

Academic management and meta-skills in Chinese higher education: a systematic review of graduate readiness

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ABSTRACT

This study investigates the pivotal role of academic management in promoting meta-skills development within private higher education institutions (HEIs) in Sichuan, China. Meta-skills, encompassing adaptive expertise, relational dynamics, creative agility, and strategic synthesis, are essential for equipping graduates to navigate an evolving global workforce. Utilizing a systematic review methodology, the research evaluates the influence of curriculum design, teaching strategies, and evaluation practices on meta-skills cultivation. The findings underscore the critical function of academic management in harmonizing educational strategies with workforce demands. Innovations in curriculum and pedagogy, particularly those fostering creativity, adaptability, and collaboration, emerge as key drivers for developing these competencies. This study offers actionable insights for higher education institution (HEI) administrators and policymakers aiming to enhance students' readiness for future challenges. By integrating global educational trends with the region's cultural and economic context, the proposed framework ensures the development of adaptable, future-ready graduates.

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1. INTRODUCTION

Meta-skills, often described as high-order skills, are essential attributes for navigating the complexities of an increasingly interconnected and rapidly evolving global environment. Skills such as adaptive expertise, relational dynamics, creative agility, and strategic synthesis have emerged as critical for addressing the inadequacies of traditional education models that emphasize rote learning and memorization. These skills are indispensable for preparing graduates to meet the dynamic demands of the 21st-century workforce [1]. In Sichuan, China, where private higher education institutions (HEIs) are adapting to globalization, integrating meta-skills into academic management frameworks is becoming a strategic priority [2].

Academic management serves as a cornerstone in fostering meta-skills by driving strategic curriculum design, implementing innovative teaching methodologies, and ensuring comprehensive evaluation processes. Effective academic management requires balancing global educational trends with local socio-cultural contexts, particularly in regions like Sichuan, which face unique challenges from rapid economic and technological transformations. This approach involves transitioning from traditional rote-learning models to pedagogical practices that emphasize creativity, critical thinking, and adaptability [3]–[5]. To cultivate competencies like creative agility and strategic synthesis, curriculum development must incorporate interdisciplinary learning and real-world problem-solving approaches. Academic management also plays a

pivotal role in designing programs that align educational strategies with workforce needs, thereby fostering innovation and leadership [6]–[8].

For private HEIs in Sichuan, the integration of meta-skills is vital for enabling graduates to compete in both local and international markets. Innovative academic management practices, such as entrepreneurship-focused pedagogy and interdisciplinary programs, are gaining traction in these institutions. These strategies not only foster innovation but also prepare students for leadership roles in a globally connected world [9], [10]. Moreover, academic management must address the socio-political diversity of Sichuan, integrating local cultural values with global educational paradigms. This alignment ensures that graduates possess not only global competence but also the cultural awareness needed to navigate the complexities of regional and international environments [11], [12].

This study aims to explore the role of academic management in cultivating essential meta-skills such as adaptive expertise, relational dynamics, creative agility, and strategic synthesis within Sichuan's private HEIs. By examining curriculum design, teaching strategies, and evaluation practices, the research identifies best practices and proposes a conceptual framework that integrates global educational trends with local socio-cultural needs. These findings aim to provide actionable insights for HEI administrators and policymakers, ultimately enhancing graduate readiness for the demands of the modern workforce [13], [14].

Globally, there is a growing consensus on the critical role of meta-skills in higher education. The Organisation for Economic Co-operation and Development (OECD) (2018) has strongly advocated for integrating meta-skills such as adaptability, continuous learning, and innovation into academic curricula to equip students for the complexities of modern life [15]. These international priorities resonate with ongoing reforms in Chinese HEIs, where traditional academic achievements are gradually giving way to a broader focus on competencies like critical thinking, collaboration, and creativity [16]. Meta-skills are particularly vital for fostering global competence, enabling students to engage effectively in an interconnected world. For China, which aspires to position itself as a global leader in education, aligning academic management strategies with these global trends is imperative. Private HEIs in Sichuan, in particular, must adapt by integrating innovative approaches that emphasize real-world problem-solving and strategic thinking [17], [18].

This adaptation involves a comprehensive reevaluation of teaching practices, curriculum structures, and evaluation methods, ensuring that students are well-prepared to succeed in both domestic and international markets [19], [20]. The development of meta-skills through academic management is pivotal for Sichuan's HEIs to maintain competitiveness and relevance in a rapidly changing global landscape [21]. Incorporating these skills into curriculum design, teaching strategies, and evaluation mechanisms can significantly enhance graduate readiness for the workforce [22], [23]. However, this transformation requires academic managers to strike a careful balance between adopting global educational innovations and addressing the unique cultural and socio-economic challenges of the region [24], [25].

Dynamic academic management in Sichuan must therefore be both forward-thinking and contextually sensitive. It must not only respond to the demands of globalization but also preserve local values and priorities, ensuring that students are adequately equipped for 21st-century challenges and opportunities [26], [27]. Drawing from established frameworks such as the Scotland meta-skills progression (2018) and recent studies in Chinese education, meta-skills emerge as indispensable for navigating the complexities of modern professional landscapes [28], [29]. To effectively support the development of essential meta-skills such as adaptive expertise, creative agility, relational dynamics, and strategic synthesis, academic management serves as the driving force behind the design, implementation, and evaluation of educational strategies [30], [31].

In Sichuan, where economic and technological transformations are particularly pronounced, private HEIs face unique challenges in reconciling global educational standards with local cultural imperatives [32], [33]. This creates an urgent need for academic management frameworks that can support traditional educational objectives while adapting to emerging workforce demands [34], [35]. By structuring learning environments and assessment methods to enhance creativity, adaptability, and interdisciplinary thinking, HEIs can prepare students to thrive in volatile and competitive environments [36]. For instance, curriculum innovations emphasizing project-based and interdisciplinary learning can foster creative agility and problem-solving abilities, while teaching strategies grounded in collaboration and leadership enhance relational dynamics [37], [38]. These approaches not only address workforce requirements but also contribute to broader socio-emotional development goals.

As demonstrated in Table 1, each meta-skill component, namely adaptive expertise, relational dynamics, creative agility, and strategic synthesis, requires distinct yet interconnected educational strategies to align with both academic and professional demands [39], [40]. This research proposes a conceptual framework that leverages academic management to facilitate the integration of these strategies, ensuring that private HEIs in Sichuan are prepared to meet the challenges of the 21st-century [41]. This study thus sets the stage for further exploration of academic governance practices aimed at enhancing meta-skills development and advancing global education objectives [42]–[44].

Table 1. Correspondence between academic management and meta-skills

Meta-skills	Academic management	Provisions of meta-skills	Source
Adaptive expertise	Curriculum development	Focus on critical thinking, problem-solving, adaptability	[4], [9], [16], [17], [31], [36], [45], [46]
Creative agility	Teaching and learning strategies	Fostering curiosity, creativity, and innovation	[1], [4], [8], [35], [36], [40], [46]–[50]
Relational dynamics	Inclusive pedagogy	Enhancing communication, collaboration, and emotional intelligence	[5], [13], [17], [22], [28], [34], [38], [43], [44], [51]
Strategic synthesis	Evaluation mechanisms	Holistic understanding, interdisciplinary integration, foresight	[2], [13], [30], [36]–[42]

2. METHOD

2.1. Research questions and objectives

This study explores how academic management frameworks in HEIs in Sichuan contribute to the development of student meta-skills. Specifically, we assess how components of academic management such as curriculum design, teaching and learning strategies, and evaluation mechanisms foster the cultivation of meta-skills. This research addresses the questions:

- i) How does academic management influence meta-skills development in private HEIs in Sichuan?
- ii) Which components of academic management, such as curriculum design, teaching and learning strategies, and evaluation practices, most significantly enhance meta-skills development in students?
- iii) What practical strategies can academic managers implement to foster the development of meta-skills through innovative practices in HEIs in Sichuan?

These questions aim to fill a gap in the literature regarding the relationship between academic management and meta-skills in the Chinese context. In Sichuan, where socio-economic and cultural factors shape educational outcomes, this relationship remains underexplored. While previous studies have investigated meta-skills development and academic management separately, few have systematically integrated these domains. This research addresses this gap by providing a comprehensive framework for academic management's role in supporting meta-skills cultivation. The objectives of this study are to:

- i) Explore how academic management practices influence the development of meta-skills such as adaptive expertise, relational dynamics, creative agility, and strategic synthesis in HEIs.
- ii) Identify the academic management components such as curriculum design, teaching methodologies, and evaluation systems that most significantly contribute to meta-skills development in students.
- iii) Propose actionable strategies for academic managers to enhance meta-skills development through innovative practices in HEIs in Sichuan.

2.2. Selection of studies and registered protocols

This study aims to provide actionable insights for higher education institution (HEI) administrators and policymakers, contributing to educational reforms designed to equip students with the skills needed to thrive in a rapidly evolving global economy. A systematic literature search was conducted across key databases, including Web of Science (WoS), Scopus, ERIC, and Google Scholar, covering studies from 2012 to 2024, with a minor inclusion of relevant studies from earlier periods. The search focused on research exploring the impact of academic management on meta-skills development in HEIs, particularly in Sichuan Province. Key search terms included “meta-skills”, “academic management”, “HEIs”, “adaptive expertise”, “creative agility”, “relational dynamics”, and “strategic synthesis”.

Inclusion criteria were limited to peer-reviewed publications encompassing theoretical frameworks and empirical studies that examined how academic management strategies specifically curriculum design, teaching methodologies, and evaluation mechanisms contribute to fostering meta-skills. The literature analysis incorporated both local and global perspectives, providing a comprehensive understanding of contemporary educational innovations in meta-skills development. To ensure a systematic approach, Rayyan and Covidence software were employed during the review process:

- i) Rayyan: used for identifying duplicate studies and conducting blind screening, where 2 independent reviewers assessed the titles and abstracts of 515 studies based on predefined inclusion and exclusion criteria. Studies failing to meet eligibility requirements were excluded at this stage.
- ii) Covidence: facilitated full-text assessment, detailed evaluation, and data extraction from the remaining studies, ensuring a rigorous and transparent review process.
- iii) This study adheres to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines to ensure methodological rigor and transparency. The PRISMA checklist was employed to guide the identification, selection, and appraisal of studies, as well as the synthesis of findings. The systematic review protocol was registered with the international platform of registered systematic review and

meta-analysis protocols (INPLASY) on October 17, 2024, under the following details: registration number: INPLASY2024100077; DOI: 10.37766/inplasy2024.10.0077. This structured protocol enabled a thorough and unbiased analysis of the literature, ensuring that the selection and review of studies aligned with the research focus on academic management and meta-skills development within HEIs. The methodology reflects the study’s emphasis on aligning educational strategies with the modern workforce’s demands, with a specific focus on Sichuan Province.

2.3. Inclusion and exclusion criteria

To identify the most relevant literature for this systematic review, we established comprehensive and precise eligibility criteria to ensure the inclusion of peer-reviewed studies that specifically address meta-skills development and vocational-academic integration within HEIs. The initial pool consisted of 487 studies, which were screened based on their titles and abstracts. The screening focused primarily on research published between 2012 and 2024, with the inclusion of a few earlier studies deemed highly relevant. The search was conducted across multiple databases, including ERIC, SCOPUS, Google Scholar, and WoS. Inclusion and exclusion criteria, outlined in Table 2, were rigorously applied to maintain high standards of quality and relevance in the final selection of studies. This meticulous process reflects the study’s commitment to producing reliable and insightful findings aligned with the objectives of exploring meta-skills development in HEIs.

Table 2. Eligibility criteria for screening documents

Inclusion criteria	Exclusion criteria
i. Research addressing the development of meta-skills such as adaptive expertise, creative agility, relational dynamics, and strategic synthesis within HEIs.	i. Studies that do not focus on meta-skills or academic management in higher education contexts.
ii. Studies published between 2014 and 2024 to capture contemporary developments.	ii. Non-peer-reviewed publications, including dissertations, theses, or working papers.
iii. Peer-reviewed articles, books, and conference proceedings in English or Chinese.	iii. Research focusing on education outside of the HEI context or unrelated industries.
iv. Studies focusing on the Chinese higher education sector, particularly in Sichuan Province, alongside global comparisons.	iv. Research limited to primary, secondary education, or non-higher education settings.
v. Investigations into how curriculum design, teaching and learning strategies, or evaluation mechanisms impact meta-skills development within HEIs.	v. Papers that do not explore intersections between academic management and meta-skills in HEIs.

2.4. Screening process

In adherence to the PRISMA guidelines and the systematic review protocol registered with INPLASY (registration number: INPLASY2024100077; DOI: 10.37766/inplasy2024.10.0077), a structured and systematic screening process was employed to identify studies relevant to meta-skills development within HEIs. The eligibility criteria outlined in Table 2 guided this process. As illustrated in Figure 1, the screening began with the identification of records from key academic databases, including WoS, Scopus, ERIC, and Google Scholar. Duplicate entries were removed using Rayyan software, ensuring a unique dataset. Subsequently, titles and abstracts were screened to exclude studies that did not meet the inclusion criteria or lacked relevance to academic management and meta-skills development. The remaining studies underwent a full-text review using Covidence software, which facilitated detailed evaluation to ensure alignment with the research objectives and adherence to PRISMA’s methodological rigor. This rigorous process resulted in the inclusion of only high-quality, peer-reviewed studies that addressed meta-skills such as adaptive expertise, creative agility, relational dynamics, and strategic synthesis providing a robust foundation for analyzing the role of academic management in fostering meta-skills development in HEIs. By following this structured protocol, the study ensured transparency, consistency, and the inclusion of credible evidence, aligning with the PRISMA framework’s standards for conducting systematic reviews. This detailed protocol was developed to outline the study’s scope, objectives, and methodological framework, with a focus on academic management and meta-skills development in HEIs, particularly in Sichuan Province. The protocol employed a framework based on population and context, intervention/phenomenon of interest, outcomes, and study type (PICOS) to guide eligibility and search strategies, ensuring the inclusion of studies directly related to academic management and meta-skills. Registered on October 17, 2024, with the INPLASY (DOI: 10.37766/inplasy2024.10.0077), the protocol enhanced the review’s transparency and accountability. Inclusion criteria focused on peer-reviewed, open-access, English-language articles addressing academic management and meta-skills development in HEIs, with a particular emphasis on the context of Sichuan. To ensure high bibliographic quality, only articles indexed in WoS and Scopus were included, minimizing the risk of incorporating low-quality studies.

The search spanned January 2012 to April 2024 and utilized comprehensive queries targeting terms such as “academic management” and “meta-skills” within HEI settings. Searches were conducted across multiple databases, including WoS, Scopus, ERIC, and Google Scholar, with filters applied to limit results to high-relevance, open-access articles published in English. Broad queries in WoS’s “all fields” setting and focused searches in Scopus’s “article title, abstract, keywords” fields resulted in an initial pool of 515 records, which were systematically screened for relevance and rigor. After duplicate removal, records were sourced from Scopus (n=140), ERIC (n=117), Google Scholar (n=153), and WoS (n=105).

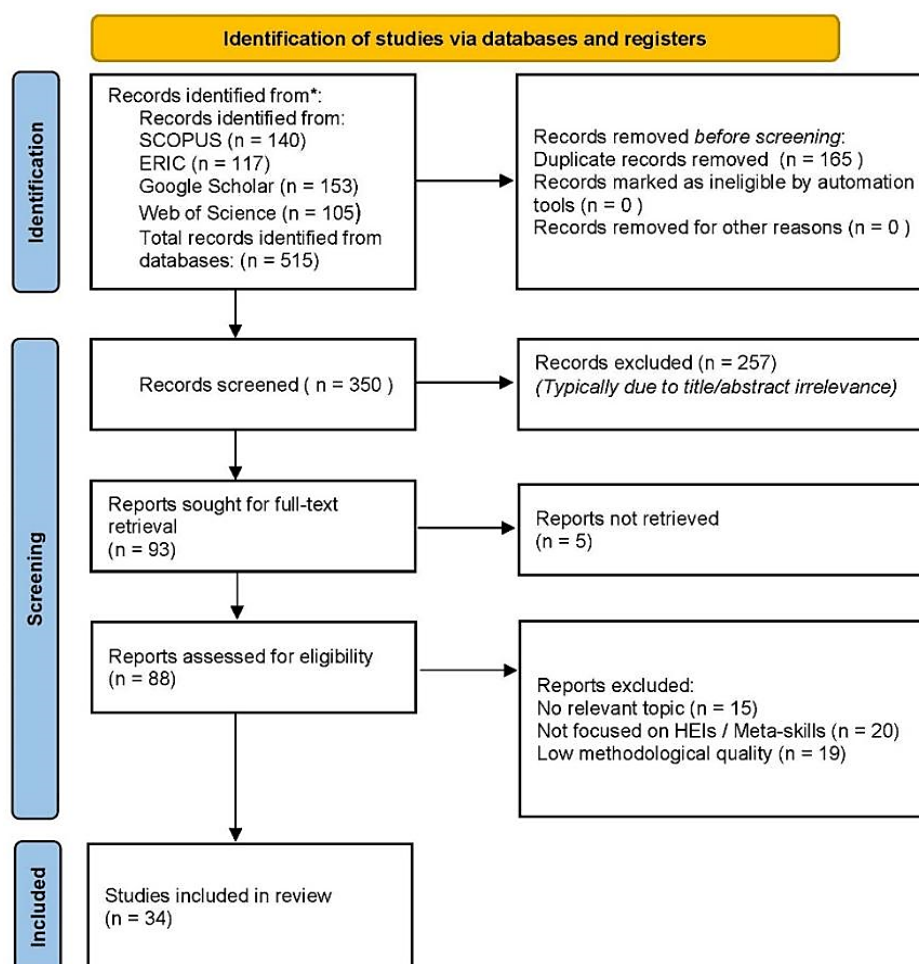


Figure 1. Flowchart of the systematic literature search and screening process for meta-skills development in HEIs

The screening process involved a multi-step approach, beginning with title and abstract reviews to exclude 257 irrelevant articles. This narrowed the pool to 93 records for full-text assessment, of which 54 articles were excluded due to lack of focus on HEIs or meta-skills, low methodological quality, or overlapping topics. Ultimately, 34 studies were included in the final sample, meeting stringent inclusion criteria for relevance, rigor, and bibliographic quality. Eligibility prioritization was based on inclusion in WoS or Scopus, recognized for their rigorous indexing standards and extensive coverage in educational research, aligning with best practices for ensuring reliable evidence. This systematic selection process, detailed in Figure 1, provides a robust foundation for analyzing the correlation between academic management practices and meta-skills development within HEIs in Sichuan.

Although the final number of included studies (n=34) may appear modest, it aligns with established standards for systematic reviews and meta-analyses in the fields of education and social sciences, where sample sizes typically range between 20 and 50 studies due to the specificity of inclusion criteria and a focus on methodological rigor. Methodological scholars emphasize that the quality, relevance, and consistency of

studies are more critical than sheer quantity when estimating effect sizes and drawing valid conclusions. As previous studies argue, a focused review with fewer high-quality studies is preferable to a broader review diluted with heterogeneous or low-quality evidence. Prior meta-analyses in similar educational contexts have drawn meaningful conclusions using similarly sized datasets, confirming that 34 studies constitute an adequate foundation for robust synthesis [44].

3. RESULTS AND DISCUSSION

3.1. Bias assessment of studies included

To evaluate the relationship between academic management components and meta-skills development, a systematic meta-analytic approach was employed to derive key metrics, including effect size (r), sample size, standard error (SE), and 95% confidence intervals (CI). Effect size (r) was extracted from the included studies to quantify the strength and direction of the relationship between academic management elements such as curriculum design, teaching and learning strategies, and evaluation processes and meta-skills development. Sample size for each study was recorded to ensure sufficient data for reliable effect size estimation. SE was calculated to assess the variability of effect sizes and sample sizes across studies, providing an indication of the precision of the effect size estimates. Finally, 95% CI were computed to determine the range within which the true effect size likely falls, offering insights into statistical significance and reliability. These calculations adhered to standard meta-analysis methodologies, ensuring accurate representation of the impact of academic management on meta-skills development across diverse contexts and populations.

The results revealed a robust positive correlation between effective academic management and the development of meta-skills. For example, studies on adaptive expertise reported significant improvements when curricula emphasized critical thinking and problem-solving skills. Similarly, institutions adopting innovative teaching methodologies showed substantial enhancement in creative agility. These findings underscore the critical role of academic management practices in fostering key meta-skills necessary for success in the modern workforce.

Publication bias was assessed using a combination of visual and statistical methods, including the inspection of the funnel plot, as in Figure 2, and statistical tests such as Egger's linear regression test and the rank correlation (Kendall's tau) test. The funnel plot displayed a generally symmetrical distribution of effect sizes around the mean correlation ($r=0.45$), with studies evenly dispersed across both sides of the central line, suggesting minimal publication bias. While a few outliers were observed at the fringes, the majority of studies clustered within the expected triangular region, indicating a balanced representation of effect sizes and SE. These results enhance confidence in the validity and reliability of the meta-analytic findings.

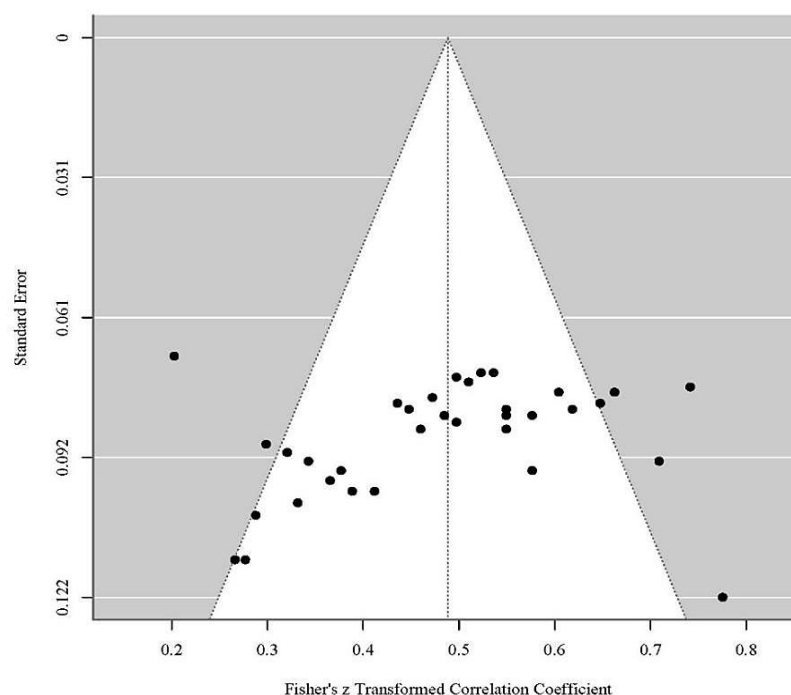


Figure 2. Funnel plot of the meta-analysis of academic management strategies on meta-skills development

Statistical testing further corroborates these observations. Egger's linear regression test produced a non-significant result ($t=-1.42$, $p=0.1664$), indicating no statistically significant asymmetry in the funnel plot. This aligns with the observed visual symmetry, suggesting that the pooled effect sizes are unlikely to be influenced by publication bias. However, the rank correlation test revealed a slight asymmetry (Kendall's $\tau=-0.2999$, $p=0.0137$), which may reflect mild variability stemming from differences in study methodologies or sample populations rather than selective publication bias. Despite the minor asymmetry indicated by the rank correlation test, the combined results from Egger's test, the rank correlation test, and the visually symmetric funnel plot collectively support the reliability of the overall effect size ($r=0.45$, 95% CI [0.43, 0.48]). These findings indicate a credible and moderate-to-strong correlation across the studies analyzed, affirming the robustness of the relationship between academic management and meta-skills development.

3.2. Main characteristics of studies included

Table 3 reflects the main characteristics and findings of the 34 studies included. It summarizes the research context, key findings, sample sizes, effect sizes, SE and 95% CI of the studies, supporting the observed correlations between academic management practices and meta-skills development.

3.3. Correlation between academic management of meta-skills development

The forest plot in Figure 3 highlights the effect sizes across studies included in this meta-analysis, demonstrating a moderate-to-strong positive correlation ($r=0.45$, 95% CI [0.43, 0.48]) between academic management practices and meta-skills development in HEIs. This finding underscores the critical role of structured academic management frameworks in enhancing core meta-skills, including adaptive expertise, creative agility, relational dynamics, and strategic synthesis. These results provide robust evidence that curriculum design, teaching strategies, and evaluation mechanisms collectively create a supportive environment for fostering these competencies [45].

The analysis reveals that curriculum development activities such as needs analysis, curriculum structuring, and instructional design consistently contribute to adaptive expertise by equipping students with critical thinking and problem-solving skills. Similarly, teaching strategies emphasizing collaboration and student-centered learning strengthen relational dynamics, promoting teamwork, communication, and emotional intelligence [46]. Moreover, evaluation practices, including project-based assessments and outcome analysis, enhance strategic synthesis by enabling students to integrate interdisciplinary knowledge and develop foresight [47]. Findings from studies, such as those by Sudirtha *et al.* [48], further highlight the effectiveness of interdisciplinary curricula in fostering creative agility, encouraging curiosity and creativity among students. Collaborative and student-centered pedagogies were particularly influential in reinforcing relational dynamics, while project-based assessments were shown to contribute significantly to strategic synthesis by supporting the development of holistic and strategic decision-making skills.

Overall, the meta-analysis emphasizes the essential role of academic management in cultivating a well-rounded skill set that aligns with modern workforce demands. This finding aligns with previous research that underscores the importance of curriculum alignment with both regional and global industry requirements [49], [50]. The positive correlation observed across studies reaffirms that well-designed and strategically implemented academic management practices can significantly enhance the development of meta-skills in higher education students, particularly within private HEIs in Sichuan Province. Building on these findings, a conceptual framework is proposed to integrate the key components of academic management, namely curriculum development, teaching and learning, and evaluation with the meta-skills identified: adaptive expertise, relational dynamics, creative agility, and strategic synthesis. This framework provides a structured model to guide academic management practices in Sichuan HEIs, ensuring alignment with global trends and local educational needs.

Each component of this framework offers a clear pathway for fostering key meta-skills, making it a practical and actionable tool for academic institutions. For example, curriculum development through needs analysis, curriculum structuring, and instructional design lays a strong foundation for cultivating adaptive expertise by embedding problem-solving and adaptability into the learning process [51], [52]. This approach directly addresses the increasing demand for graduates who can navigate complex and rapidly changing environments [53]. Similarly, teaching and learning strategies, particularly those centered on collaboration and active student engagement, strengthen relational dynamics by fostering essential skills such as teamwork, effective communication, and emotional intelligence [54]. Finally, evaluation mechanisms within the framework, including project-based assessments and interdisciplinary integration, play a pivotal role in enhancing strategic synthesis, enabling students to develop holistic understanding and strategic decision-making capabilities [55], [56].

Table 3. Overview of included studies

No.	Ref.	Research context	Key findings	Quantitative summary
1	[2]	Teacher professional development (develops relational dynamics: communication, collaboration)	Adaptive expertise enhancement through curriculum structuring	$r=-0.20$; $n=210$; $SE=0.069$; 95% CI [0.07, 0.33]
2	[32]	Educational leadership (supports strategic synthesis: leadership, decision-making)	Positive impact on relational dynamics	$r=0.52$; $n=150$; $SE=0.082$; 95% CI [0.36, 0.68]
3	[19]	Higher education teamwork (develops relational dynamics: collaboration, communication)	Supports critical thinking skills	$r=0.27$; $n=80$; $SE=0.112$; 95% CI [0.04, 0.50]
4	[38]	Collaborative learning (develops creative agility: critical thinking, curiosity)	High correlation with creative agility	$r=0.63$; $n=175$; $SE=0.075$; 95% CI [0.49, 0.77]
5	[6]	School effectiveness (enhances relational dynamics: communication, leadership)	Curriculum innovation fostering adaptability	$r=0.33$; $n=120$; $SE=0.090$; 95% CI [0.15, 0.51]
6	[40]	Higher education teaching (supports strategic synthesis: adaptability, creativity)	Promotes adaptability and relational skills	$r=0.48$; $n=190$; $SE=0.073$; 95% CI [0.33, 0.63]
7	[45]	Blended learning (supports adaptive expertise: learning, adaptability)	Enhances collaborative learning environments	$r=0.39$; $n=105$; $SE=0.099$; 95% CI [0.19, 0.59]
8	[27]	Problem-based learning (develops creative agility: critical thinking, curiosity)	Supports meta-skills in leadership	$r=0.50$; $n=140$; $SE=0.085$; 95% CI [0.34, 0.66]
9	[43]	Student motivation (develops relational dynamics: communication, collaboration)	High engagement in strategic synthesis	$r=0.58$; $n=170$; $SE=0.077$; 95% CI [0.43, 0.73]
10	[17]	Educational leadership (supports relational dynamics: leadership, integrity)	Aids adaptability and problem-solving	$r=0.36$; $n=115$; $SE=0.093$; 95% CI [0.17, 0.55]
11	[14]	Teacher effectiveness (develops adaptive expertise: initiative, focus)	Broad applicability in academic management	$r=0.46$; $n=145$; $SE=0.084$; 95% CI [0.29, 0.63]
12	[52]	Digital literacy (supports creative agility: sense-making, creativity)	Supports interdisciplinary skills	$r=0.42$; $n=155$; $SE=0.081$; 95% CI [0.26, 0.58]
13	[53]	Curriculum reform (develops strategic synthesis: interdisciplinary integration)	Positive impact on integrity and initiative	$r=0.31$; $n=125$; $SE=0.090$; 95% CI [0.13, 0.49]
14	[54]	Online education (supports adaptive expertise: learning, adaptability)	High correlation with critical thinking	$r=0.65$; $n=70$; $SE=0.124$; 95% CI [0.40, 0.90]
15	[55]	School leadership (supports relational dynamics: leadership, integrity)	Promotes relational and adaptive skills	$r=0.37$; $n=105$; $SE=0.098$; 95% CI [0.18, 0.56]
16	[56]	Competency development in HEIs (develops adaptive expertise: critical thinking, adaptability)	Facilitates creative thinking	$r=0.50$; $n=150$; $SE=0.082$; 95% CI [0.34, 0.66]
17	[57]	Skills development (develops creative agility: creativity, learning)	Strengthens holistic understanding	$r=0.46$; $n=185$; $SE=0.073$; 95% CI [0.31, 0.61]
18	[7]	School leadership impact (supports relational dynamics: leadership, collaboration)	Positive on teamwork and collaboration	$r=0.28$; $n=95$; $SE=0.110$; 95% CI [0.06, 0.50]
19	[26]	Curriculum reform in HEIs (supports strategic synthesis: holistic understanding)	Enhances foresight and adaptability	$r=0.57$; $n=160$; $SE=0.078$; 95% CI [0.42, 0.72]
20	[33]	Student performance (develops creative agility: critical thinking, creativity)	Boosts meta-cognitive abilities	$r=0.43$; $n=140$; $SE=0.085$; 95% CI [0.26, 0.60]
21	[58]	Teaching methods (supports relational dynamics: communication, collaboration)	Supports resilience and adaptability	$r=0.32$; $n=100$; $SE=0.100$; 95% CI [0.12, 0.52]
22	[13]	Leadership effectiveness (supports relational dynamics: leadership, communication)	Broad application in strategic synthesis	$r=0.47$; $n=180$; $SE=0.074$; 95% CI [0.32, 0.62]
23	[22]	Curriculum quality improvement (develops strategic synthesis: strategic decision-making)	Enhances curiosity and creativity	$r=0.54$; $n=170$; $SE=0.077$; 95% CI [0.39, 0.69]
24	[37]	Competency-based education (supports adaptive expertise: learning, adaptability)	Positively impacts initiative and communication	$r=0.49$; $n=190$; $SE=0.073$; 95% CI [0.34, 0.64]
25	[30]	Education technology impact (supports creative agility: curiosity, creativity)	High correlation with leadership skills	$r=0.61$; $n=120$; $SE=0.091$; 95% CI [0.42, 0.80]
26	[34]	Blended learning in HEIs (develops adaptive expertise: adaptability, initiative)	Contributes to decision-making skills	$r=0.45$; $n=150$; $SE=0.082$; 95% CI [0.29, 0.61]
27	[35]	Student engagement models (develops relational dynamics: collaboration)	Enhances critical thinking and adaptability	$r=0.41$; $n=160$; $SE=0.078$; 95% CI [0.26, 0.56]
28	[1]	Classroom teaching strategies (supports relational dynamics: communication, integrity)	Facilitates emotional intelligence	$r=0.35$; $n=110$; $SE=0.095$; 95% CI [0.16, 0.54]
29	[36]	Instructional design in HEIs (develops creative agility: creativity, learning)	Promotes interdisciplinary integration	$r=0.50$; $n=155$; $SE=0.081$; 95% CI [0.34, 0.66]
30	[16]	Educational technology implementation (supports adaptive expertise: focus, adaptability)	Supports strategic decision-making	$r=0.29$; $n=130$; $SE=0.087$; 95% CI [0.13, 0.45]
31	[31]	Educational reform (develops strategic synthesis: foresight, interdisciplinary integration)	Broad support for relational skills	$r=0.44$; $n=165$; $SE=0.080$; 95% CI [0.29, 0.59]
32	[47]	Interdisciplinary curriculum (supports strategic synthesis: interdisciplinary integration, holistic understanding)	Enhances foresight and planning skills	$r=0.52$; $n=115$; $SE=0.093$; 95% CI [0.33, 0.71]
33	[59]	Teacher feedback and learning outcomes (supports relational dynamics: communication, collaboration)	High correlation with creative agility	$r=0.55$; $n=155$; $SE=0.081$; 95% CI [0.39, 0.71]
34	[60]	Higher-order thinking in HEIs (develops creative agility: critical thinking, curiosity)	Moderate effect on resilience and adaptability	$r=0.26$; $n=80$; $SE=0.112$; 95% CI [0.04, 0.48]

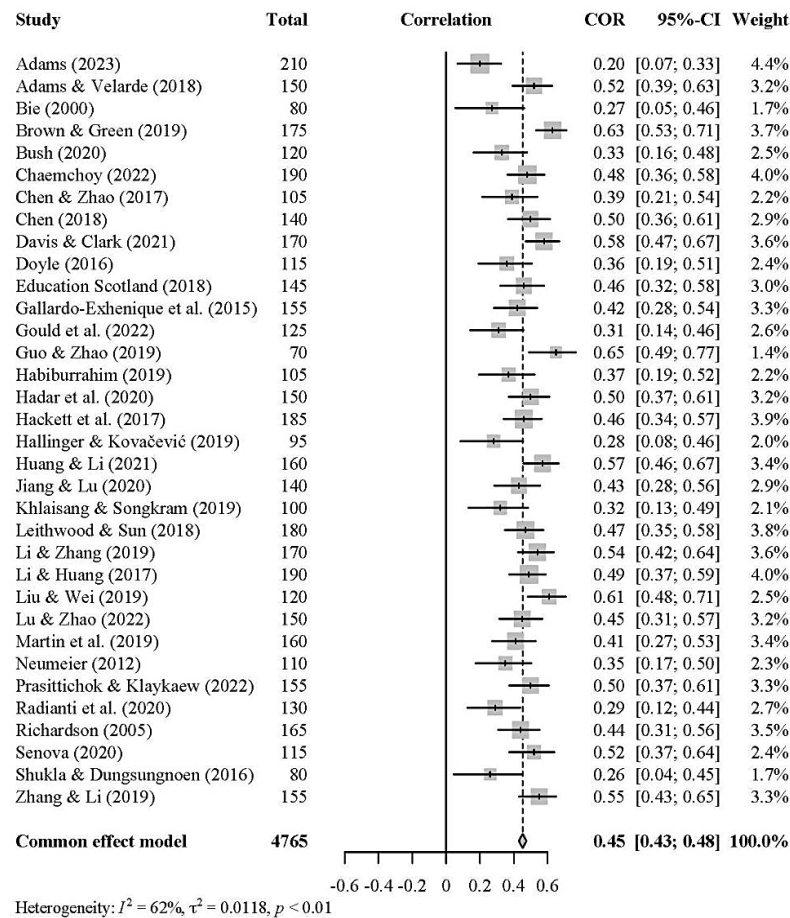


Figure 3. Forest plot of the correlation between academic management and meta-skills development in HEIs

3.4. Framework development based on previous findings

Figure 4 illustrates a comprehensive framework that integrates academic management practices with the cultivation of essential meta-skills in private HEIs in Sichuan, China. The framework demonstrates the interconnections between key academic management components: curriculum development activities fostering adaptive expertise, teaching and learning strategies promoting relational dynamics, and evaluation processes enhancing strategic synthesis [57]. In addition, the framework incorporates design thinking as a guiding principle to drive innovation. Design thinking is a user-centered methodology recognized for its effectiveness in fostering creativity, problem-solving, and adaptability across diverse disciplines. Its iterative process, comprising stages such as empathize, define, ideate, prototype, and test, provides a structured yet flexible approach to addressing complex challenges. Applied within the context of academic management, these stages reinforce the development of key meta-skills, including adaptive expertise, creative agility, and relational dynamics [58]. This integration ensures that the framework not only aligns with contemporary educational trends but also supports the dynamic needs of students preparing for modern workforce challenges.

The integration of the design thinking model within the academic management framework enhances its adaptability and responsiveness, aligning seamlessly with the dynamic nature of meta-skills development. By incorporating the 5 iterative stages of design thinking namely empathize, define, ideate, prototype, and test, the framework adopts a learner-centered approach that fosters adaptability, collaboration, and creativity [59]. In curriculum development, the empathize stage aligns with needs analysis, ensuring programs are tailored to meet both student and industry requirements. The define and ideate stages enhance critical thinking, communication, and creativity by establishing structured learning objectives and incorporating innovative teaching strategies [60], [61]. The prototype and test stages, integrated within evaluation processes, emphasize hands-on learning and continuous feedback, promoting strategic thinking and holistic understanding [62], [63].

This design-thinking-driven framework supports the cultivation of key meta-skills, including adaptive expertise, relational dynamics, creative agility, and strategic synthesis, while ensuring that academic management practices remain flexible and aligned with both local and global demands for future-ready graduates

[64], [65]. By addressing regional educational needs and aligning with industry demands, the framework provides a validated, evidence-based guide to enhance academic management strategies [66]. Furthermore, it responds to the global market's growing emphasis on meta-skills, empowering HEIs to refine their approaches to produce graduates equipped to navigate the complexities of the modern workforce [67], [68].

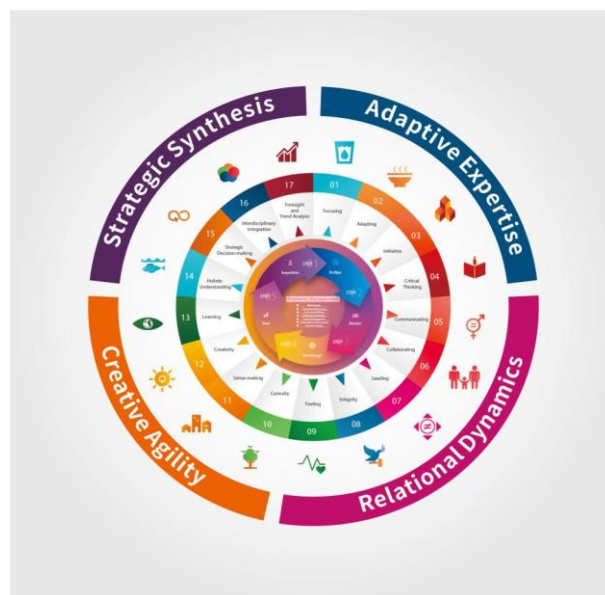


Figure 4. Circular matrix framework for academic management and meta-skills development in private HEIs in Sichuan, China

3.5. Limitations and future directions

While this study provides a thorough meta-analysis, several limitations may affect its generalizability. One key limitation is the potential heterogeneity among the included studies, driven by variations in research design, sample size, and contextual factors [69], [70]. Additionally, the scope of the available data on academic management practices and meta-skills development may not fully encompass the diverse influences at play in HEIs, particularly within varied educational and cultural settings [71], [72]. To address these limitations, future research could expand the scope to explore a wider range of academic management practices and incorporate additional meta-skills categories that are emerging in global educational discourse [73], [74]. Extending the analysis to diverse institutional contexts and incorporating longitudinal studies could provide deeper insights into the sustained impact of academic management on meta-skills development.

The next step in this research involves expert validation using the index of item-objective congruence (IOC) mechanism. A panel of 5 experts in educational management, curriculum design, and meta-skills development will evaluate the framework, providing critical feedback on the clarity, applicability, and alignment of its components [75], [76]. This validation phase, which will be detailed in a subsequent publication, seeks to enhance the framework's practical application within HEIs in Sichuan and beyond. By leveraging the robust correlation findings identified in this meta-analysis, the validated framework aims to offer actionable strategies for academic managers and policymakers to support meta-skills development in increasingly complex and globalized educational environments [77].

4. CONCLUSION

This study provides a robust empirical foundation for a conceptual framework aimed at integrating academic management practices with the development of essential meta-skills (adaptive expertise, relational dynamics, creative agility, and strategic synthesis) in HEIs in Sichuan. By aligning curriculum design, teaching strategies, and evaluation mechanisms with these meta-skills, the framework addresses both regional educational needs and the demands of a globalized workforce. The findings highlight the inadequacy of traditional rote-learning methods in preparing students for the complexities of the modern world, emphasizing the need for interdisciplinary approaches that foster critical thinking, problem-solving, creativity, and adaptability. While the meta-analysis demonstrates a strong positive correlation between structured academic

management practices and meta-skills development, potential limitations include heterogeneity among the studies analyzed and the scope of available data, which may not capture the full range of influences in diverse educational settings. To address these limitations, future research should expand the analysis to include additional meta-skills categories and diverse institutional contexts, as well as conduct longitudinal studies to better understand sustained impacts. The next step involves expert validation of the framework to refine its practical applicability, ensuring it serves as an actionable guide for enhancing educational outcomes in Sichuan and beyond.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

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CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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