

A Case Study on the Effectiveness Evaluation of University Discipline Construction Based on ESI Data in the Context of Breaking the “Five-Only” Criteria

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Abstract

Against the backdrop of “Breaking the Five-Only”, representative work evaluation has become a crucial initiative in the reform of scientific and technological evaluation. Highly cited papers in ESI data can be considered as scholars’ representative works for objectively evaluating the effectiveness of university discipline construction. This study constructs an evaluation model for university discipline construction effectiveness based on ESI highly cited papers, taking H University as a case study, and analyzes 30 periods of ESI tracking data from the past five years through methods including bibliometrics and statistics. The findings reveal that the case university has achieved significant overall effectiveness in discipline construction, though some disciplines have developed slowly. This research can provide methodological references for evaluating university discipline construction effectiveness and facilitate optimal resource allocation and strategy formulation in university discipline construction.

Full Text

Preamble

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Abstract

Under the “Breaking the Five-Only” policy backdrop, representative work evaluation has emerged as a key initiative in reforming science and technology assessment. Highly cited papers in ESI data can be regarded as scholars’ representative works for objectively evaluating university discipline construction effectiveness. This study constructs an evaluation model for discipline construction effectiveness based on ESI highly cited papers. Taking H University as a case, we analyze 30 consecutive periods of ESI tracking data from 2018–2022 using bibliometrics and statistical methods. The findings reveal that the case university has achieved remarkable overall effectiveness in discipline construction, though development across disciplines remains uneven. This research provides methodological references for evaluating discipline construction effectiveness and promotes optimal resource allocation and strategy formulation for university discipline development.

Keywords: ESI data; discipline construction; effectiveness evaluation; representative work evaluation

Introduction

Discipline construction constitutes a fundamental undertaking for universities in talent cultivation, scientific research, and social service. Discipline construction effectiveness typically refers to the achievements attained within a specific period, manifested primarily through academic performance indicators [1]. Evaluating discipline construction effectiveness serves as a crucial reference for national oversight of university discipline development and strategic planning, as well as an essential foundation for universities to optimize their discipline orientation, thereby holding significant importance for promoting disciplinary advancement.

In 2018, the Ministry of Education issued the “Notice on Launching Special Actions to Eliminate ‘Paper-Only, Title-Only, Hat-Only, Diploma-Only, and Award-Only’ Evaluation,” initiating the cleanup of the “Five-Only” practices, rectifying unscientific education evaluation orientations, and implementing representative work evaluation systems. In 2020, the Ministry of Education and other departments jointly released the “Evaluation Methods for ‘Double First-Class’ Construction Effectiveness (Trial),” which emphasized establishing a normalized monitoring system and reasonably referencing third-party evaluation performance [2]. The ESI database, as a tool for measuring research performance and tracking scientific development trends, can serve as an objective reference for discipline construction effectiveness evaluation. ESI highly cited

papers are defined as papers ranked in the top 1% of citations within the same discipline, document type, and publication year during the ESI database coverage period [3], representing high-quality and high-impact works within a discipline that can be considered scholars' representative works. In light of this, this paper explores the evaluation of discipline construction effectiveness in Chinese universities from the perspective of ESI highly cited papers.

1 Related Research Status

Domestic scholars have conducted research on discipline construction effectiveness evaluation from three primary perspectives: (1) **Evaluation philosophy studies**: Zhong Binglin et al. proposed a quality-centered, multi-factor assessment philosophy [4], while Cui Yubao et al. examined international experiences and their implications for China's discipline construction effectiveness evaluation philosophy [5]. (2) **Evaluation system construction**: Lin Mengquan et al. proposed a two-dimensional structural model for discipline construction effectiveness evaluation systems [6], and Gu Xiaohui et al. constructed a classified and hierarchical evaluation system [7]. (3) **Evaluation tools and indicators**: Wang Zhanjun et al. studied the value and application of dynamic monitoring in "Double First-Class" construction effectiveness evaluation [8], and Shao Lingzhi investigated the structural characteristics of case indicators for "Double First-Class" construction effectiveness evaluation [9].

Additionally, some studies have utilized ESI data for discipline construction effectiveness evaluation. Zhao Naixuan et al. explored "Double First-Class" university construction effectiveness using five periods of ESI data [10]; Chen Weijing et al. analyzed university construction effectiveness from the perspective of ESI discipline development trends [11]; and He Xiumei et al. evaluated discipline construction in high-level universities using two periods of ESI data [12].

In summary, while existing domestic research has evaluated university discipline construction effectiveness based on ESI data, few studies have conducted in-depth analysis using continuously tracked ESI highly cited paper data. This paper constructs an evaluation model and analyzes 30 consecutive periods of ESI highly cited paper data from H University over the past five years, providing a case reference for evaluating discipline construction effectiveness.

2 Data Sources and Evaluation Model

This study utilizes 30 periods of ESI highly cited paper data from H University spanning 2018–2022. Drawing on existing research, we construct an evaluation model for university discipline construction effectiveness based on ESI highly cited papers (Figure 1 [Figure 1: see original paper]), selecting four indicators: paper quantity, disciplinary distribution, departmental distribution, and author distribution. Using bibliometrics and statistical methods, we assess discipline construction effectiveness from multiple data dimensions. In the data character-

istic analysis, we measure paper development trends using absolute quantities per period, period-to-period growth rates, and year-over-year growth rates. We evaluate disciplinary distribution trends through period-by-period analysis of papers across disciplines, departmental contribution trends through period-by-period analysis of departmental disciplinary distribution, and leading authors through analysis of main authors per period and authors across all 30 periods.

3 Basic Situation of H University

H University is a key national university under the Ministry of Education with engineering strengths. From 2018–2022, the university’s ESI disciplines developed rapidly, with its global ranking percentile increasing by over 20 percentage points, particularly in 2019 and 2020 when the ranking percentile saw its largest gains—correlating with institutional restructuring and new discipline construction planning initiatives. During this five-year period, six additional disciplines entered the top 1% ESI ranking. By the end of 2022, H University ranked 960th globally with nine ESI top 1% disciplines. These achievements demonstrate significant discipline construction effectiveness and steady overall progress over the past five years.

4 Case Analysis of University Discipline Construction Effectiveness

Based on the constructed evaluation model, we conduct an in-depth analysis of H University’s discipline construction effectiveness over the past five years.

4.1 Development Trend of High-Level Papers

The number of highly cited papers at H University showed clear growth over the five-year period. In terms of absolute quantity, the university’s highly cited papers increased from fewer than 100 per period in 2018 to over 200 per period (Figure 2 [Figure 2: see original paper]). Regarding period-to-period growth rates, growth was relatively slow in 2018, accelerated rapidly in 2019 and 2020, and moderated somewhat in 2021 and 2022 (Figure 3 [Figure 3: see original paper]). For year-over-year growth rates, the second half of 2019 and first half of 2020 showed particularly high growth, while other periods remained below 50% (Figure 4 [Figure 4: see original paper]). Overall, H University demonstrated strong productivity in high-level papers, especially with significant improvement from the second half of 2019 to the first half of 2020, indicating robust performance in high-quality research output and continuously improving academic standards, though the growth rate has slowed in recent years.

4.2 Discipline Distribution of High-Level Papers

Analyzing the distribution of highly cited papers across ESI’s 22 subject categories reveals institutional disciplinary priorities. The analysis shows that H

University's highly cited papers increasingly span more disciplines, growing from 8–9 disciplines in 2018 to 15 by the end of 2022. However, contributions remain concentrated in several key disciplines, with Engineering far ahead, followed by Computer Science and Mathematics—aligning closely with the university's ESI top 1% disciplines and demonstrating clear advantages in these areas. Meanwhile, disciplines such as Physics and Plant & Animal Science, though not yet in the ESI top 1%, have shown growth in highly cited papers in recent years, indicating strong potential for development. This reflects the university's capacity to advance different disciplines in accordance with its institutional characteristics and disciplinary strengths.

4.3 Departmental Distribution Trend of High-Level Papers

By the end of 2022, H University had established 20 schools and colleges. Analyzing period-by-period departmental distribution and departmental disciplinary distribution helps understand each unit's role in discipline construction. The data show that highly cited papers originate from a broad range of departments, with 12–17 colleges contributing each period—representing over half of all departments. Annual distributions vary, with major contributions concentrated in science and engineering colleges. In 2018, the primary contributors were the College of Mechanics and Materials, College of Internet of Things Engineering, and College of Hydrology and Water Resources. From 2019–2022, the College of Mechanics and Materials took a substantial lead, while the College of Environment and Business School made significant progress, and the College of Civil and Transportation and College of Energy and Electrical Engineering showed strong performance in 2021–2022. The disciplinary distribution of papers from major contributing departments has become increasingly broad, reflecting rich interdisciplinary characteristics in key colleges. Overall, most departments have engaged in high-level paper production, with leading departments maintaining their advantage and potential departments showing clear progress. Departments tend to focus on their established disciplines, while top departments increasingly emphasize interdisciplinary research.

4.4 Main Contributing Authors

Highly cited papers not only reflect high-quality research output but also indicate leading scholars and research teams. Statistics show that approximately 280 faculty and students from H University contributed to ESI highly cited papers over the five-year period. Eight faculty members had more than 10 highly cited papers in a single period, representing outstanding producers of high-level research. Thirty-three faculty members had highly cited papers in 25 or more periods, demonstrating sustained high impact. Dominant disciplines have relatively stable academic leaders, with research teams expanding yearly—particularly in Engineering, which grew from over 20 members in 2018 to over 100 in 2022 across multiple departments. Potential disciplines have established leaders but smaller team sizes (Table 1). Overall, increasing numbers of fac-

ulty and students have engaged in high-level research, with numerous high-yield and excellent authors emerging. Dominant disciplines have stable, strong academic leaders with growing teams, while potential disciplines need to support their leaders while expanding team membership to produce more high-quality papers.

5 Evaluation Results and Development Recommendations

5.1 Evaluation Results

(1) Significant overall discipline construction effectiveness with broad participation

Over the past five years, H University has achieved remarkable overall discipline construction effectiveness with strong productivity in high-level papers. Growth in key disciplines aligns with those entering the global top 1%, indicating clear policy direction and targeted measures. During this process, various departments actively participated, demonstrating a pattern of “one outstanding performer with many advancing together.” Science and engineering departments played key roles, with most focusing on their established disciplines while top departments increasingly emphasized interdisciplinary research. Growing numbers of faculty and students engaged in high-level paper production, including many high-yield and excellent authors.

(2) Noticeable disciplinary variations with strong performance in key disciplines

Over the five-year period, H University’s high-level papers covered increasingly more disciplines, reflecting efforts to promote high-quality development across fields. However, significant variations exist among disciplines. Dominant disciplines showed outstanding construction effectiveness with expanding departmental and faculty participation. Some potential disciplines continued advancing, while others developed slowly with limited departmental and faculty involvement.

(3) Uneven discipline team construction with gaps in some areas

Overall, H University’s discipline team construction has been positive, producing numerous high-yield and sustained-impact authors. Particularly in dominant disciplines, team building has been strong, with stable, well-established academic leaders and growing team sizes.

5.2 Development Recommendations

(1) Optimize institutional mechanisms to boost discipline construction

Based on discipline construction effectiveness and research levels, universities should optimize relevant institutional mechanisms to enable precise policy implementation, including organizational restructuring, discipline allocation, talent development, and research management. This involves rational resource allocation, providing support and safeguards for discipline development, establishing

faculty incentive and constraint mechanisms, promoting collaborative innovation, and achieving positive interaction between research levels and discipline development.

(2) Adjust disciplinary layout for coordinated development of dominant and potential disciplines

Universities should rationally adjust disciplinary layouts according to national and institutional contexts, following the principle of “strengthening dominant disciplines, emphasizing characteristic disciplines, supporting emerging disciplines, and developing interdisciplinary fields.” While reinforcing dominant disciplines, institutions should identify and support potential disciplines, leverage their distinctive features, and encourage emerging and interdisciplinary development to create a healthy disciplinary ecosystem. Relevant administrative departments and colleges should develop discipline-specific and journal submission guidelines tailored to institutional characteristics to help faculty produce more targeted high-quality research.

(3) Strengthen team building with talent driving discipline construction

Based on strategic discipline construction planning, universities should build relevant talent teams through both internal cultivation and external recruitment. Efforts should focus on supporting and cultivating academic leaders in key disciplines while expanding high-level talent and excellent research teams to establish high-caliber, well-structured disciplinary teams. Additionally, institutions should actively communicate with domestic and international research organizations, build exchange platforms, encourage faculty collaboration, and expand university-industry partnerships to publish more high-level papers, enhance research standards, and promote world-class discipline development.

Conclusion

Discipline construction is a long-term, complex, and systematic undertaking that requires objective data support for effectiveness evaluation. As a reference tool for discipline evaluation, ESI can reflect discipline development from the representative work perspective under the “Breaking the Five-Only” policy backdrop and assist in strategy adjustment. This study has limitations, such as the absence of weight assignment for indicators in the evaluation model, and the scientific validity and rationality of evaluation indicators require further research and verification.

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Note: Figure translations are in progress. See original paper for figures.

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