Comprehensive Evaluation of Sustainable Development of Entrepreneurship Education in Chinese Universities Using Entropy–TOPSIS Method

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Abstract: A comprehensive evaluation is important for the sustainable development of entrepreneurship education in colleges and universities. Specifically, evaluating entrepreneurship education in colleges and universities from the perspective of teachers, as stakeholders of entrepreneurship education in colleges and universities, can provide a basis for decision making to improve the quality of entrepreneurship education. Using the improved entropy–TOPSIS method, this study selects 35 indicators from five aspects, namely, curriculum systems, organizational leadership, faculty construction, teaching management, and an institutional guarantee, to establish a sustainable and comprehensive evaluation framework for entrepreneurship education in colleges and universities. Survey data from a questionnaire of college teachers in 11 provinces (cities) in China’s Yangtze River economic zone are used. The objective is to propose a framework that enables a comprehensive evaluation of the sustainability of entrepreneurship education and to develop a new evaluation method that highlights the challenges in evaluating the sustainability of entrepreneurship education, including the selection and effective measurement of the evaluation criteria. The study provides a scientific basis and support for decision making on the optimal reform of entrepreneurship education, faculty allocation, and education methods in Chinese universities and contributes to the realization of the goal of sustainable development of entrepreneurship education in universities.

Keywords: entrepreneurship education in universities; sustainability; entropy–TOPSIS; faculty; multifactorial assessment and GIS

1. Introduction

Higher education helps drive national economic development by creating social wealth [1], plays a key role in the sustainability of future development [2], and contributes to the achievement of the United Nations Sustainable Development Goals for education (SDGs No. 4) [3]. Entrepreneurship education, as an important component of the new economic strategy for job creation [4], produces innovative entrepreneurs and is essential for achieving the United Nations Sustainable Development Goals [5,6]. Moreover, integrating entrepreneurship education into higher education can promote the transformation of higher education, and its introduction and development represents an important aspect of current research [7]. Hence, it is necessary to emphasize the need for the sustainable development of entrepreneurship education in universities. Currently, the focus of entrepreneurship education in various countries is gradually shifting from the scale of the education to the improvement of the quality of education [8]. As an important part of the management of higher education in schools, entrepreneurship education evaluation is performed through...
the self-inspection of schools and under the supervision and evaluation of the government or other third-party organizations. The evaluation results are then used towards content innovation and systemic reform of entrepreneurship education so as to improve its overall quality. Thus, it is important to conduct a comprehensive evaluation of the sustainable development of entrepreneurship education in colleges and universities.

Most of the current research in entrepreneurship education focuses on the logical relationship between entrepreneurship education and entrepreneurial behavior, self-assessment, and the degree of influence as it attempts to establish a causal relationship between educational interventions and entrepreneurial behavior [9]. Many studies only broadly introduce the concept and connotation of entrepreneurship courses [10] or evaluate their economic benefits by comparing them with or without participation in entrepreneurship courses as a control variable [11]. Weber evaluated the quality of entrepreneurship education by developing a model to predict entrepreneurial behavior through entrepreneurial intentions [12]. Other research focuses on the outcome evaluation of entrepreneurship education, that is, the measurement is assessed by comparing the changes between expected and actual outcomes [13,14]; this approach is complicated by the fact that entrepreneurial behavior is influenced by a variety of factors and that there is no standardized outcome measure for outcome evaluation [15]. The research on entrepreneurship education quality is currently at the initial stage [16] while the research on entrepreneurship education evaluation is still imperfect given the lack of systematic, comprehensive, and scientific investigations into entrepreneurship education sustainability evaluation [17]; the lack of research designs or reports that affect evaluation outcome criteria [14]; and the lack of logical and meticulous research designs, effective evaluation tools, scientifically robust statistical power, and long-term dynamic observations to break through the barriers of entrepreneurship education research [18–21]. Therefore, establishing an evaluation framework for entrepreneurship education in universities and exploring evaluation methods to measure its sustainability have become an important research focus.

In China, entrepreneurship education has always been the focus of the government, universities, and education scholars. Some scholars use the “entrepreneurship rate of college students” as a criterion to evaluate the effectiveness of entrepreneurship education, as it can explain the role of entrepreneurship education to some extent. However, the goal of entrepreneurship education is to cultivate multidisciplinary, multiform, and multifaceted innovative talents, and its effect is not mainly reflected in the number of college students specializing in entrepreneurship. Therefore, it is somewhat one-sided and limiting to judge the quality development of entrepreneurship education by using the entrepreneurship rate alone. For example, Liang, H. et al. analyzed the quality of innovation and entrepreneurship education in higher education institutions from the input and output aspects [22]. Xu, X. introduced the value dimension through a rooted theory approach and established a theoretical structure model that includes value, process, and result evaluation [23]. As the index weights in evaluation systems are usually determined by experts’ deliberation, they are influenced by factors such as personal perception and academic background, thereby resulting in errors in evaluation weights and subjective evaluation results. Therefore, entrepreneurship education evaluation needs a scientific and objective method for determining indicator weights. In China, the evaluation of the results of national entrepreneurship education pilot projects is relatively lagging, and the general trend seems to be focused on the evaluation of individual courses and individual activities, while monitoring and evaluation at a more general level appearing to be less common [24]. Therefore, establishing a scientific evaluation system to accurately evaluate the quality of entrepreneurship education is a problem that needs to be solved by current research. Findings will enrich the theory of entrepreneurship education evaluation research while achieving the educational objectives of “integrating innovation and entrepreneurship into the whole process of talent cultivation” and “deepening the reform of innovation and entrepreneurship education in colleges and universities” and improving the overall systematic and targeted research of entrepreneurship education evaluation systems.
The main contributions of this study are as follows:

1. Teachers are the stakeholders of entrepreneurship education in higher education, and teacher quality, as one of the main determinants of talent cultivation quality in colleges and universities, is evaluated comprehensively from the perspective of teachers. The results can thus provide a basis for decision making to improve the quality and sustainable development of entrepreneurship education in colleges and universities.

2. This study constructs an evaluation framework for entrepreneurship education in colleges and universities from five aspects: curriculum system, organizational leadership, faculty construction, teaching management, and institutional guarantee. It also conducts a comprehensive evaluation of the quality of entrepreneurship education in 11 provinces and cities in the Yangtze River economic zone. The evaluation results identify the factors affecting the sustainable development of entrepreneurship education and may facilitate future comparisons of research and the analysis of key factors.

3. The entropy-weight method was used to determine the index weights while TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) was used to rank the results. ArcGIS software was utilized to draw a regional distribution map for comparing the differences in evaluation results among provinces and cities in the Yangtze River economic zone in a more intuitive way. The entropy-weight-TOPSIS evaluation results are verified using the fuzzy comprehensive evaluation (FCE) method. These results can be used as feedback for the implementation of relevant policies and as a reference for policy adjustment.

In summary, this study provides a comprehensive evaluation of the sustainable development of entrepreneurship education in universities and proposes an innovative evaluation method to ensure the scientific nature of the evaluation results.

The rest of the paper is arranged as follows: Section 2 provides the proposed framework of indicators. The indicators are also explained in detail. Section 3 presents a comprehensive evaluation model. Section 4 verifies the accuracy and validity of the evaluation model through empirical analysis. Section 5 analyzes the comprehensive evaluation results. Section 6 discusses and summarizes the research results and describes the limitations of the study as well as future research expectations.

2. Building a Sustainable Evaluation Framework for Entrepreneurship Education in Universities

2.1. Framework of Sustainable Evaluation Indicators

The evaluation of entrepreneurship education in higher education involves several key factors of different natures and various types of evaluation, whose effectiveness is limited by numerous factors and the absence of a standardized measurement tool [15]. In this study, we select the entrepreneurship education process for comprehensive evaluation and extract key information on the basis of relevant policy documents and relevant literature [10,25–27] to construct an evaluation framework. We also invite experts, scholars, and pedagogues in the field of entrepreneurship education to determine the framework of features that may influence the sustainability of the quality of entrepreneurship education in colleges and universities. To ensure the scientific nature of the framework and the systematic and representative selection of evaluation indicators, we conducted two rounds of scholar expert meetings and one round of teaching expert interviews, and invited a total of 20 scholars and experts in the field of entrepreneurship education to discuss and determine the indicators in the framework one by one. The feature framework was adjusted according to the suggestions made by the experts, and the indicators that are repetitive and easily cause ambiguity were deleted. The content of indicators in the dimension of institutional guarantee was added to ensure the comprehensiveness of the evaluation [28]. Meanwhile, we invited teachers with teaching experience in entrepreneurship education to conduct semi-structured interviews, and finally determined a feature framework for sustainable evaluation of entrepreneurship education in colleges and universities that includes five
dimensions: curriculum system, organizational leadership, faculty construction, teaching management, and institutional guarantee. The framework includes 35 secondary indices.

2.2. Evaluation Index Determination

2.2.1. Curriculum System

Education for sustainable development has been recognized as a factor in promoting the values of sustainable development [29]. Nevertheless, there is still room for improving sustainability education in higher education entrepreneurship curricula [6]. The integration of sustainable development into academic curricula is necessary to achieve the spirit of sustainable development [30]. For example, at least 400 universities in the United States offer entrepreneurship courses [31], and a focus on curricula has been observed to exert an important impact on innovation and entrepreneurship education in higher education. In the current study, the secondary indices of the curriculum system dimension are as follows: the development of entrepreneurship teaching materials to meet students’ diverse learning needs (A1); the establishment of a tiered and classified curriculum system for innovation and entrepreneurship education (A2); the establishment of online open courses such as entrepreneurship catechism and a case database for entrepreneurship (A3); the formation of a flexible mutual recognition mechanism for entrepreneurship credits (A4); the establishment of a specialized curriculum for entrepreneurship education that combines specializations (A5); the development of reasonable management methods for appointing teachers inside and outside the university (A6); the provision of advanced laboratories, training centers, and other venues to support innovation and entrepreneurship education (A7); the placement of a sufficient number of full-time and part-time teachers (A8); the integration of entrepreneurship education with professional education (A9); and the use of reasonable assessment and evaluation mechanisms co-created by teachers and students (A10).

A positive correlation exists between the sustainable development of entrepreneurial knowledge and the sustainable development of entrepreneurial behavior [30], and innovation in entrepreneurship education and training in higher education can promote the development of students’ entrepreneurial skills and activities, which are important in strengthening entrepreneurial culture [32]. Research has shown that entrepreneurship curriculum can be regarded as an effective tool to stimulate the economy and that attaching great importance to the construction of an innovative entrepreneurship education curriculum system can maximize the role of innovation and entrepreneurship education and further integrate their concepts into the curriculum [31]. Therefore, the 10 secondary indicators in the curriculum system dimension mentioned previously exert a positive influence on the innovation of entrepreneurship education in higher education. They are thus chosen as positive indicators in the current study.

2.2.2. Organizational Leadership

As the “helmsman” ensures the orderly operation of innovation and entrepreneurship education in higher education, higher education organizations play a crucial role in promoting active sustainable entrepreneurial practices [33,34]. Owing to the persistent lack of support for sustainability-related teaching subjects [35–37], higher education organizations need a sound theoretical foundation, academic leadership related to the field of innovation and entrepreneurship, proactive staff support, adequate funding, and appropriate organizational structures for system design. Therefore, the secondary indicators of organizational leadership selected in this work are as follows: the establishment of a special entrepreneurship management department (e.g., entrepreneurship college) (B1); the provision of entrepreneurship education faculty and full-time managers (B2); the provision of special offices and practice spaces, as well as a soft environment in the entrepreneurship college (B3); the attachment of great importance to entrepreneurship education and establishment of a relevant working leadership team (B4); the establishment of a systematic special plan for the development of innovation and entrepreneurship education (B5); and
the assessment of secondary colleges that include entrepreneurship education performance indicators (B6).

The will and values of university leaders play a key role in the development of entrepreneurship education [38], and the establishment of administrative configurations related to entrepreneurship education in universities is beneficial for the curriculum system and students’ education, as well as for the training and development of school faculty in the field of entrepreneurship [39]. Therefore, the six secondary indicators in the organizational leadership dimension have a positive impact on innovation and entrepreneurship education in colleges and universities. All the indicators described previously are selected as positive indicators in the current study.

2.2.3. Faculty Construction

As the main force in the development of innovation and entrepreneurship education in colleges and universities, faculty construction exerts considerable influence on the implementation of innovation and entrepreneurship education in colleges and universities, and teachers’ personal interests are the driving force for the sustainable integration of entrepreneurship-education-related courses [40]. In the current study, the secondary indicators of the faculty construction dimension include the following: the inclusion of personal entrepreneurship education performance into the performance assessment criteria of teachers (C1), the inclusion of personal entrepreneurship education performance into the conditions of evaluation of teachers’ titles (C2), the strengthening of the teaching capacity of teachers in entrepreneurship education (C3), the development of research projects related to teaching entrepreneurship education (C4), the organization of teachers to participate in various entrepreneurial mentorship cultivation projects outside the university (C5), and the encouragement of teachers to lead students in innovation and entrepreneurship (C6).

Studies have shown that teacher evaluation is a key lever for improving teaching quality [41] and that teacher performance plays an equally important role. It can be seen that “inclusion of personal entrepreneurship education performance into the performance assessment criteria of teachers (C1)” and “inclusion of personal entrepreneurship education performance into the conditions of evaluation of teachers’ titles (C2)” exerts a positive impact on the entrepreneurship education process in universities. Seikkula-Leino emphasized the necessity of teacher training for the successful implementation of entrepreneurship education in schools [42]; thus, “strengthening of the teaching capacity of teachers in entrepreneurship education (C3)” and “organization of teachers to participate in various entrepreneurial mentorship cultivation projects outside the university (C5)” have a positive impact on the process of innovation and entrepreneurship education in universities. Mbanefo argued that teachers need to use a practical approach to teaching when conducting innovative entrepreneurship education for students in universities [43]. Birdthistle et al., and Ruskovaara and Pihkala suggested that teacher training in entrepreneurship education has a positive impact on the practice of entrepreneurship education and increases the number of practices applied to entrepreneurship education [44,45]. Therefore, the positive influence of “development of research projects related to teaching entrepreneurship education (C4)” and “encouragement of teachers to lead students in innovation and entrepreneurship (C6)” on the process of innovation and entrepreneurship education in colleges and universities is indicated by the abovementioned indicators.

2.2.4. Teaching Management

Teaching management plays an important role in the development of innovation and entrepreneurship education in colleges and universities as it not only imparts knowledge but also cultivates the entrepreneurial skills and innovation ability of college students. Therefore, the secondary indicators of teaching management selected in this work are as follows: entrepreneurship education for all students (D1), encouragement of students and teachers to collaborate on innovative experiments, publications, patent development, and self-employment (D2), innovative entrepreneurship education courses for all students (D3),
combination of the school’s professional discipline characteristics to develop entrepreneurship education (D4), formulation of school policies that encourage students and teachers to work together on research and entrepreneurship projects (D5), and the establishment of a collaborative university–enterprise entrepreneurship education mechanism (D6).

Entrepreneurship education should provide value to key educational stakeholders [26]. Therefore, the indicators “entrepreneurship education for all students” (D1) and “innovative entrepreneurship education courses for all students” (D3) exert a positive impact on the entrepreneurship education process in universities. School–enterprise cooperation is crucial in entrepreneurship education, and the establishment of a structured university–enterprise cooperation mechanism can enable universities to better adapt to the requirements of the social job market [46]. Therefore, the indicators of “combination of the school’s professional discipline characteristics to develop entrepreneurship education” (D4) and “establishment of a collaborative university–enterprise entrepreneurship education mechanism” (D6) positively influence the entrepreneurship education process in universities. The application of a collaborative and creative approach to entrepreneurship education with students and stakeholders (e.g., teachers) to establish new connections that allow students to explore knowledge more freely across disciplines; this feature is conducive to the awakening of creative consciousness and the development of innovative capabilities [47]. Therefore, the “encouragement of students and teachers to collaborate on innovative experiments, publications, patent development, and self-employment” (D2) and “formulation of school policies that encourage students and teachers to work together on research and entrepreneurship projects” (D5) have a positive influence on the process of entrepreneurship education in universities. The above indicators are thus selected as positive indicators in the current study.

2.2.5. Institutional Guarantee

Entrepreneurship education in colleges and universities as a whole can be regarded as the operation of an organizational system, and certain incentives and guarantees are conducive to promoting members’ enthusiasm and improving organizational efficiency. Therefore, the secondary indicators of the institutional guarantee dimension selected in this study are as follows: the development of a relatively independent title promotion mechanism for entrepreneurship teachers (E1), the provision of sufficient funding for entrepreneurship education (E2), the development of an incentive mechanism for professional teachers involved in teaching entrepreneurship education (E3), the formulation of a good operation mechanism for a university entrepreneurship park or crowdsourcing space (E4), the encouragement of innovation-based entrepreneurship or high-end technology-based entrepreneurship (E5), the emphasis on cross-college or interdisciplinary entrepreneurship education cooperation mechanism (E6), and the active implementation of entrepreneurship support policies introduced by governments at all university levels (E7).

In recent years, the UK government has been working on supporting the policy aspects related to sustainable development education [48–50]. Meanwhile, the relevant documents in China also propose the building of strong innovation and entrepreneurship-practice platforms in colleges and universities, increasing financial support for development, and improving the policy of guaranteeing and motivating instructors of dual innovation in colleges and universities [51]. It is clear that an institutional guarantee, which includes teacher motivation, financial support, and collaborative cooperation, is a current issue that needs to be addressed to facilitate the implementation of entrepreneurship education in colleges and universities. Therefore, the seven secondary indicators in the institutional guarantee dimension exert a positive influence on entrepreneurship education in colleges and universities, and are thus selected as positive indicators in the current study.

3. Research Methodology

3.1. Entropy Method for Determining Index Weights

“Entropy” is called “information entropy” from the perspective of information theory. In 1948, Shannon [52] proposed that problems that cannot be measured quantitatively can
be judged by the size of their information entropy, which is inversely proportional to the degree of information variation. The more informative and deterministic the indicator is in the comprehensive evaluation, the smaller its entropy value. Conversely, the less informative and less deterministic the indicator is, the larger its entropy value. As the size of the entropy value of information depends entirely on the size of the information provided by the index itself, the use of the entropy method to determine the weight of an index can ensure objective and accurate evaluation results and avoid the errors caused by subjective factors in the process of human assignment. The entropy method is also applicable to the determination of the weight of any index. The weight size of each indicator is measured according to the size of the information provided by the indicator to provide a basis for comprehensive evaluation results. The objective method to determine the weight size avoids the interference of subjective errors in the results. This study thus provides a new perspective for the determination of indicator weights in entrepreneurship education evaluation research.

3.2. TOPSIS-Integrated Evaluation Method

Proposed by Hwang et al., the TOPSIS method as a decision-making method for ranking the closeness of evaluation objects to positive and negative ideal solutions by calculating the distance of each evaluation target to the optimal and inferior targets [53]. The relative posting rate is obtained by calculating the distance of each evaluation target to the optimal and inferior targets; it is used as the basis for judging the superiority of the evaluation target. Meanwhile, the evaluation target is ranked comprehensively according to the magnitude of the relative posting rate. The TOPSIS method does not have strict requirements with regard to sample distribution and quantity size, and it offers certain flexibility in its application. Hence, it is suitable for the comprehensive evaluation of entrepreneurship education in colleges and universities.

3.3. Entropy–TOPSIS for Establishing an Evaluation Model

The entropy–TOPSIS method is a comprehensive evaluation approach that combines the entropy method and TOPSIS. Specifically, it measures the evaluation index weights via information entropy and ranks the evaluation targets comprehensively via TOPSIS. Hence, this method addresses the influence of subjective errors in determining the weights of TOPSIS indices and makes the evaluation results more objective, scientific, and accurate. Given that the evaluation of entrepreneurship education in colleges and universities has many evaluation targets and rich levels, the determination of index values in previous studies mainly depends on experts’ academic backgrounds and subjective preferences. Such dependence can lead to the problem in which different evaluators set different index weights for the same evaluation targets and come up with different evaluation results. To evaluate the current situation of entrepreneurship education in colleges and universities more objectively, we established the entropy-weight–TOPSIS evaluation model in this work. The specific process steps are presented in the succeeding sections.

3.3.1. Data Standardization

With $m$ evaluation objects and $n$ evaluation indicators for each evaluation object, the judgment matrix of the raw data is constructed as follows:

$$X = \begin{bmatrix}
x_{11} & x_{12} & \ldots & x_{1n} \\
x_{21} & x_{22} & \ldots & x_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
x_{m1} & x_{m2} & \ldots & x_{mn}
\end{bmatrix}$$

(1)
Owing to the differences in the magnitude and order of magnitude of each index, the raw data need to be normalized to obtain the normalized judgment matrix $R$, which is processed as follows.

\[
R = \begin{bmatrix}
    r_{11} & r_{12} & \cdots & r_{1n} \\
    r_{21} & r_{22} & \cdots & r_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    r_{m1} & r_{m2} & \cdots & r_{mn}
\end{bmatrix}
\]  

(2)

where $r_{ij}$ denotes the standard value of the $i$th evaluation object in the $j$th evaluation index; it is given as

\[
r_{ij} = \frac{x_{ij} - x_{\text{Min}}}{x_{\text{Max}} - x_{\text{Min}}} \quad (i = 1, 2, \ldots, m; j = 1, 2, \ldots, n).
\]

(Note: $x_{\text{Max}}$ denotes the maximum value under the same index, $x_{\text{Min}}$ denotes the minimum value under the same index; $i = 1, 2, \ldots, m$; $j = 1, 2, \ldots, n$).

### 3.3.2. Entropy-Weight Method for Determining the Weights

When there are $m$ evaluation objects and $n$ evaluation indicators, the information entropy of the $j$th indicator is expressed as

\[
E_i = -\frac{1}{\ln m} \left( \sum_{j=1}^{n} f_{ij} \ln f_{ij} \right)
\]

\[
f_{ij} = \frac{r_{ij}}{\sum_{j=1}^{n} r_{ij}} (i = 1, 2, \ldots, m; j = 1, 2, \ldots, n)
\]

After obtaining the entropy of the $j$th indicator, the entropy-weight coefficient of the $j$th indicator is calculated as follows:

\[
\omega_j = \frac{1 - E_i}{n - \sum_{j=1}^{n} E_j} \sum_{j=1}^{n} \omega_j = 1
\]

On the basis of the judgment matrix $R$ and the entropy-weight coefficient $\omega_j$, a normalized weighted decision matrix $V = (v_{ij})_{m \times n}$ is established as follows:

\[
V = \begin{bmatrix}
    v_{11} & v_{12} & \cdots & v_{1n} \\
    v_{21} & v_{22} & \cdots & v_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    v_{m1} & v_{m2} & \cdots & v_{mn}
\end{bmatrix} = r_{ij} \times \omega_j
\]

(6)

### 3.3.3. Determining the Ranking of Evaluation Values

We calculate the optimal ideal solution $V^+$ and the worst ideal solution $V^-$ and determine the relative proximity of each evaluation object to the optimal and worst solutions as follows:

\[
V^+ = \left\{ \max_{1 \leq i \leq m} r_{ij} \mid j = 1, 2, \ldots, n \right\} = \{v_{1}^+, v_{2}^+, \ldots, v_{n}^+\}
\]

\[
V^- = \left\{ \min_{1 \leq i \leq m} r_{ij} \mid j = 1, 2, \ldots, n \right\} = \{v_{1}^-, v_{2}^-, \ldots, v_{n}^-\}
\]

(7)
The Euclidean distance $D^+$, $D^-$ of each evaluation object from the positive and negative ideal solutions is determined as follows:

$$D^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_{ij}^+)^2}$$

$$D^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_{ij}^-)^2}$$

The closeness of each evaluation object to the optimal ideal solution ($C_i$ value) is calculated as

$$C_i = \frac{D^-_i}{(D^-_i + D^+_i)} \quad (i = 1, 2, \cdots, m)$$

The more the value of $C_i$ converges to 1, the closer the evaluation object is to the ideal solution, and the evaluation target is ranked from the largest to the smallest, according to the order of merit.

4. Empirical Analysis

4.1. Data Sources

China’s Yangtze River economic zone includes Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Chongqing, Sichuan, Yunnan, and Guizhou (Figure 1). This zone has an area of approximately 2,052,300 km$^2$, thus accounting for 21.4% of the entire area of China and more than 40% of China’s population and gross domestic product (https://cjjjd.ndrc.gov.cn/zoujinchangjiang/zhanlue/, accessed on 10 May 2022).

The Yangtze River economic zone is the key to the country’s sustainable development goals and provides strong support for the country’s sustainable and healthy economic development. Hence, it was selected as the study area in our research.

In this study, the teachers of colleges and universities in 11 provinces and cities in China’s Yangtze River economic zone were used as the research subjects, and the data were collected by questionnaire survey. Referring to the survey scale in the relevant foreign literature, we designed the questionnaire report of the survey (the sustainable evaluation of entrepreneurship education in colleges and universities as part of the Chinese Social Science Foundation project) according to the indicator characteristics of the evaluation framework and setting the corresponding questions for each indicator to measure. The questionnaire was revised several times after discussions in meetings of experts in the field of entrepreneurship education, questionnaire evaluation, and semi-structured interviews. We contacted nearly 100 universities nationwide to send the questionnaire for pre-survey and to determine the final questionnaire. The survey was anonymous and participants participated voluntarily throughout. A total of 596 Chinese universities were surveyed, 13,120 questionnaires were collected, 12,596 valid questionnaires were obtained, and the effective rate of the questionnaire was 96.01%. After screening the questionnaire data that fit the scope and theme of this study (universities in the Yangtze River economic zone of China), the final sample size of 2725 was obtained.
The questionnaire consists of five dimensions.

1. Curriculum system: the curriculum system is the key to achieve the sustainability of entrepreneurship education and has a primary impact on the innovation and outcome production of entrepreneurship education in colleges and universities. The influence of the curriculum system is considered from the aspects of curriculum design, textbook compilation, teaching career, and teaching content [6,30,31] (10 questions).

2. Organizational leadership: the focus on the practical process of entrepreneurship education in colleges and universities at the organizational level and to establish support related to the sustainability of entrepreneurship education in colleges and universities, the influence of organizational leadership is examined in terms of management department settings, entrepreneurship education development planning, and professional administrative management [33,34,36] (6 questions).

3. Faculty construction: teachers are an important driving force for the sustainable development of entrepreneurship education and the key to improving teaching quality.
The impact of faculty development was observed in terms of faculty performance assessment standards, investment in faculty development, and the encouragement of projects [42,43,45] (6 questions).

4. Teaching management: effective teaching management can cultivate excellent entrepreneurial skills and the innovation ability of college students. The impact of teaching management is considered in terms of entrepreneurship education coverage, school–enterprise cooperation, and teacher–student cooperation [46,47] (6 questions).

5. Institutional guarantee: policies that support educational sustainability can promote the motivation of members in university entrepreneurship education. The influence of an institutional guarantee is mainly reflected in the incentive of teachers, financial support, and collaboration [49–51] (7 questions).

The questionnaire was measured using a five-point Likert scale (one score does not fit my characteristics at all, five scores fit my characteristics perfectly), and the reliability analysis yielded a standardized Cronbach alpha coefficient of 0.986, which is greater than 0.9. The validity was verified using the Kaiser–Meyer–Olkin (KMO) test and Bartlett’s test, and the KMO value was found to be 0.990, which is greater than 0.8, indicating that the satisfactory reliability and validity of the scale.

4.2. Comprehensive Evaluation Based on Entropy–TOPSIS

A questionnaire survey was conducted on college teachers in 11 provinces and cities in the Yangtze River economic zone to collect the data required for the development of the proposed comprehensive evaluation framework of entrepreneurship education in colleges and universities as well as the original evaluation matrix. First, the original matrix was standardized by combining Equations (1)–(6), calculating the entropy value and weight of each index to obtain the weight matrix, and constructing the comprehensive evaluation index framework for the sustainable development of entrepreneurship education in colleges and universities (Table 1). Second, the optimal scheme of curriculum system, organizational leadership, faculty construction, teaching management, and institutional guarantee of each unit in the research region was measured by combining Equations (7)–(9).

The magnitudes of the closeness were compared to finally obtain the comprehensive evaluation ranking results (Table 2).

<table>
<thead>
<tr>
<th>Target Layer</th>
<th>Criterion Level</th>
<th>Index Layer</th>
<th>Weight Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive evaluation of entrepreneurship education in colleges and universities</td>
<td>Curriculum system (A)</td>
<td>Development of entrepreneurship teaching materials to meet students' diversified learning needs (A1)</td>
<td>2.15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Establishment of a tiered and classified curriculum system for innovation and entrepreneurship education (A2)</td>
<td>2.70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Establishment of online open courses such as entrepreneurship catechism and a case database for entrepreneurship (A3)</td>
<td>2.92%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formation of a flexible mutual recognition mechanism for entrepreneurship credits (A4)</td>
<td>4.19%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Establishment of a specialized curriculum for entrepreneurship education that combines specializations (A5)</td>
<td>1.83%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development of reasonable management methods for appointing teachers inside and outside the university (A6)</td>
<td>2.01%</td>
</tr>
</tbody>
</table>
### Table 1. Cont.

<table>
<thead>
<tr>
<th>Target Layer</th>
<th>Criterion Level</th>
<th>Index Layer</th>
<th>Weight Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of advanced laboratories, training centers, and other venues to support innovation and entrepreneurship education (A7)</td>
<td></td>
<td>3.16%</td>
<td></td>
</tr>
<tr>
<td>Placement of a sufficient number of full-time and part-time teachers (A8)</td>
<td></td>
<td>2.36%</td>
<td></td>
</tr>
<tr>
<td>Integration of entrepreneurship education with professional education (A9)</td>
<td></td>
<td>2.44%</td>
<td></td>
</tr>
<tr>
<td>Use of reasonable assessment and evaluation mechanisms co-created by teachers and students (A10)</td>
<td></td>
<td>2.92%</td>
<td></td>
</tr>
<tr>
<td>Establishment of a dedicated entrepreneurship management department (e.g., entrepreneurship college) (B1)</td>
<td></td>
<td>2.15%</td>
<td></td>
</tr>
<tr>
<td>Provision of entrepreneurship education faculty and full-time managers (B2)</td>
<td></td>
<td>1.93%</td>
<td></td>
</tr>
<tr>
<td>Provision of special offices and practice spaces as well as a soft environment in the entrepreneurship college (B3)</td>
<td></td>
<td>2.61%</td>
<td></td>
</tr>
<tr>
<td>Attachment of great importance to entrepreneurship education and establishment of a relevant working leadership team (B4)</td>
<td></td>
<td>3.38%</td>
<td></td>
</tr>
<tr>
<td>Establishment of a systematic special plan for the development of innovation and entrepreneurship education (B5)</td>
<td></td>
<td>2.94%</td>
<td></td>
</tr>
<tr>
<td>Assessment of secondary colleges that includes entrepreneurship education performance indicators (B6)</td>
<td></td>
<td>2.32%</td>
<td></td>
</tr>
<tr>
<td>Inclusion of personal entrepreneurship education performance into the performance assessment criteria of teachers (C1)</td>
<td></td>
<td>2.27%</td>
<td></td>
</tr>
<tr>
<td>Inclusion of personal entrepreneurship education performance in the conditions for evaluation of teachers’ titles (C2)</td>
<td></td>
<td>2.67%</td>
<td></td>
</tr>
<tr>
<td>Strengthening of the teaching capacity of teachers in entrepreneurship education (C3)</td>
<td></td>
<td>3.45%</td>
<td></td>
</tr>
<tr>
<td>Development of research projects related to teaching entrepreneurship education (C4)</td>
<td></td>
<td>3.32%</td>
<td></td>
</tr>
<tr>
<td>Organization of teachers to participate in various entrepreneurial mentorship cultivation projects outside the university (C5)</td>
<td></td>
<td>3.83%</td>
<td></td>
</tr>
<tr>
<td>Encouragement of teachers to lead students in innovation and entrepreneurship (C6)</td>
<td></td>
<td>2.79%</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurship education for all students (D1)</td>
<td></td>
<td>3.62%</td>
<td></td>
</tr>
<tr>
<td>Encouragement of students and teachers to cooperate on innovative experiments, publications, patent development, and self-employment (D2)</td>
<td></td>
<td>2.40%</td>
<td></td>
</tr>
<tr>
<td>Innovative entrepreneurship education courses for all students (D3)</td>
<td></td>
<td>1.99%</td>
<td></td>
</tr>
<tr>
<td>Combination of the school’s professional discipline characteristics to develop entrepreneurship education (D4)</td>
<td></td>
<td>3.43%</td>
<td></td>
</tr>
<tr>
<td>Formulation of school policies that encourage students and teachers to work together on research and entrepreneurship projects (D5)</td>
<td></td>
<td>2.93%</td>
<td></td>
</tr>
<tr>
<td>Establishment of a collaborative university–enterprise entrepreneurship education mechanism (D6)</td>
<td></td>
<td>3.17%</td>
<td></td>
</tr>
</tbody>
</table>
Table 1. Cont.

<table>
<thead>
<tr>
<th>Target Layer</th>
<th>Criterion Level</th>
<th>Index Layer</th>
<th>Weight Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional guarantee (E)</td>
<td>Development of a relatively independent title promotion mechanism for entrepreneurship teachers (E1)</td>
<td></td>
<td>3.32%</td>
</tr>
<tr>
<td></td>
<td>Provision of sufficient funding for entrepreneurship education (E2)</td>
<td></td>
<td>3.67%</td>
</tr>
<tr>
<td></td>
<td>Development of an incentive mechanism for professional teachers involved in teaching entrepreneurship education (E3)</td>
<td></td>
<td>2.62%</td>
</tr>
<tr>
<td></td>
<td>Formulation of a good operation mechanism for a university entrepreneurship park or crowdsourcing space (E4)</td>
<td></td>
<td>2.86%</td>
</tr>
<tr>
<td></td>
<td>Encouragement of innovation-based entrepreneurship or high-end technology-based entrepreneurship (E5)</td>
<td></td>
<td>3.30%</td>
</tr>
<tr>
<td></td>
<td>Emphasis on cross-college or interdisciplinary entrepreneurship education cooperation mechanism (E6)</td>
<td></td>
<td>3.62%</td>
</tr>
<tr>
<td></td>
<td>Active implementation of entrepreneurial support policies introduced by governments at all university levels (E7)</td>
<td></td>
<td>2.76%</td>
</tr>
</tbody>
</table>

Table 2. Comprehensive evaluation results of sustainable development of entrepreneurship education in colleges and universities, including Curriculum system (CS), Organizational leadership (OL), Faculty construction (FC), Teaching management (TM), and Institutional guarantee (IG).

<table>
<thead>
<tr>
<th>Province</th>
<th>CS $C_{Ai}$</th>
<th>Rank</th>
<th>OL $C_{Bi}$</th>
<th>Rank</th>
<th>FC $C_{Ci}$</th>
<th>Rank</th>
<th>TM $C_{Di}$</th>
<th>Rank</th>
<th>IG $C_{Ei}$</th>
<th>Rank</th>
<th>Values $C_i$</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanghai</td>
<td>1.000</td>
<td>1</td>
<td>0.970</td>
<td>1</td>
<td>1.000</td>
<td>1</td>
<td>1.000</td>
<td>1</td>
<td>1.000</td>
<td>1</td>
<td>0.989</td>
<td>1</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>0.707</td>
<td>3</td>
<td>0.712</td>
<td>4</td>
<td>0.709</td>
<td>3</td>
<td>0.737</td>
<td>2</td>
<td>0.727</td>
<td>2</td>
<td>0.718</td>
<td>2</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>0.676</td>
<td>4</td>
<td>0.785</td>
<td>2</td>
<td>0.725</td>
<td>2</td>
<td>0.703</td>
<td>3</td>
<td>0.677</td>
<td>4</td>
<td>0.706</td>
<td>3</td>
</tr>
<tr>
<td>Hunan</td>
<td>0.735</td>
<td>2</td>
<td>0.729</td>
<td>3</td>
<td>0.663</td>
<td>4</td>
<td>0.627</td>
<td>4</td>
<td>0.724</td>
<td>3</td>
<td>0.697</td>
<td>4</td>
</tr>
<tr>
<td>Chongqing</td>
<td>0.579</td>
<td>5</td>
<td>0.487</td>
<td>7</td>
<td>0.540</td>
<td>5</td>
<td>0.436</td>
<td>7</td>
<td>0.549</td>
<td>5</td>
<td>0.525</td>
<td>5</td>
</tr>
<tr>
<td>Sichuan</td>
<td>0.523</td>
<td>6</td>
<td>0.562</td>
<td>5</td>
<td>0.492</td>
<td>6</td>
<td>0.461</td>
<td>6</td>
<td>0.494</td>
<td>6</td>
<td>0.505</td>
<td>6</td>
</tr>
<tr>
<td>Jiangxi</td>
<td>0.507</td>
<td>7</td>
<td>0.524</td>
<td>6</td>
<td>0.480</td>
<td>7</td>
<td>0.485</td>
<td>5</td>
<td>0.461</td>
<td>7</td>
<td>0.489</td>
<td>7</td>
</tr>
<tr>
<td>Yunnan</td>
<td>0.167</td>
<td>8</td>
<td>0.177</td>
<td>8</td>
<td>0.130</td>
<td>8</td>
<td>0.176</td>
<td>8</td>
<td>0.093</td>
<td>9</td>
<td>0.149</td>
<td>8</td>
</tr>
<tr>
<td>Hubei</td>
<td>0.102</td>
<td>10</td>
<td>0.172</td>
<td>9</td>
<td>0.046</td>
<td>11</td>
<td>0.135</td>
<td>9</td>
<td>0.132</td>
<td>8</td>
<td>0.120</td>
<td>9</td>
</tr>
<tr>
<td>Anhui</td>
<td>0.141</td>
<td>9</td>
<td>0.156</td>
<td>10</td>
<td>0.109</td>
<td>9</td>
<td>0.084</td>
<td>10</td>
<td>0.039</td>
<td>11</td>
<td>0.110</td>
<td>10</td>
</tr>
<tr>
<td>Guizhou</td>
<td>0.024</td>
<td>11</td>
<td>0.073</td>
<td>11</td>
<td>0.103</td>
<td>10</td>
<td>0.069</td>
<td>11</td>
<td>0.059</td>
<td>10</td>
<td>0.068</td>
<td>11</td>
</tr>
</tbody>
</table>

5. Analysis of Results

5.1. Indicator Weights

The weights of each index in the standardized matrix are calculated according to Equations (1)–(6) (Table 1). The weights of the “formation of a flexible mutual recognition mechanism for entrepreneurship credits” (A4), “organization of teachers to participate in various entrepreneurial mentorship cultivation projects outside the university” (C5), “entrepreneurship education for all students” (D1), “provision of sufficient funding for entrepreneurship education” (E2), and “emphasis on cross-college or interdisciplinary entrepreneurship education cooperation mechanism” (E6) are all greater than 0.036, indicating that they are the main factors affecting the comprehensive evaluation of entrepreneurship education in universities. These main factors are followed by “provision of advanced laboratories, training centers, and other venues to support innovation and entrepreneur-
ship education” (A7), “attachment of great importance to entrepreneurship education and establishment of a relevant working leadership team” (B4), “strengthening of the teaching capacity of teachers in entrepreneurship education” (C3), “development of research projects related to teaching entrepreneurship education” (C4), and “combination of the school’s professional discipline characteristics to develop entrepreneurship education” (D4). The indicator weights of “establishment of a collaborative university–enterprise entrepreneurship education mechanism” (D6), “development of a relatively independent title promotion mechanism for entrepreneurship teachers” (E1), and “encouragement of innovation-based entrepreneurship or high-end technology-based entrepreneurship” (E5) are all greater than 0.030, indicating that they also play an important role in the comprehensive evaluation of entrepreneurship education. As shown in Table 3, the weights of the five major factors influencing the comprehensive evaluation of entrepreneurship education in colleges and universities are ranked as follows: curriculum system > institutional guarantee > faculty construction > teaching management > organizational leadership.

Table 3. Weight values of indicators of entrepreneurship education in colleges and universities, including Curriculum system (CS), Organizational leadership (OL), Faculty construction (FC), Teaching management (TM), and Institutional guarantee (IG).

<table>
<thead>
<tr>
<th>Dimension</th>
<th>CS</th>
<th>OL</th>
<th>FC</th>
<th>TM</th>
<th>IG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weights</td>
<td>0.2668</td>
<td>0.1533</td>
<td>0.1833</td>
<td>0.1754</td>
<td>0.2215</td>
</tr>
</tbody>
</table>

5.2. Evaluation Results

5.2.1. Multifactorial Assessment Results

The results of Table 2 are introduced into ArcGIS (wherein ArcMap is an application capable of data processing, editing, analysis, and many other functions and can be used for spatial analysis, building spatial databases, drawing maps, etc.), and the data are classified into three levels according to the natural intermittent classification. The scores of curriculum system, organizational leadership, faculty construction, teaching management, and institutional guarantee are shown in Figures 2–6.

**Figure 2. Curriculum system sustainability.**
Figure 3. Organizational leadership sustainability.

Overall, the sustainable development of entrepreneurship education quality in terms of the five dimensions, namely, curriculum system, organizational leadership, faculty construction, teaching management, and institutional guarantee can be regarded as better in East China than in Southwest China. Specifically, in all dimensions except teaching management, Shanghai, Jiangsu, Zhejiang, and Hunan have the highest scores. The reasons for this trend are as follows: schools have not implemented a flexible mutual recognition mechanism for entrepreneurship credits, teachers have fewer opportunities to participate in off-campus entrepreneurship mentor training, and innovation and entrepreneurship education (e.g., establishment of a relevant leadership group) are not given adequate attention. For the teaching management dimension, Shanghai, Zhejiang, and Jiangsu have
the highest scores. This result is mainly related to the adequacy of funding for teaching work, availability of an independent title promotion mechanism for teachers in the field of entrepreneurship, and the conduct of entrepreneurship education in conjunction with the school’s special disciplines.

Figure 5. Teaching management sustainability.

Figure 6. Institutional guarantee sustainability.

5.2.2. Comprehensive Evaluation Results

The $C_i$ values of each evaluation unit in Table 2 are imported into ArcGIS, and the natural discontinuity classification method is used to divide the evaluation objects (11 provinces and cities in the Yangtze River economic zone) into three classes, namely, quality leadership
ladder (Class I), optimized development ladder (Class II), and general adjustment ladder (Class III) (Figure 7).

![Composite scores](image)

Figure 7. Regional distribution of composite scores.

As shown in Figure 6, there are obvious regional differences in the quality of entrepreneurship education in colleges and universities in the study area, with a high concentration of spatial distribution and a trend of decreasing quality from East China to Southwest China. Class I is the quality leadership ladder, and it includes Shanghai, Jiangsu, Zhejiang, and Hunan. The quality of entrepreneurship education in this ladder has obvious advantages in the Yangtze River economic zone. Class II is the optimized development ladder, and it includes Chongqing, Sichuan, and Jiangxi. The entrepreneurship education in colleges and universities in this ladder has not reached obvious advantages in practice, but still has relative advantages in a comprehensive view. Class III is the general adjustment ladder, and it includes Yunnan, Hubei, Anhui, and Guizhou. The overall quality of entrepreneurship education in this ladder is in a general position and the overall planning and practice need to be adjusted appropriately.

5.3. Fuzzy Comprehensive Evaluation Method for Testing the Evaluation Results

The ranking results often vary depending on the choice of evaluation method [54], and the choice of method appears to be crucial in the evaluation process. Therefore, to verify the accuracy of the results, we validate the TOSIS ranking by using a fuzzy comprehensive evaluation method.

5.3.1. Fuzzy Comprehensive Evaluation (FCE)

The FCE method is a mathematical method that uses the thinking and methods of fuzzy mathematics to perform a comprehensive assessment of evaluation objectives that are difficult to clearly define [55]. In this study, the FCE method was used to measure the sample matrix, obtain the evaluation results, and rank them accordingly. The details are shown in Table 4.
Table 4. Fuzzy comprehensive evaluation (FCE) method for ranking results.

<table>
<thead>
<tr>
<th>Evaluation Object</th>
<th>FCE Value</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanghai</td>
<td>0.100</td>
<td>1</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>0.095</td>
<td>1</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>0.095</td>
<td>1</td>
</tr>
<tr>
<td>Hunan</td>
<td>0.085</td>
<td>1</td>
</tr>
<tr>
<td>Chongqing</td>
<td>0.092</td>
<td>5</td>
</tr>
<tr>
<td>Sichuan</td>
<td>0.085</td>
<td>5</td>
</tr>
<tr>
<td>Jiangxi</td>
<td>0.095</td>
<td>5</td>
</tr>
<tr>
<td>Yunnan</td>
<td>0.092</td>
<td>8</td>
</tr>
<tr>
<td>Hubei</td>
<td>0.092</td>
<td>8</td>
</tr>
<tr>
<td>Anhui</td>
<td>0.083</td>
<td>8</td>
</tr>
<tr>
<td>Guizhou</td>
<td>0.085</td>
<td>11</td>
</tr>
</tbody>
</table>

5.3.2. Ranking Similarity Coefficient

In comparing different rankings, the most common method is to perform a correlation analysis between two or more sets of ranking results [56]. Using the data in Table 5, we analyze the correlation between the TOPSIS ranking and the FCE ranking by conducting correlation analysis. The strength of the correlation is expressed using Pearson’s correlation coefficient. Table 6 shows that the correlation coefficient between the TOPSIS ranking and the FCE ranking is 0.956 and that it is significant at the 0.01 level.

Table 5. Ranking results of TOPSIS and FCE.

<table>
<thead>
<tr>
<th>Evaluation Object</th>
<th>TOPSIS Ranking</th>
<th>FCE Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanghai</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Hunan</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Chongqing</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sichuan</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Jiangxi</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Yunnan</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Hubei</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Anhui</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Guizhou</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 6. Correlation coefficient between TOPSIS ranking and FCE ranking.

<table>
<thead>
<tr>
<th>Pearson’s Correlation Coefficient</th>
<th>TOPSIS ranking</th>
<th>FCE ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FCE ranking</td>
<td>0.956 **</td>
</tr>
</tbody>
</table>

** p < 0.01.

6. Discussion and Conclusions

6.1. Discussion

The purpose of this study is to propose a framework that enables a comprehensive evaluation of the entrepreneurship education sustainability process, introduce a new evaluation method, discuss its application through the case of the Yangtze River economic zone in China, and explain the factors that may influence the assessment of entrepreneurship education sustainability in Chinese universities. The study highlights the following challenges in evaluating entrepreneurship education sustainability: the selection of evaluation criteria and their effective measurement. According to the comprehensive evaluation index weights, the key to the sustainable development of entrepreneurship education in colleges and universities is the curriculum system and an institutional guarantee, whose entropy weights...
are 0.27 and 0.22, respectively. Johannisson, Autio et al., Safavian-Martinon, and Fayolle similarly emphasized the importance of curriculum and institutions in entrepreneurship education in higher education [57–60].

**Curriculum system**: Chinese universities should not only focus on theoretical learning in the design of the curriculum system but also emphasize the importance of practical teaching. The current educational practice in entrepreneurship education is still mainly in the form of “about” [27]; hence, there is a need to change the focus from “about” entrepreneurship education to “for” entrepreneurship education [61]. Moreover, Chinese universities should have a flexible mutual recognition mechanism for entrepreneurship credits and focus on building venues or centers for students’ entrepreneurship training and innovation practice. School–enterprise cooperation is also essential in the design of an entrepreneurship curriculum. By inviting entrepreneurs to teach and lecture and integrating entrepreneurial awareness into classroom learning, students can have more opportunities for social training, which is conducive to the transformation of knowledge results and enhances students’ innovation and practical ability. Meanwhile, cooperation between enterprises and universities can promote resource conversion and improve the transformation rate of scientific and technological innovation results. The sustainability of entrepreneurship education curriculum design is uneven across countries [62–64], and sustainability accounts for a relatively small share of entrepreneurship education. Moreover, few studies have paid attention to the measurement of the overall effectiveness of entrepreneurship education curricula [15]. Hence, there is still room to improve the sustainability of the entrepreneurship curricula in higher education [6], and further consideration should be given to how new curricula can be integrated with the established entrepreneurship education system [65] so as to achieve SDG No. 4 [66].

**Institutional guarantee**: This study argues that the system of promoting teachers’ titles should be improved, adequate funding for innovation and entrepreneurship projects should be given, cross-faculty and interdisciplinary collaboration between faculty and students should be encouraged, funding should be provided to finance students’ entrepreneurship projects, entrepreneurship training centers and campus incubators should be supported, and technological innovation should be encouraged. This also confirms the findings of Rasmussen, E. that effective policies and measures should be embedded in university administrators, research teams, industrial partners, etc. [67,68].

**Teaching management**: Teaching content and teaching methods are the key elements for the success of entrepreneurship education [69]. Entrepreneurship education should be oriented toward the whole school and strengthen the combination of the school’s professional discipline characteristics and entrepreneurship education (specialization and innovation integration). New pedagogical designs conducive to entrepreneurship teaching practices [70], such as collaborative faculty–student participation in hands-on entrepreneurship education activities, should be encouraged more often. The Internet brings hope and convenience for the transformation of educational theory into practice [71], and the combination of Internet technology and entrepreneurship education teaching is a new innovative teaching method [72].

**Faculty construction**: Teachers are one of the stakeholders of innovation and entrepreneurship education in colleges and universities, and faculty construction is an essential part of developing high-quality entrepreneurship education. Therefore, colleges and universities should pay attention to the teaching capacity development of entrepreneurship teachers, conduct regular on- and off-campus trainings for innovation and entrepreneurship teachers, encourage young teachers to declare entrepreneurship research projects, and create a first-class entrepreneurship faculty team. The Chinese Ministry of Education has been designing and providing a series of teacher training programs in the field of entrepreneurship education since 2003, but the shortage of competent teachers is still a problem faced by entrepreneurship education in China [24]. We should emphasize high-quality teacher training and invest in the further development of teacher training [73], because faculty construction is the foundation of future entrepreneurship education.
Organizational leadership: Many studies illustrate the lack of a systematic and complete administrative support system within universities and the need to establish a leadership team for entrepreneurship education-related work, develop a systematic special plan for the development of entrepreneurship education, and place full-time managers for entrepreneurship education. These efforts are expected to improve the leading role of entrepreneurship education in organizations [38], enhance the academic status of entrepreneurship education research, and guarantee the promotion of faculty positions by motivating the creation of faculty research teams [74]. It is also necessary to increase the investment in research in the field of entrepreneurship education [75] and to pay attention to academic research on the evaluation of entrepreneurship education programs [26].

Comparing the regional rankings of each dimension, we find that under the dimensions of curriculum systems, organizational leadership, faculty construction, teaching management, and institutional guarantees, Shanghai, Jiangsu, and Zhejiang have an advantage. There are obvious geographical differences in the sustainable development of entrepreneurship education in colleges and universities, and the high-quality sustainable development of entrepreneurship education is mainly concentrated in the Yangtze River delta region (with the comprehensive evaluation results showing Shanghai, Jiangsu, and Zhejiang in the top three). Provinces and cities in the quality leadership ladder rank high in the evaluation results for the five dimensions, indicating that the overall quality of entrepreneurship in colleges and universities needs the integration of multiple links to realize the deepening reform of entrepreneurship education. At present, the Yangtze River economic zone has achieved significant success in developing innovation and entrepreneurship education in colleges and universities. Among the top 15 winners of the 7th “Internet+” College Innovation and Entrepreneurship Competition, eight provinces and cities (53.3%) are located in the Yangtze River economic zone. According to the China Youth Entrepreneurship Development Report (2021), the Yangtze River delta region is an active entrepreneurial region with obvious location advantages, and Jiangsu and Shanghai are the gathering places of scientific and technologically innovative enterprises. Thus, the Yangtze River delta region is in an important position and plays a crucial role in national economic and social development. Combining this feature with the new situation requirements for development, universities should pay close attention to interschool cooperation, school–enterprise collaboration, and cross-regional collaborative development. They should also build a new pattern of innovation and entrepreneurship education in universities and promote the development of a social-knowledge economy.

A comprehensive evaluation of entrepreneurship education in colleges and universities responds to one of the challenges of entrepreneurship education research, that is, “developing research methods to measure the effectiveness of entrepreneurship education, that is, the extent to which goals are achieved” [76]. As the quality of innovation and entrepreneurship education in colleges and universities is affected by a variety of complex factors in the process of conducting innovation and entrepreneurship education and given the fact that evaluation needs to consider the interference of objective factors (e.g., time, region, culture), it is necessary to focus on the feasibility of index selection when evaluating the quality of innovation and entrepreneurship education in colleges and universities [76]. Doing so should ensure the establishment of a scientific and effective comprehensive evaluation framework. In addition, the core indices should be determined through multiple experiments, and the evaluation results should be verified by multiple parties. In the process of implementation, entrepreneurship education involves multiple subjects, and evaluation, as a reflection of value orientation, should consider the needs and attitudes of stakeholders. A comprehensive consideration from different evaluation perspectives at multiple levels is recommended to maximize the interests of multiple parties and promote the development of innovation and entrepreneurship education in colleges and universities more effectively.
6.2. Conclusions

This study adopts the entropy–TOPSIS method to comprehensively evaluate the sustainable development of entrepreneurship education in colleges and universities in China’s Yangtze River economic zone. Using an intuitive regional distribution map, we find that there are obvious regional differences in the quality of entrepreneurship education in colleges and universities in China’s Yangtze River economic zone. We also observe that the high-quality sustainable development of entrepreneurship education is mainly concentrated in the Yangtze River delta region (with the comprehensive evaluation results indicating Shanghai, Jiangsu, and Zhejiang in the top three). The Yangtze River delta region is an entrepreneurially active region with obvious locational advantages and is in an important position in China’s economic development. Combining this fact with current requirements, universities should pay attention to interschool cooperation, school–enterprise collaboration, and cross-regional collaborative development. They should also emphasize the importance of practical teaching in curriculum design [77], focus on the integration of new curriculum and entrepreneurship education system, introduce Internet technology [73] into entrepreneurship education teaching in teaching management, increase the teaching capacity training of entrepreneurship teachers, improve the title promotion system of entrepreneurship teachers, increase the funding for entrepreneurship projects, and emphasize the leadership role of entrepreneurship education in organizations.

The article responds well to previous research on innovation in the evaluation of entrepreneurship education processes [78,79]. This study discusses the framework of impact indicators for the sustainable development of entrepreneurship education in colleges and universities in the Yangtze River economic zone of China. It highlights the phenomenon of uneven regional development in terms of the sustainable development of entrepreneurship education in colleges and universities in the Yangtze River economic zone on the basis of the comprehensive evaluation results. It further offers suggestions in the aspects of a curriculum system, institutional guarantee, organizational leadership, faculty construction, and teaching management. This study brings new research ideas for the future evaluation of entrepreneurship education in China with a new comprehensive evaluation method; it provides a scientific basis and support for planning and decision making for deepening reforms, optimizing configurations, and improving the education methods of entrepreneurship education in colleges and universities; and expands the connotation of the comprehensive evaluation of entrepreneurship education in colleges and universities. Hence, it offers certain practical significance.

The sustainable development of entrepreneurship education in colleges and universities is affected by a variety of complex factors while entrepreneurship education has a time-lag effect and requires feedback from long-term serial observations. Limited by the data collected, this study only selects cross-sectional data for a comprehensive evaluation of the current situation of entrepreneurship education in colleges and universities. Future longitudinal analysis and comparative research should thus be conducted [76], along with other efforts, such as the establishment of a multilevel comprehensive dynamic monitoring and evaluation of the quality of entrepreneurship education in colleges and universities.

In terms of methodology, the entropy–TOPSIS method was used as an evaluation tool to provide a new research idea for entrepreneurship education evaluation by using a mathematical algorithm model for comprehensive evaluation. The FCE method was introduced to verify the validity of the TOPSIS ranking, and the Pearson correlation coefficient was used to compare the rankings. The results showed that the two groups had high-similarity. Future research can explore more multicriteria decision analysis methods to compare results. Although the entropy–TOPSIS method can avoid the subjective bias caused by human factors, its validity depends largely on the constructed indicator system. Therefore, there is still room for further improvement in the selection of evaluation indicators in this study.
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References

30. Fanea-Ivanovic, M.; Baber, H. Sustainability at Universities as a Determinant of Entrepreneurship for Sustainability. *Sustainability* 2022, 14, 454. [CrossRef]
42. Seikkila-Leino, J. The implementation of entrepreneurship education through curriculum reform in Finnish comprehensive school. *Curriculum Studies 2011*, 1, 69–85. [CrossRef]