognitive, emotional, and skill objectives proposed by Bloom et al. (1956) correspond to the key goals of education offered by Gedeon (2017), namely, Head, Hand, and Heart; thus, going forward, in this study, these three objectives are adopted. Second, according to the theory of planned behavior, for the promotion of entrepreneurial intention, reflection on the control of beliefs, social norms, and perceptual behaviors must be included. EE’s impact on the Head, Hand, and Heart will promote the power of entrepreneurs’ thoughts and perceptual actions. Therefore, this approach is beneficial for enhancing entrepreneurial intentions. Third, according to entrepreneurship process theory, entrepreneurial performance is affected by various factors, including entrepreneurial opportunities, teams, and resources. Consideration of the concepts of Head, Hand, and Heart can enhance entrepreneurial opportunity recognition and entrepreneurial team capabilities. However, as the primary means of obtaining external resources, social networks play an essential role in improving the performance of innovation and entrepreneurship companies (Gao et al., 2023). Therefore, an effective EE program should tell students how to take action, connect them with those who can help them succeed (Ronstadt, 1985), and help them access the necessary resources. If EE institutions can provide relevant help, they will consolidate entrepreneurial intentions and improve entrepreneurial performance, enabling the EE’s objective to better support the Head, Hand, and Heart.

**Content model of EE.** EE necessitates establishing a systematic implementation framework to achieve the 4H objectives. Current research on EE predominantly focuses on two facets: one focuses on EE methods to improve students’ skills, and the other focuses on EE outcome measurements, which consider the impact of EE on different stakeholders. Based on this, to foster innovation in EE approaches and enable long-term sustainable EE outcomes, the 4H Model of EE objectives mandates that pertinent institutions provide entrepreneurial learning, entrepreneurial practice,



**Fig. 2 Content model.** The content model of entrepreneurship education.

startup services, and a suitable entrepreneurial climate. These components constitute the four integral facets of the content model for EE, as depicted in Fig. 2.

*Entrepreneurial learning.* Entrepreneurial learning mainly refers to the learning of innovative entrepreneurial knowledge and theory. This factor represents the core of EE and can contribute significantly to the Head component. It can also improve the entrepreneurial thinking ability of academic subjects through classroom teaching, lectures, information reading and analysis, discussion, debates, etc. Additionally, it can positively affect the Hand and Heart elements of EE.

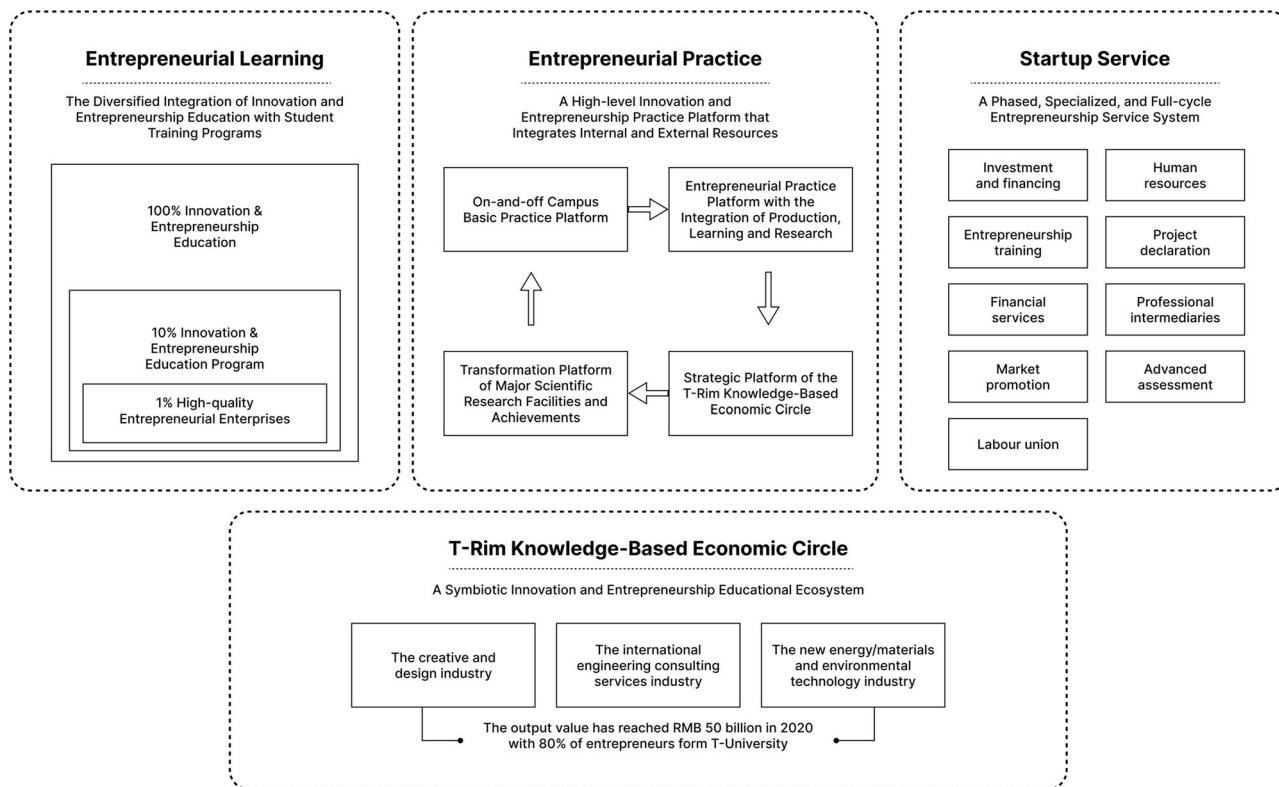
*Entrepreneurial practice.* Entrepreneurial practice mainly refers to academic subjects comprehensively enhancing their cognition and ability by participating in entrepreneurial activities. This element is also a key component of EE and plays a significant role in the cultivation of the Hand element. Entrepreneurial practice is characterized by participation in planning and implementing entrepreneurial programs, competitions, and simulation activities. Furthermore, it positively impacts EE’s Head, Heart, and Help factors.

*Startup services.* Startup services mainly refer to entrepreneurial-related support services provided by EE institutions, which include investment and financing, project declaration, financial and legal support, human resources, marketing, and intermediary services. These services can improve the success of entrepreneurship projects. Therefore, they can reinforce the expectations of entrepreneurs’ success and positively impact the Heart, Hand, and Head objectives of EE.

*Entrepreneurial climate.* The entrepreneurial climate refers to the entrepreneurial environment created by EE institutions and their community and is embodied mainly in the educational institutions’ external and internal entrepreneurial culture and ecology. The environment can impact the entrepreneurial attitude of educated individuals and the Heart objective of EE. Additionally, it is beneficial for realizing EE’s Head, Hand, and Help goals.

**Case study: EE practice of T-University**

**Overview of EE at T-University.** T-University is one of the first in China to promote innovation and EE. Since the 1990s, a series of policies have been introduced, and different platforms have been set up. After more than 20 years of teaching, research, and practice, an innovation and entrepreneurship education system with unique characteristics has gradually evolved. The overall goal



**Fig. 3 System map.** T-University innovation and entrepreneurship education map.

of this system is to ensure that 100% of students receive such education, with 10% of students completing the program and 1% achieving entrepreneurship with a high-quality standard. The overall employment rate of 2020 graduates reached 97.49%. In recent years, the proportion of those pursuing entrepreneurship has been more than 1% almost every year. The T-Rim Knowledge-Based Economic Circle, an industrial cluster formed around knowledge spillover from T-University’s dominant disciplines, employs more than 400 T-University graduates annually.

In 2016, T-University established the School of Innovation & Entrepreneurship, with the president serving as its dean. This school focuses on talent development and is pivotal in advancing innovation-driven development strategies. It coordinates efforts across various departments and colleges to ensure comprehensive coverage of innovation and EE, the integration of diverse academic disciplines, and the transformation of interdisciplinary scientific and technological advancements (see Fig. 3).

**Entrepreneurial learning.** T-University is dedicated to integrating innovation and EE into every stage of talent development. As the guiding framework for EE, the university has established the Innovation and EE sequence featuring “three-dimensional, linked, and cross-university cooperation” with seven educational elements. These elements include the core curriculum system of innovation and entrepreneurship, the “one top-notch and three excellences” and experimental zones of innovation and entrepreneurship talent cultivation model, the four-level “China-Shanghai-University-School” training programs for innovation and entrepreneurship, four-level “International-National-Municipal-University” science and technology competitions, four-level “National-Municipal-University-School” innovation and entrepreneurship practice bases, three-level “Venture Valley-Entrepreneurship Fund-Industry Incubation” startup services and a high-level teaching team with both full-time and part-time personnel.

T-University has implemented several initiatives. First, the university has implemented 100% student innovation and EE through reforming the credit setting and curriculum system. Through the Venture Valley class, mobile class, and “joint summer school”, more than 10% of the students completed the Innovation and EE program. Moreover, through the professional reform pilot and eight professional incubation platforms in the National Science and Technology Park of T-University and other measures, 1% of the students established high-quality entrepreneurial enterprises. Second, the university is committed to promoting the integration of innovation and entrepreneurship and training programs, exploring and practising a variety of innovative talent cultivation models, and adding undergraduate innovation ability development as a mandatory component of the training program. In addition, pilot reforms have been conducted in engineering, medicine, and law majors, focusing on integrating research and education.

**Entrepreneurial practice.** T-University has constructed a high-level integrated innovation and entrepreneurship practice platform by combining internal and external resources. This platform serves as the central component in Fig. 3, forming a sequence of innovation and entrepreneurship practice opportunities, including 1) the On-and-off Campus Basic Practice Platform, 2) the Entrepreneurship Practice Platform with the Integration of Production, Learning, and Research, 3) the Transformation Platform of Major Scientific Research Facilities and Achievements, and 4) the Strategic Platform of the T-Rim Knowledge-Based Economic Circle. All these platforms are accessible to students based on their specific tasks and objectives.

Moreover, the university has reinforced its support for entrepreneurship and collaborated with local governments in Sichuan, Dalian, and Shenzhen to establish off-campus bases jointly. In 2016, in partnership with other top universities in China, the university launched the Innovation and



Entrepreneurship Alliance of Universities in the Yangtze River Delta. This alliance effectively brings together government bodies, businesses, social communities, universities, and funding resources in the Yangtze River Delta, harnessing the synergistic advantages of these institutions. In 2018, the university assumed the director role for the Ministry of Education's Steering Committee for Innovation and Entrepreneurship. Through collaborations with relevant government agencies and enterprises, T-University has continued its efforts to reform and advance innovation and EE, establishing multiple joint laboratories to put theory into practice.

**Startup service.** In terms of entrepreneurial services, T-University has focused on the employment guidance center and the science and technology Park, working closely with the local industrial and commercial bureaus in the campus area to provide centralized entrepreneurial services. Through entities such as the Shanghai Municipal College Entrepreneurship Guidance Station, entrepreneurship seedling gardens, the science and technology park, and off-campus bases such as the entrepreneurship valley, the university has established a full-cycle service system that is tailored to students' innovative and entrepreneurial activities, providing continuous professional guidance and support from the early startup stage to maturity.

Notably, the T-University Science and Technology Park has set up nine professional incubation service platforms that cover investment and financing, human resources, entrepreneurship training, project declaration, financial services, professional intermediaries, market promotion, advanced assessment, and the labor union. Moreover, the Technology Park has established a corporate service mechanism for liaison officers, counselors, and entrepreneurship mentors to ensure that enterprises receive comprehensive support and guidance. Through these services, T-University has successfully cultivated numerous high-tech backbone enterprises, such as New Vision Healthcare, Zhong Hui Ecology, Tongjie Technology, Tonglei Civil Engineering, and Tongchen Environmental Protection, which indicates the positive effect of these entrepreneurial services.

**Entrepreneurial climate.** T-University places significant emphasis on fostering the entrepreneurial climate, which is effectively nurtured through the T-Rim Knowledge-Based Economic Circle and on-campus entrepreneurship activities. Moreover, T-University is dedicated to establishing and cultivating a dynamic T-Rim Knowledge-Based Economic Circle in strategic alignment with the district government and key agencies. This innovative ecosystem strategically centers around three prominent industrial clusters: the creative and design industry, the international engineering consulting services industry, and the new energy/materials and environmental technology industry. These industrial clusters provide fertile ground for graduates' employment and entrepreneurial pursuits and have yielded remarkable economic outputs. In 2020, the combined value of these clusters surged to a staggering RMB 50 billion, with 80% of entrepreneurs being teachers, students, or alumni from T-University.

This commitment has led to the establishment of an intricate design industry chain featuring architectural design and urban planning design; it also supports services in automobile design, landscape design, software design, environmental engineering design, art media design, and associated services such as graphic production, architectural modeling, and engineering consulting.

**The EE system at T-University.** T-University has undertaken a comprehensive series of initiatives to promote EE, focusing on

four key aspects: entrepreneurial learning, entrepreneurial practice, startup service, and the entrepreneurial climate. As of the end of 2021, the National Technology Park at T-University has cumulatively supported more than 3000 enterprises. Notably, the park has played a pivotal role in assisting more than 300 enterprises established by college students.

In its commitment to EE, the university maintains an open approach to engaging with society. Simultaneously, it integrates innovative elements such as technology, information, and talent to facilitate students' entrepreneurial endeavors. Through the synergy between the university, government entities, and the market, EE cultivates a cadre of entrepreneurial talent. The convergence of these talents culminates in the formation of an innovative and creative industry cluster within the region, representing the tangible outcome of the university's "disciplinary chain—technology chain—industry chain" approach to EE. This approach has gradually evolved into the innovative ecosystem of the T-Rim Knowledge-Based Economic Circle.

## Findings and discussion

**Unified macroscopic objectives of EE.** To date, a widespread consensus on defining EE in practical terms has yet to be achieved (Mwasalwiba, 2010; Nabi et al., 2017). Entrepreneurial education should strive towards a common direction, which is reflected in the agreement on educational objectives and recommended teaching methods (Aparicio et al., 2019). Mason and Arshed (2013) criticized that entrepreneurial education should teach about entrepreneurship rather than for entrepreneurship. Therefore, EE should not only focus on singular outcome-oriented aspects but also emphasize the cultivation of fundamental aspects such as cognition, abilities, attitudes, and skills.

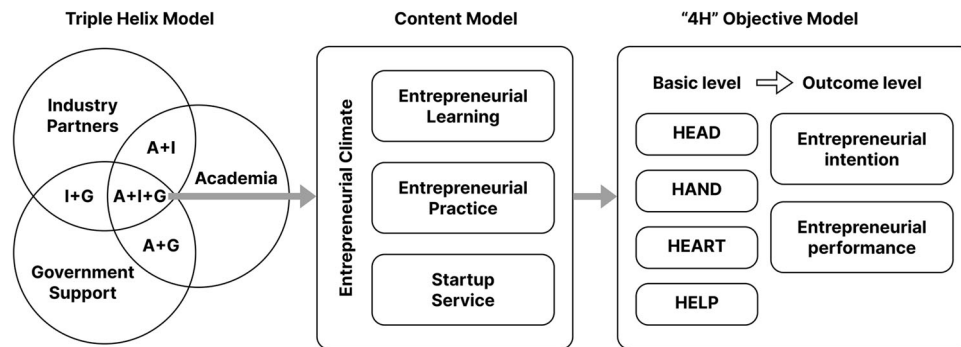
This study embarks on a synthesis of the EE-related literature, integrating educational objective theory, planned behavior theory, and entrepreneurial process theory. The 4H model of EE objectives, which consists of basic and outcome levels, is proposed. This model aims to comprehensively capture the core elements of EE, addressing both students' performance in entrepreneurial outcomes and their development of various aspects of foundational cognitive attributes and skills.

The basic level of the EE objective model includes the 4Hs, namely Head (mindset), Hand (skill), Heart (attitude), and Help (support). First, Head has stood out as a prominent learning outcome within EE over the past decade (Fretschner & Lampe, 2019). Attention given to the "Head" aspect not only highlights the development of individuals recognized as "entrepreneurs" (Mitra, 2017) but also underscores its role in complementing the acquisition of skills and practical knowledge necessary for initiating new ventures and leading more productive lives (Neck & Corbett, 2018).

Second, the Hand aspect also constitutes a significant developmental goal and learning outcome of EE. The trajectory of EE is evolving towards a focus on entrepreneurial aspects, and the learning outcomes equip students with skills relevant to entrepreneurship (Wong & Chan, 2022). Higher education institutions should go beyond fundamental principles associated with knowledge and actively cultivate students' entrepreneurial skills and spirit.

Third, Heart represents EE objectives that are related to students' psychological aspects, as students' emotions, attitudes, and other affective factors impact their perception of entrepreneurship (Cao, 2021). Moreover, the ultimate goal of EE is to instill an entrepreneurial attitude and pave the way for future success as entrepreneurs in establishing new businesses and fostering job creation (Kusumojanto et al., 2021). Thus, the cultivation of this mindset is not only linked to the understanding





**Fig. 4 Overall framework.** Practical contents and objectives based on the triple helix theory.

of entrepreneurship but also intricately tied to the aspiration for personal fulfillment (Yang, 2013).

Fourth, entrepreneurship support (Help) embodies the goal of providing essential resource support to students to establish a robust foundation for their entrepreneurial endeavors. The establishment of a comprehensive support system is paramount for EE in universities. This establishment encompasses the meticulous design of the curriculum, the development of training bases, and the cultivation of teacher resources (Xu, 2017). A well-structured support system is crucial for equipping students with the necessary knowledge and skills to successfully navigate the complexities of entrepreneurship (Greene & Saridakis, 2008).

The outcome level of the EE objective model encompasses entrepreneurial intention and entrepreneurial performance, topics that have been extensively discussed in the previous literature. Entrepreneurial intention refers to individuals' subjective willingness and plans for entrepreneurial behavior (Wong & Chan, 2022) and represents the starting point of the entrepreneurial process. Entrepreneurial performance refers to individuals' actual behaviors and achievements in entrepreneurial activities (Wang et al., 2021) and represents the ultimate manifestation of entrepreneurial goals. In summary, the proposed 4H model of the EE objectives covers fundamental attitudes, cognition, skills, support, and ultimate outcomes, thus answering the question of what EE should teach.

**Specific implementable system of EE.** To facilitate the realization of EE goals, this study developed a corresponding content model as an implementable system and conducted empirical research through a case university. Guided by the 4H objectives, the content model also encompasses four dimensions: entrepreneurial learning, entrepreneurial practice, startup service, and entrepreneurial climate. Through a detailed exposition of the practical methods at T-university, this study provides support for addressing the question of how to teach EE.

In the traditional EE paradigm, there is often an overreliance on the transmission of theoretical knowledge, which leads to a deficiency in students' practical experience and capabilities (Kremel and Wetter-Edman, 2019). Moreover, due to the rapidly changing and dynamic nature of the environment, traditional educational methods frequently become disconnected from real-world demands. In response to these issues, the approach of "learning by doing" has emerged as a complementary and improved alternative to traditional methods (Colombelli et al., 2022).

The proposed content model applies the "learning by doing" approach to the construction of the EE system. For entrepreneurial learning, the university has constructed a comprehensive innovation and EE chain that encompasses courses, experimental areas, projects, competitions, practice bases, and teaching teams.

For entrepreneurial practice, the university has built a high-level, integrated innovation and entrepreneurship practice platform that provides students with the opportunity to turn their ideas into actual projects. For startup services, the university has established close collaborative relationships with local governments and enterprises and has set up nine professional incubation service platforms. For the entrepreneurial climate, the university cultivated a symbiotic innovation and EE ecosystem by promoting the construction of the T-Rim Knowledge-Based Economic Circle. Through the joint efforts of multiple parties, the entrepreneurial activities of teachers, students, and alumni have become vibrant and have formed a complete design industry chain and an enterprise ecosystem that coexists with numerous SMEs.

**Development of a framework based on the TH theory.** Through the exploration of the interactive relationships among universities, governments, and industries, TH theory points out a development direction for solving the dilemma of EE. Through the lens of TH theory, this study developed a comprehensive framework delineating the macroscopic objectives and practical methods of EE, as depicted in Fig. 4. In this context, EE has become a common undertaking for multiple participants. Therefore, universities can effectively leverage the featured external and internal resources, facilitating the organic integration of entrepreneurial learning, practice, services, and climate. This, in turn, will lead to better achievement of the unified goals of EE.

Numerous scholars have explored the correlation between EE and the TH theory. Zhou and Peng (2008) articulated the concept of an entrepreneurial university as "the university that strongly influences the regional development of industries as well as economic growth through high-tech entrepreneurship based on strong research, technology transfer, and entrepreneurship capability." Moreover, Tianhao et al. (2020) emphasized the significance of fostering collaboration among industry, academia, and research as the optimal approach to enhancing the efficacy of EE. Additionally, Ribeiro et al. (2018) underscored the pivotal role of MIT's entrepreneurial ecosystem in facilitating startup launches. They called upon educators, university administrators, and policymakers to allocate increased attention to how university ecosystems can cultivate students' knowledge, skills, and entrepreneurial mindsets. Rather than viewing EE within the confines of universities in isolation, we advocate for establishing an integrated system that encompasses universities, government bodies, and businesses. Such a system would streamline their respective roles and ultimately bolster regional innovation and entrepreneurship efforts.

Jones et al. (2021) reported that with the widespread embrace of EE by numerous countries, the boundaries between

universities and external ecosystems are becoming increasingly blurred. This convergence not only fosters a stronger entrepreneurial culture within universities but also encourages students to actively establish startups. However, these startups often face challenges related to limited value and long-term sustainability. From the perspective of TH theory, each university can cultivate an ecosystem conducive to specialized entrepreneurial activities based on its unique resources and advantages. To do so, universities should actively collaborate with local governments and industries, leveraging shared resources and support to create a more open, inclusive, and innovation-supporting ecosystem that promotes lasting reform and sustainability.

There are two main ways in which this paper contributes to the literature. First, this study applies TH theory to both theoretical and empirical research on EE in China, presenting a novel framework for the operation of EE. Previous research has applied TH theory in contexts such as India, Finland, and Russia, showcasing the unique contributions of TH in driving social innovation. This paper introduces the TH model to the Chinese context, illustrating collaborative efforts and support for EE from universities, industries, and governments through the construction of EE objectives and content models. Therefore, this paper not only extends the applicability of the TH theory globally but also provides valuable insights for EE in the Chinese context.

Second, the proposed conceptual framework clarifies the core goals and practical content of EE. By emphasizing the comprehensive cultivation of knowledge, skills, attitudes, and resources, this framework provides a concrete reference for designing EE courses, activities, and support services. Moreover, the framework underscores the importance of collaborative efforts among stakeholders, facilitating resource integration to enhance the quality and impact of EE. Overall, the conceptual framework presented in this paper serves not only as a guiding tool but also as a crucial bridge for fostering the collaborative development of the EE ecosystem.

## Conclusion

While EE has widespread global recognition, many regions still face similar developmental challenges, such as a lack of organized objectives and content delivery methods. This article, grounded in the context of EE in Chinese higher education institutions, seeks to address the current challenges guided by TH theory. By aligning EE with socioeconomic demands and leveraging TH theory, this study offers insights into the overall goals and practical content of EE.

This study presents a 4H objective model of EE comprising two levels. The first level focuses on outcomes related to entrepreneurial behavior, including entrepreneurial intentions and performance, which highlight the practical effects of EE. The second level is built as the foundation of the outcomes and encompasses the four elements of mindset, skill, attitude, and support. This multilayered structure provides a more systematic and multidimensional consideration for the cultivation of entrepreneurial talent. The framework offers robust support for practical instructional design and goal setting. Additionally, the research extends to the corresponding content model, incorporating four elements: entrepreneurial learning, entrepreneurial practice, startup services, and the entrepreneurial climate. This content model serves as a practical instructional means to achieve EE goals, enhancing the feasibility of implementing these objectives in practice.

Moreover, this study focused on a representative Chinese university, T-University, to showcase the successful implementation

of the 4H and content models. Through this case, we may observe how the university, through comprehensive development in entrepreneurial learning, practice, services, and climate, nurtured many entrepreneurs and facilitated the formation of the innovation and entrepreneurship industry cluster. This approach not only contributes to the university's reputation and regional economic growth but also offers valuable insights for other regions seeking to advance EE.

This study has several limitations that need to be acknowledged. First, the framework proposed is still preliminary. While its application has been validated through a case study, further exploration is required to determine the detailed classification and elaboration of its constituent elements to deepen the understanding of the EE system. Second, the context of this study is specific to China, and the findings may not be directly generalizable to other regions. Future research should investigate the adaptability of the framework in various cultural and educational contexts from a broader international perspective. Finally, the use of a single-case approach limits the generalizability of the research conclusions. Subsequent studies can enhance comprehensiveness by employing a comparative or multiple-case approach to assess the framework's reliability and robustness.

In conclusion, this study emphasizes the need to strengthen the application of TH theory in EE and advocates for the enhancement of framework robustness through multiple and comparative case studies. An increase in the quantity of evidence will not only generate greater public interest but also deepen the dynamic interactions among universities, industries, and the nation. This, in turn, may expedite the development of EE in China and foster the optimization of the national economy and the overall employment environment.

## Data availability

The datasets generated during and/or analyzed during the current study are not publicly available. Making the full data set publicly available could potentially breach the privacy that was promised to participants when they agreed to take part, in particular for the individual informants who come from a small, specific population, and may breach the ethics approval for the study. The data are available from the corresponding author on reasonable request.

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## Author contributions

All the authors contributed to the study's conception and design. Material preparation, data collection, and analysis were performed by Luning Shao, Yuxin Miao, Sanfa Cai and Fei Fan. The first Chinese outline and draft were written by Luning Shao, Yuxin Miao, and Shengce Ren. The English draft of the manuscript was prepared by Fei Fan. All the authors commented on previous versions of the manuscript. All the authors read and approved the final manuscript.

## Competing interests

The authors declare no competing interests.

## Ethical approval

This research was approved by the Tongji University Ethics Committee for Human Research (No. tjdxsr079). The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

## Informed consent

Informed consent was obtained from all participants.

## Additional information

Correspondence and requests for materials should be addressed to Fei Fan.

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