

A Gap Analysis of Blended Learning Needs Among Preschool Education Undergraduates in Private Universities: A Case Study of Nanning, Guangxi

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Abstract

Learning outcomes serve as a key indicator for evaluating the effectiveness of blended learning. This study aimed to assess the gap between current learning outcomes and expected objectives among undergraduate students majoring in Early Childhood Education at private universities in Nanning, Guangxi. A questionnaire was employed to evaluate learning needs across three dimensions: professional knowledge, professional competencies, and professional philosophy and ethics. Data were analyzed using descriptive statistics, factor analysis, and the Modified Priority Needs Index (PNI Modified). The findings indicated that while students held very high expectations for blended learning ($M = 4.26$), their perceived current level was significantly lower ($M = 3.21$), revealing a substantial gap. The most critical gaps, reflected by the highest PNI values, were identified in “integrating community and local educational resources” and “critical thinking and innovative problem-solving.” These competencies are essential for addressing authentic and complex childcare scenarios. Their deficiency not only constrains students’ immediate competence but may also hinder their long-term professional development. Consequently, this study establishes a priority sequence for improvement, providing empirical evidence and strategic direction for developing a targeted blended learning enhancement model for early childhood education programmes.

Keywords: Blended Learning, Needs Assessment, Gap Analysis, Learning Outcomes, Early Childhood Education

Introduction

High-quality development in higher education has become a central theme in contemporary educational reform. As a vital component of China's higher education system, the urgent need for quality enhancement in private higher education is particularly pressing (The State Council of the People's Republic of China, 2015). Within the context of "Internet Plus" education, blended learning models are widely regarded as an effective pathway for enhancing teaching quality due to their ability to integrate the richness of online resources with the depth of offline interaction. They have become the "new normal" in higher education teaching reform (Graham et al., 2013). In the field of early childhood education, which demands both theoretical depth and practical applicability, teacher training requires not only a solid foundation in educational theory but also systematic practical training (OECD, 2021). Against this backdrop, blended learning—by organically integrating the richness of online resources with the interactive advantages of face-to-face teaching—is recognised as a significant pedagogical pathway for fostering pre-service teachers' professional competence and enhancing quality of talent development (Garrison & Vaughan, 2008;

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Lin & Chen, 2021; UNESCO, 2021).

However, translating the theoretical advantages of blended learning into practical effectiveness constitutes a complex systemic endeavour, proving particularly challenging within private institutions facing relative resource constraints. Examining current teaching practices in China's private universities reveals that despite the widespread adoption of blended learning models, their implementation still faces numerous challenges (Dai et al., 2025). Although early childhood education programmes exhibit rapid expansion, deep-seated contradictions persist in talent cultivation, including insufficient faculty and curriculum support, weak practical skills development, and disconnects between training schemes and industry demands (Huang & Peng, 2024). Against the national policies explicitly mandating enhanced early childhood education quality and resource guarantees, private institutions struggle to resolve all issues through increased human resource investment alone. This manifests as current blended teaching often becoming trapped in an inefficient cycle of "online resource accumulation coupled with offline traditional lectures," resulting in "disconnect between teaching and learning" and "disjunction between theory and practice." This situation not only fails to achieve intended objectives but exacerbates the gap between actual teaching outcomes and student expectations (Li, 2024).

Traditional teaching quality assessments often struggle to pinpoint precise priorities for improvement within this specific contradiction between "high expectations" and "low effectiveness." Consequently, this study adopts the theory of needs assessment as its analytical framework. Within traditional needs assessment methodologies, gap analysis is widely applied in educational reform due to its intuitive and practice-oriented nature (Borich, 1980). Its core logic posits that the degree of divergence between the current state and desired objectives determines the priority sequence for improvement efforts. Specifically, this study employs the Modified Priority Needs Index (PNI Modified), calculated as: $PNI \text{ Modified} = (I - D) / D$, where I denotes the desired level and D represents the current level. This index uses the current level as a baseline to reflect the urgency of improvement for each indicator. A higher index value indicates a greater need for that indicator and a higher priority for improvement (Yurayat & Seechaliao, 2021; Meadseena et al., 2023; Wang et al., 2025). Therefore, adopting a student-centered perspective, this study focused on undergraduate students majoring in early childhood education at private universities in Nanning, Guangxi. Through needs assessment and gap analysis, the research systematically identified students' learning needs within blended learning contexts, thereby providing precise empirical evidence for reforming blended teaching in preschool education programs at private institutions.

The contributions of this study were twofold: First, at the empirical level, it conducted a systematic assessment of blended learning needs specific to preschool education in Chinese private universities, addressing the research gap regarding this understudied context; Second, at the practical level, based on empirical data from the Nanning region, this study constructed a priority framework for improving blended teaching, offering valuable empirical guidance for private universities in China to optimize instructional design and resource allocation under resource constraints.

Literature Review

1. Conceptual Definition of Blended Learning

As an important paradigm of higher education reform in the 21st century, the conceptual connotation of blended learning has undergone continuous evolution. Garrison and Vaughan (2008) defined it as the "intentional integration of face-to-face and online learning," emphasizing that blended learning is not a simple superposition of online and offline modalities, but a systematic design based on pedagogical principles. Graham et al. (2013) further proposed that the successful implementation of blended learning requires coordinated transformation across three dimensions: curriculum design, teaching implementation, and institutional support.

2. The Importance of Blended Learning in the Chinese Higher Education Context

Against the backdrop of the universalization of higher education in China, the strategic value of blended learning has become increasingly prominent. In 2015, the State Council issued the Guiding Opinions on Actively Promoting the "Internet Plus" Action Plan, elevating "Internet Plus Education" to a national strategy (State Council of the People's Republic of China, 2015). Subsequently, the Education Informatization 2.0 Action Plan (Ministry of Education of the People's Republic of China, 2018) and China Education Modernization 2035 (Central Committee of the Communist Party of China & State Council, 2019) further clarified the developmental pathway for the deep integration of information technology and education.

For higher education institutions, blended learning is not merely an adjustment in teaching format, but also carries important functions in optimizing resource allocation, improving teaching quality, and promoting talent cultivation model reform. Private universities have long faced structural constraints including faculty shortages, limited funding, and insufficient practical resources. Blended learning provides an innovative pathway of "exchanging technology for resources" (Bates, 2019)—introducing quality courses through online platforms, compensating for insufficient practical conditions through virtual simulation, and realizing personalized teaching support through intelligent technologies—thereby achieving quality leaps despite resource constraints.

Regarding early childhood education programs, high-quality early education depends on faculty with solid theoretical foundations and rich practical capabilities (OECD, 2021). However, early childhood education is characterized by both theoretical depth and practical application requirements, and the traditional model struggles to unify both within limited class hours (Darling-Hammond, 2006). Blended learning, through the integration of online theoretical instruction and offline practical training, provides a feasible pathway to resolve this dilemma (Lin & Chen, 2021).

Research Objectives

This study aimed to assess the learning needs of undergraduate students majoring in early childhood education at private universities in Nanning, Guangxi, within blended learning contexts. By comparing the gaps between students perceived current levels and desired levels of learning outcomes, and utilizing the Modified Priority Needs Index (PNI Modified) to identify the priority order for improvement across dimensions, this research sought to provide an empirical basis for developing targeted recommendations to optimize blended teaching.

Research Design

This study employed a quantitative cross-sectional survey design. This methodological approach aligned with the research objectives, enabling quantitative analysis of the gaps between current and desired learning needs, and facilitating the identification of priority areas for blended learning improvement through subsequent PNI Modified gap analysis and demographic variable difference tests.

1. Population and Sampling

1.1 Population

The population of this study comprised all undergraduate students majoring in Preschool Education at private universities in Nanning, Guangxi Zhuang Autonomous Region. According to information obtained from the official websites of the four private undergraduate institutions in Nanning offering Preschool Education programs, the total number of undergraduate students enrolled in these programs was approximately 3,512.

1.2 Sampling

This study utilized purposive sampling to select participants. Specifically, undergraduate students majoring in Early Childhood Education at two private universities in Nanning—Guangxi University of Foreign Languages and Nanning University of Technology—were selected as the sample. The rationale for selecting these two institutions was as follows: (1) Both were full-time private undergraduate institutions approved by the Guangxi Zhuang Autonomous Region Department of Education, exhibiting typical representativeness among private universities in Nanning regarding educational objectives, curriculum design, and student demographics; and (2) both institutions had long histories of offering preschool education programs and had implemented blended learning practices for over three years, meeting the contextual requirements of this study.

Following the selection of institutions, the minimum required sample size was determined using Cochran (1977) sample size formula: $n_0 = (Z^2 \times p \times q) / e^2$. Under the conditions of 95% confidence level ($Z=1.96$), maximum variance ($p=0.5$, $q=0.5$), and 5% margin of error ($e=0.05$), and applying the finite population correction for $N=3,512$, the calculated minimum sample size was 346.

In this study, a total of 744 questionnaires were distributed, with 650 returned. After excluding 51 invalid responses—characterized by completion times of less than 3 minutes, patterned repetitive answers, or logical inconsistencies—a final sample of 559 valid questionnaires was obtained, yielding a valid response rate of 92.2%.

The demographic characteristics of the sample were distributed as follows: Females constituted 88.19% of participants, with males accounting for 11.81%. In terms of year distribution, third-year students constituted the largest proportion (60.82%), followed by second-year students (23.97%). First-year (8.23%) and fourth-year (6.98%) students represented relatively smaller proportions. Regarding blended learning course participation, the largest cohort (42.40%) had taken 1–2 such courses, followed by those who had taken 3–4 courses (36.31%). Relatively fewer students (21.29%) had taken 5 or more blended courses. In terms of online learning time allocation, 47.41% of students spent 20%–40% of their total course time learning online. Concerning cumulative kindergarten placement/internship duration, over sixty per cent of students (62.97%) undertook placements or internships lasting one month or less. Those with placements/internships lasting 2–3 months accounted for 9.12%, while placements/internships lasting 4–6 months

comprised 9.30%. Students undertaking placements/internships exceeding six months constituted 18.60%.

2. Instrumentation

2.1 Questionnaire Design

The questionnaire for this study was developed by referencing the Ministry of Education's Professional Standards for Kindergarten Teachers (Trial) and the Preschool Education Programme Accreditation Standards. Learning evaluation indicators were formulated according to the characteristics of the preschool education programme. The questionnaire comprised two main sections: the first gathered students' basic information; the second featured a learning effectiveness assessment scale employing a five-point Likert scale, requiring students to evaluate both their "current level" and "desired level" of learning. The scale encompassed three dimensions:

professional knowledge Dimension (Q6–Q10): Assessed students' mastery of fundamental theories, policies and regulations, childcare methodologies, and environmental design knowledge.

professional competence Dimension (Q11–Q19): Covered core competencies including educational technology application, integration of local culture, observation and analysis of young children, activity design, classroom management, home-school collaboration, resource integration, and critical thinking.

professional philosophy and ethics dimension (Q20–Q24): Assessed educational ethos, ethical standards, professional identity, reflective awareness, and commitment to lifelong learning. Each scale item was rated across two dimensions: "Current Level" and "Desired Level".

2.2 Validity and Reliability of the Questionnaire

To ensure instrument quality, item analysis and reliability testing were conducted.

Content Validity: Three experts in early childhood education were invited to evaluate the questionnaire items. Revisions were made based on their feedback to improve clarity and relevance.

Item Analysis: The Critical Ratio (CR) method was employed to assess item discrimination. The top 27% and bottom 27% of respondents, based on total scores, were classified as the high- and low-scoring groups, respectively. An independent samples t-test was conducted to compare the two groups. The results showed that t-values for all 19 items ranged from 17.010 to 22.192 ($p < 0.01$), indicating strong discriminative power.

Reliability Analysis: Cronbach's alpha coefficient for the overall scale was .958, substantially exceeding the acceptable threshold of .70, indicating excellent internal consistency. The Corrected Item–Total Correlations (CITC) for all items were above .40. Furthermore, deleting any item did not significantly improve the alpha coefficient, confirming the stability of the scale.

Construct Validity—Exploratory Factor Analysis (EFA): Since the questionnaire was developed based on a theoretical framework, EFA was conducted to examine whether the empirical structure aligned with the theoretical assumptions. The Kaiser–Meyer–Olkin (KMO) measure was .959, and Bartlett's test of sphericity was significant ($\chi^2 = 8441.384$, $df = 171$, $p < 0.001$). Principal Component Analysis (PCA) with Varimax rotation extracted three factors, explaining 71.031% of the total variance. All factor loadings and communalities exceeded 0.40. These findings support the proposed three-dimensional structure—professional knowledge, professional competence, and professional philosophy and ethics—indicating good construct validity.

3. Data Collection

Data collection was conducted among undergraduate students majoring in early childhood education at two universities: Guangxi University of Foreign Languages and Nanning University of Technology. Researchers distributed online questionnaires via the Wenjuanxing platform, providing detailed explanations to participants regarding the research purpose, completion procedures, confidentiality principles, and requirements for voluntary participation and anonymous responses. Ultimately, a total of 559 valid questionnaires were obtained, yielding a response rate of 92% and ensuring the validity and representativeness of the data.

4. Data Analysis

Data analysis was conducted using SPSS software. First, reliability analysis was performed on the questionnaire scales to assess internal consistency reliability. Subsequently, the mean scores and standard deviations for each item were calculated separately for both the current situation and desired situation contexts. Building upon this, the Modified Priority Needs Index (PNI Modified) was applied to quantify the gap analysis for each item, thereby identifying areas requiring priority improvement. Finally, comparative analysis of gap indices across dimensions and demographic variable differences were conducted, with findings discussed in conjunction with statistical results.

Results

1. General Characteristics of Learning Needs of Preschool Education Undergraduates in Private Universities of Nanning, Guangxi within a Blended Learning Context.

Table 1 demonstrated that students in the Early Childhood Education programme at private universities in Nanning, Guangxi, exhibit relatively high overall expectations regarding the learning outcomes of blended teaching, while their assessment of the current situation remains comparatively low.. Specifically, the current mean for the professional knowledge dimension stands at 3.23 (SD=0.57), with an expected mean of 4.20 (SD=0.53); The current mean for the professional competence dimension was 3.08 (SD=0.60), with an expected mean of 4.20 (SD=0.52); the current mean for the professional philosophy and teaching ethics dimension was 3.43 (SD=0.65), with an expected mean of 4.36 (SD=0.56). The current mean scores for all items ranged between 2.96 and 3.49, indicating a "moderate" level; conversely, the desired mean scores ranged between 4.15 and 4.40, reflecting a "fairly good" to "very good" level, with a consistent gap observed across dimensions. The gap was most pronounced in the professional competence dimension (PNI Modified=0.32), with a gap value of 1.12, particularly concerning community resource integration, home-school communication and collaboration, and local cultural competence; The gap in the professional knowledge dimension was the second most pronounced (PNI Modified = 0.31, gap value 0.97), while the gap in the professional philosophy and ethics dimension was relatively the smallest (PNI Modified = 0.29, gap value 0.92). The overall gap is significant, exhibiting a structural pattern characterised by "pronounced competency shortcomings, moderate knowledge deficiencies, and relatively adequate attitudinal and ethical foundations".

Figure 1 Overall Characteristics of Learning Needs Among Preschool Education Undergraduates at Private Universities in Nanning, Guangxi

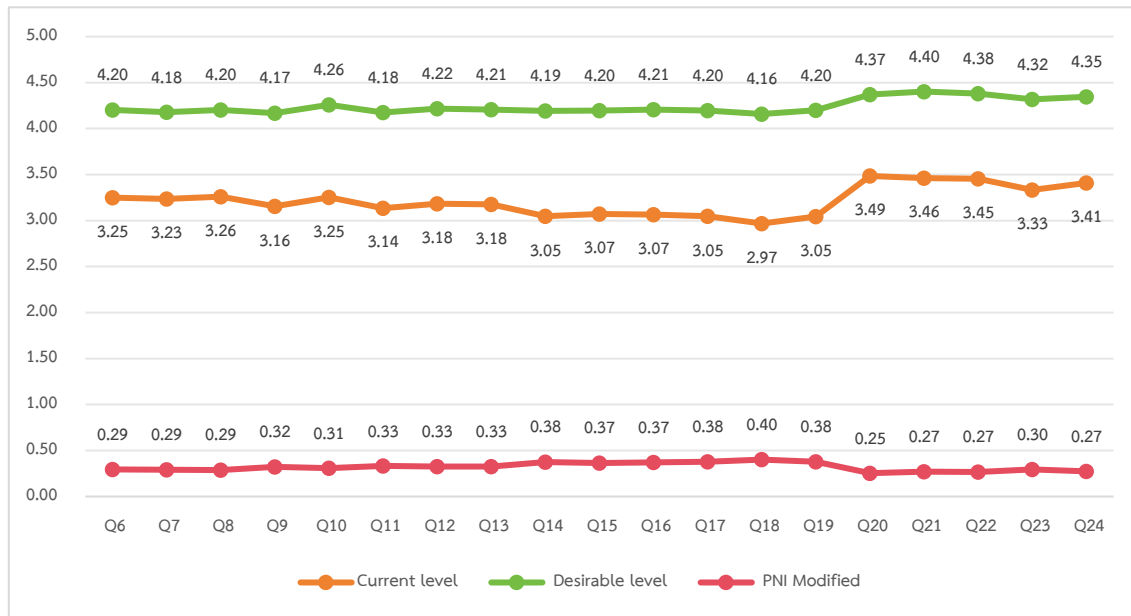


Table 1 Current Status and Expectations of Learning Outcomes Across Dimensions for Undergraduate Preschool Education Students at Private Universities in Nanning, Guangxi

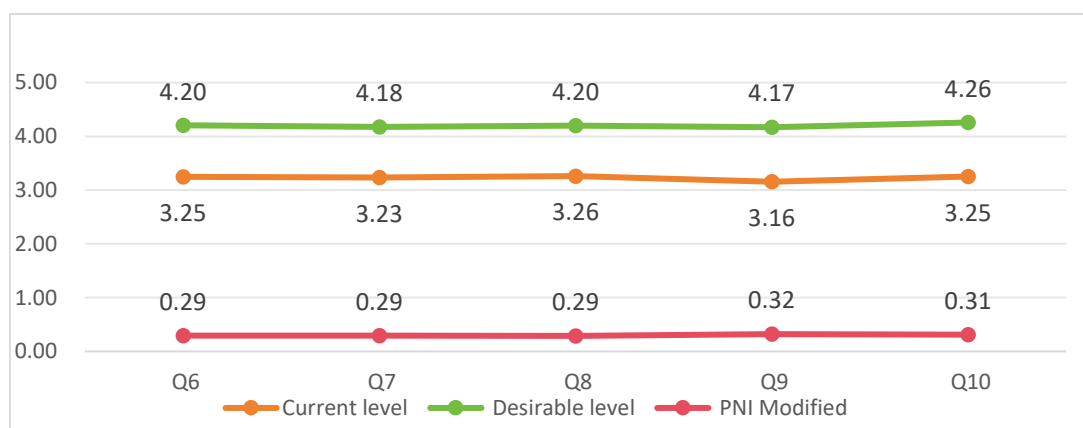
Dimension	Item	Current Level M(SD)	Desired Level M(SD)	Difference	PNI	Ranking
Professional Knowledge	Q6-Q10	3.23 (0.57)	4.20 (0.53)	0.97	0.31	2
Professional Competence	Q11-Q19	3.08 (0.60)	4.20 (0.52)	1.12	0.32	1
Professional Philosophy and Ethics	Q20-Q24	3.43 (0.65)	4.36 (0.56)	0.92	0.29	3

2. Analysis of the Professional Knowledge Dimension for Undergraduate Preschool Education Students at Private Universities in Nanning, Guangxi

The professional knowledge dimension (Q6–Q10), primarily assessed students' mastery of fundamental early childhood education theories, policies and regulations, pedagogical methods, and related foundational knowledge. The mean current levels for these items ranged between 3.16 and 3.26, while the mean desired levels ranged between 4.17 and 4.26, indicating relatively minor discrepancies. As Figure 2 indicated, within the professional knowledge dimension, students expressed the highest demand for Q9 (foundational general knowledge) (PNI = 0.32). The current mean of merely 3.16 suggested students perceived deficiencies in the current blended teaching approach regarding the supplementation of broad foundational knowledge, such as natural sciences and humanities and social sciences. Second was Q10 (environmental design and play-based teaching materials), students aspired to a higher level (M = 4.26).

In contrast, the smallest gap was observed for Q8 (educational activity methods) (PNI = 0.29), suggesting existing teaching effectively conveyed core pedagogical knowledge.

Figure 2 Current and Desired Levels of Professional Knowledge Dimensions Among Preschool Education Undergraduates at Private Universities in Nanning, Guangxi



Note:

Q6. Mastery of fundamental early childhood education theories, developmental patterns of young children, and core childcare knowledge

Q7. Understanding and mastering the core requirements of key policies and regulations such as the Learning and Development Guide for Children Aged 3-6 and the Kindergarten Education Guidance Outline

Q8. Mastering fundamental methods and strategies for kindergarten educational activities—My current level

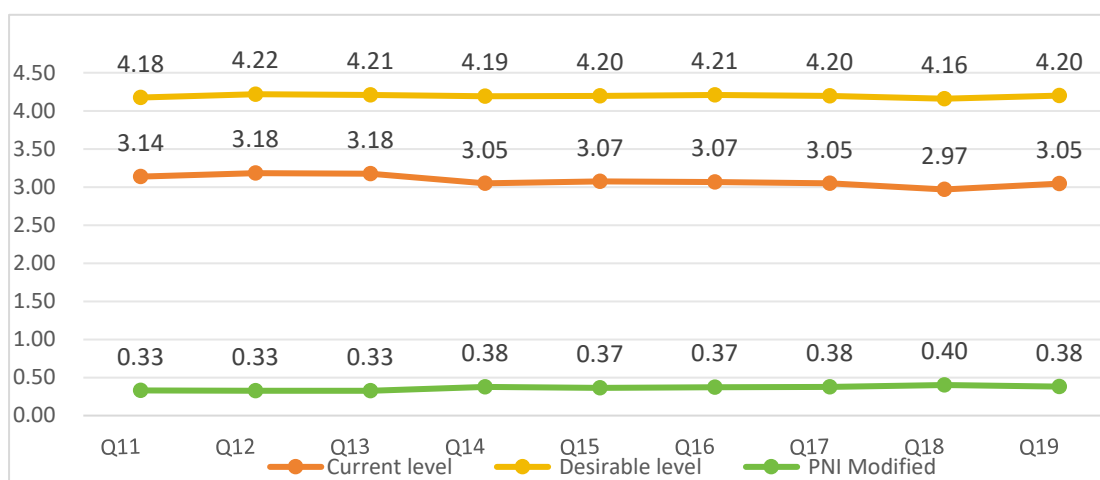
Q9. Mastering foundational knowledge in natural sciences and humanities/social sciences underpinning kindergarten educational activities

Q10. Master the fundamental principles of scientifically designing classroom environments and the basic methods for crafting educational materials and toys from diverse resources

3. Analysis of Professional Competency Dimensions for Undergraduate Preschool Education Students at Private Universities in Nanning, Guangxi

The professional competence dimension (items Q11–Q19) measured skills in applying teaching technology, integrating local culture, observing children, designing activities, managing classrooms, communicating with families, utilizing community resources, and critical thinking. The current scores averaged 2.97–3.18, while the desired scores averaged 4.16–4.22. The PNI Modified value stood at 0.32, representing the largest gap among the three dimensions. This indicated that the lack of practical application skills constituted the most significant challenge currently facing blended learning.

Figure 3 Current and Expected Levels of Professional Competence Dimensions for Preschool Education Undergraduates at Private Universities in Nanning, Guangxi



Note:

Q11: Utilising modern educational technologies such as multimedia and online resources to support teaching

Q12: Effectively integrating core elements of Guangxi's local culture (e.g., arts, festivals, folklore) into kindergarten care and educational activities

Q13: Employing observation, documentation, and analysis to conduct preliminary assessments of children's behavioural development

Q14: Designing specific plans to organically integrate local cultural elements such as Guangxi folk games into kindergarten play activities

Q15: Independently designing creative kindergarten activity plans that align with children's developmental characteristics

Q16: Establish effective classroom management strategies and resolve common conflicts among children

Q17: Communicate and collaborate effectively with parents and colleagues, and collaboratively draft preliminary home-school partnership plans

Q18: Investigate and integrate community or local resources to support comprehensive educational activities

Q19: Employ critical thinking to conduct multidimensional analyses of complex issues in teaching practice and propose innovative solutions

By ranking the gap values for each item, this dimension reveals three core characteristics:

The most pronounced gaps lie in social integration and higher-order thinking skills: Item Q18 (Integrating Community Resources) scores only 2.97 in current practice, with a gap value of 1.19 – the highest priority improvement area across the entire assessment. This is closely followed by Q19 (Critical Thinking and Innovative Problem Solving), with a gap value of 1.15. This indicates that students generally feel a lack of integration awareness and insufficient capacity for independent thinking and flexible adaptation when confronting complex, non-standardized educational scenarios.

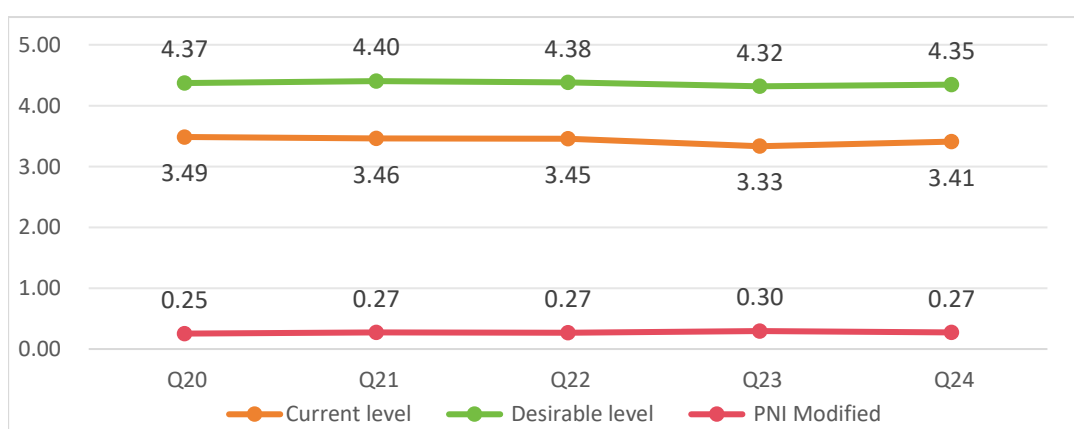
Communication and management bottlenecks in childcare settings are evident: Q17 (Home-School Communication and Collaboration) shares second place with Q19, both exhibiting a gap value of 1.15; Q16 (Classroom Management and Conflict Resolution) also shows a significant gap of 1.14. Home-school collaboration and routine classroom management represent critical challenges in frontline practice. The data reveals students pronounced "practical anxiety" when handling these multi-stakeholder interactive tasks.

Capabilities in cultural resource adaptation and programme design require urgent enhancement: Q14 (Integration of Guangxi Folk Games) showed a gap value of 1.14, while Q15 (Activity Programme Design) also reaches 1.13. By contrast, Q11, Q12, and Q13 also exhibit gaps, though their values are relatively smaller (1.03–1.04). This indicates that students still face significant conversion barriers in the "deep processing" stage of transforming local culture and folk games into concrete educational programmes.

4. Analysis of Professional Ideology and Teacher Ethics Dimensions Among Undergraduate Preschool Education Students at Private Universities in Nanning, Guangxi

The professional philosophy and ethics dimension (Q20–Q24) assesses educational ethos, professional conduct standards, occupational identity, development awareness, and commitment to lifelong learning. The current level mean scores for these items range between 3.33 and 3.49, while the desired level mean scores fall between 4.32 and 4.40, indicating a relatively modest gap. Specifically, the PNI Modified values for items Q20 (Educational Passion) and Q21 (Professional Ethics) both fall around 0.25–0.27, indicating that students' self-assessments and expectations in these areas are relatively aligned. This suggests a high level of alignment with professional philosophy and ethical standards, potentially reflecting higher education institutions' emphasis on fostering virtue and shaping values in talent cultivation. However, the PNI Modified value for item Q23 (Reflection and Planning) was relatively high (0.30), suggesting that when cultivating students' professional competence, attention should still be paid to establishing their professional identity and stimulating their awareness of lifelong learning.

Figure 4 Current and Desired Levels of Professional Ideals and Ethical Conduct Dimensions Among Undergraduate Early Childhood Education Students



Note: Q20. Possessing a more positive educational ethos, characterized by compassion, responsibility, patience, and respect for children's personalities

Q21. I have internalized professional ethics standards and the principle of fostering virtue through education as my professional creed, and am committed to upholding this mission in educational practice

Q22. I possess a strong sense of professional identity regarding my future role as a qualified kindergarten teacher and value establishing equitable, trusting teacher-child relationships

Q23. Developed awareness of fostering professional growth through reflection, and am willing to proactively plan my personal professional learning pathway

Q24. I firmly believe lifelong learning is pivotal to teachers' professional development and am committed to maintaining self-directed learning throughout my career to adapt to evolving educational demands.

Compared to the preceding two dimensions, the Professional Affect dimension exhibits the highest current status scores ($M \approx 3.43$) and generally lower PNI values (0.25–0.30). Notably, Q20 (Educational Passion) exhibits the lowest PNI value across the entire questionnaire (0.25), indicating blended teaching methods (potentially incorporating online video case studies or lectures by distinguished educators) prove relatively effective in stimulating students' emotional resonance. Conversely, Q23 (Reflection and Planning) demonstrates a comparatively higher PNI value (0.30), suggesting room for improvement in cultivating students' metacognitive abilities regarding self-reflection and career planning.

In summary, the findings reveal a structural profile characterized by "the most pronounced competency gaps, moderate knowledge deficiencies, relatively favorable affective engagement, yet requiring reinforcement in reflection and planning."

This sample-based analysis of average gaps identifies core issues prevalent in current blended teaching and establishes an overall improvement priority sequence: first address competency gaps, then promote knowledge transfer, and finally ensure value internalization through reflective communities.

5. Analysis of Demographic Variable Differences in Learning Needs Among Undergraduate Preschool Education Students

To reveal the heterogeneity of learning outcomes among students with different demographic characteristics, this study independent samples t-tests and one-way ANOVA were conducted. The results are as follows:

5.1 Analysis of Gender Differences

Independent samples t-tests compared current scores across the three dimensions for male and female students (Table 2). Results indicate p-values exceeding 0.05 for all dimensions, confirming no statistically significant gender differences in learning outcomes across these dimensions. Although male students exhibited marginally higher mean scores across all dimensions than female students, the magnitude of these differences was negligible (Cohen's d values ranging from 0.035 to 0.199). This indicates that under the current blended learning model, perceptions of learning outcomes among students of different genders are converging.

Table 2 Analysis of Current Score Differences Across Dimensions by Student Gender

Dimension	Male M±SD	Females M±SD	t	p
Professional Knowledge	3.25 ± 0.57	3.23 ± 0.57	0.270	0.787
Professional Competence	3.19±0.64	3.07±0.59	1.518	0.129
Professional Philosophy and Ethics	3.49±0.74	3.42±0.64	0.784	0.434

5.2 Grade-Level Differences Analysis

One-way ANOVA revealed significant differences across all three dimensions by grade ($p < 0.001$). Post-hoc LSD comparisons indicated a distinct "U-shaped" pattern: freshmen exhibited peak scores, while sophomores entered a trough period (professional competence $M = 2.85$), scoring significantly lower than all other grades ($p < 0.05$). Junior and senior scores subsequently recovered and stabilized. These findings suggest that the sophomore year represents a critical window for blended learning intervention.

Table 3 Analysis of Differences in Current Scores of Each Dimension Among Students of Different Grades

Dimension	Freshman M±SD	Sophomore M±SD	Junior M±SD	Senior M±SD	F	p
Professional Knowledge	3.46±0.54	2.96 ± 0.59	3.28 ± 0.53	3.44 ± 0.51	16.718	0.000**
Professional Competence	3.32 ± 0.56	2.85±0.59	3.16±0.58	2.95 ± 0.61	12.356	0.000**
Professional Ethics and Morality	3.54±0.59	3.17±0.69	3.51±0.63	3.53±0.55	9.925	0.000**

5.3 Analysis of Differences in Hybrid Course Participation Volume

ANOVA revealed no significant differences in current scores by course quantity ($p > 0.05$). This indicated that the quantity of blended courses taken did not automatically translate into perceived improvements in learning

Table 4 Analysis of Current Score Differences Across Dimensions for Students Participating in Different Numbers of Blended Learning Courses

Dimension	1–2 courses M±SD	3–4 courses M±SD	4 or more M±SD	F	p
Professional Knowledge	3.19 ± 0.56	3.28 ± 0.60	3.23 ± 0.52	1.403	0.247
Professional Competence	3.02 ± 0.59	3.16 ± 0.63	3.08 ± 0.55	3.000	0.051
Professional Ethics and Morality	3.36 ± 0.66	3.47 ± 0.67	3.51± 0.58	2.741	0.065

5.4 Analysis of Differences in Proportion of Online Learning Time

One-way ANOVA results indicated that the proportion of online learning time exerted a significant positive effect on students' current scores in the professional competence dimension ($F = 4.563$, $p = 0.004$). Post-hoc tests revealed that students with $\geq 60\%$ online learning time scored significantly higher than those with $\leq 20\%$ and $20\%-40\%$ ($p < 0.05$), whereas no significant between-group differences were observed for professional knowledge or professional philosophy and ethics dimensions ($p > 0.05$). These findings suggest that sufficient online self-learning space is more conducive to cultivating students' professional practical competencies.

Table 5 Analysis of Current Score Differences Across Dimensions for Students with Different Proportions of Online Learning Time

<i>Dimension</i>	$\leq 20\%$ M $\pm$ SD	20%-40% M $\pm$ SD	40%-60% M $\pm$ SD	$\geq 60\%$ M $\pm$ SD	<i>F</i>	<i>p</i>
Professional Knowledge	3.22 $\pm$ 0.55	3.20 $\pm$ 0.56	3.31 $\pm$ 0.58	3.30 $\pm$ 0.62	1.099	0.349
Professional Competence	3.06 $\pm$ 0.60	3.02 $\pm$ 0.56	3.20 $\pm$ 0.60	3.33 $\pm$ 0.73	4.563	0.004**
Professional Ethics and Morality	3.43 $\pm$ 0.66	3.38 $\pm$ 0.63	3.48 $\pm$ 0.66	3.62 $\pm$ 0.72	1.756	0.155

5.5 Analysis of Differences in Internship/Practicum Duration

Students with varying internship/practicum durations exhibit no significant differences in current scores across all three dimensions (p -values all > 0.05). The data indicates that without systematic guidance and mechanisms for deep reflection, merely extending placement duration results in the linear accumulation of inefficient practice rather than a spiral ascent in professional competence.

Table 6 Analysis of Current Score Differences Across Dimensions for Students with Different Internship Durations

<i>Dimension</i>	≤ 1 month M $\pm$ SD	2-3 months M $\pm$ SD	4-6 months M $\pm$ SD	≥ 6 months M $\pm$ SD	<i>F</i>	<i>p</i>
Professional Knowledge	3.20 $\pm$ 0.58	3.24 $\pm$ 0.52	3.35 $\pm$ 0.55	3.27 $\pm$ 0.55	1.205	0.307
Professional Competence	3.08 $\pm$ 0.59	3.07 $\pm$ 0.69	3.07 $\pm$ 0.63	3.09 $\pm$ 0.57	0.009	0.999
Professional Ethics and Morality	3.41 $\pm$ 0.67	3.43 $\pm$ 0.70	3.50 $\pm$ 0.58	3.47 $\pm$ 0.61	0.416	0.742

Discussion

1. Professional Knowledge Dimension: Theoretical Displacement in Information Transmission and Knowledge Construction

The gap in the professional knowledge dimension reveals current hybrid teaching's inadequacy in fostering deep learning. Students express urgent demand for integrated application of knowledge points such as "foundational liberal arts knowledge" and "environmental design methodologies" (e.g., Q9, Q10). This

reflects teaching practices largely confined to one-way transmission of online resources and repetitive offline knowledge delivery. Here, technological intervention must transcend mere resource repository functions, instead focusing on establishing "human-machine collaborative" learning environments. For instance, deploying artificial intelligence as an "intelligent learning companion" can furnish students with personalized knowledge maps and instant feedback, thereby addressing fragmented learning caused by insufficient faculty guidance through a low-cost, high-efficiency approach.

2. Professional Competence Dimension: Constraints on Learning Disengagement and Higher-Order Thinking Development

The gaps in the professional competence dimension are most pronounced, particularly in the areas of 'integrating community resources' and 'critical thinking' (Q18, Q19), reflecting two major shortcomings in the current blended teaching approach regarding competence development. Firstly, learning activities are severely disconnected from the real-world early childhood education environment. Traditional practical training models often face practical challenges such as 'difficulty in coordinating venues, heavy safety liabilities, and limited capacity for kindergartens to accommodate students', resulting in students having very little exposure to authentic childcare and teaching practice. Secondly, teaching lacks the 'scaffolding' required to cultivate higher-order thinking. Skills such as critical thinking and innovative design need to be nurtured through carefully designed complex problems and continuous guidance, and this is precisely where traditional teaching currently falls short. To address this, Human-AI Collaboration shifts from the teacher-student dyad to a triadic "teacher-student-AI" model (Huang et al., 2023), using AI to construct immersive environments where students rehearse complex communication and conflict resolution in safe virtual scenarios (Bowen & Watson, 2024), effectively compensating for limited physical placements.

3. Professional Philosophy and Ethics Dimension: Bottlenecks in Transforming Value Recognition into Practice

While the professional philosophy and teacher ethics dimension receives relatively high scores, the pronounced demand for "Reflection Promoting Professional Development" (Q23) reveals a bottleneck in translating emotional identification into conscious practice. The growth of teacher ethics is not static value indoctrination but dynamically constructed through continuous "practice-reflection-dialogue." It heavily relies on a supportive "relational ecosystem" and "reflective practice community." It warrants vigilance that if technological application prioritizes efficiency alone, it may conversely diminish emotional interaction and profound dialogue between teachers and students, as well as among students themselves. Future instructional design should employ technology as a conduit for establishing and sustaining reflective communities. For instance, online platforms could facilitate the creation of growth portfolios spanning entire teaching placements, fostering ethical dialogue and meaning negotiation between educators and students around specific educational events. This approach enables the elevation of professional ideals from mere 'knowledge' to 'conviction' and ultimately 'action'.

Conclusion

The gap structure revealed in this study indicates that blended learning has established a certain foundation at the "knowledge transmission" level. However, significant shortcomings persist in "knowledge construction closed-loop", "contextualized competence generation", and "support from reflective communities for professional ethics and ideals". The greatest disparity lies in the professional competence dimension (PNI Modified = 0.376), with items such as Q18 and Q19—involving complex practice and higher-order thinking—demonstrating particularly pressing needs. This suggests subsequent improvements should follow a prioritized sequence: first addressing competency gaps, then facilitating knowledge transfer, and finally ensuring value internalizations through reflective communities. Based on this, the following targeted recommendations are proposed to provide an actionable pathway for optimizing blended teaching in early childhood education programmes at private universities.

Recommendations

Based on the gap analysis, this study proposes a blended teaching enhancement system integrating student-centred learning, teacher guidance, and technology support.

For the professional knowledge dimension, it is recommended to develop AI-supported knowledge maps and project-based learning to promote deeper understanding and knowledge application.

For the professional competence dimension, institutions should adopt human–AI collaborative approaches by utilizing virtual simulations and real-world scenarios to strengthen practical skills and higher-order thinking.

For the professional philosophy and ethics dimension, technology-enabled reflective communities should be established through e-portfolios and peer interaction to support reflective practice and professional identity development.

Research Limitations and Future Directions

This study has several limitations. First, the sample exhibits a grade-level imbalance, which may affect the generalizability of the findings. Second, the reliance on quantitative data limits insights into students' subjective experiences; future studies should incorporate qualitative approaches to provide a more comprehensive understanding. Third, the limited internship experience among participants may bias the evaluation of professional competencies. Finally, the cross-sectional design precludes the examination of changes over time; therefore, longitudinal research is recommended to explore long-term effects.

References

- Borich, G. D. (1980). A needs assessment model for conducting follow-up studies. *Journal of Teacher Education*, 31(3), 39–42. <https://doi.org/10.1177/002248718003100310>
- Bowen, J. A., & Watson, C. E. (2024). *Teaching with AI: A practical guide to a new era of human learning*. Johns Hopkins University Press.
- Bates, A. W. (2019). *Teaching in a digital age: Guidelines for designing teaching and learning* (3rd ed.). BCcampus.
- Central Committee of the Communist Party of China & State Council. (2019). *China education modernization 2035* (in Chinese). http://www.gov.cn/zhengce/2019-02/23/content_5367987.htm.

- Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). John Wiley & Sons.
- Dai, X., Sukor, N. S., Said, N., & Sun, H. (2025). Faculty acceptance of blended learning in private universities in China. *International Journal of Academic Research in Progressive Education and Development*, 14(1), 627-641. <https://doi.org/10.6007/IJARPED/v14-i1/24357>
- Darling-Hammond, L. (2006). Constructing 21st-Century Teacher Education. *Journal of Teacher Education*, 57(3), 300-314. <https://doi.org/10.1177/0022487105285962>
- Garrison, D. R., & Vaughan, N. D. (2008). *Blended learning in higher education: Framework, principles, and guidelines*. Jossey-Bass/Wiley.
- Graham, C. R., Woodfield, W., & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *The Internet and Higher Education*, 18, 4-14. <https://doi.org/10.1016/j.iheduc.2012.09.003>
- Huang, D. D., & Peng, J. (2024). Construction of a talent cultivation model for preschool education majors in private undergraduate colleges under the background of teacher education accreditation: A case study of a private university in Guangxi. *Educational Theory Observation*, 2(7), 76-79. <https://doi.org/10.61369/EDTR.9873> [in Chinese]
- Huang, R., Liu, D., Tlili, A., Zhang, G., Chen, Y., & Wang, H. (2023). Human-machine collaborative teaching: Path design based on virtual avatars, digital twins, and educational robotics. *Open Education Research*, 29(6), 4-14. <https://doi.org/10.13966/j.cnki.kfjyyj.2023.06.001> (in Chinese)
- Li, H. (2024). Advantages, principles, and strategies of artificial intelligence-empowered talent cultivation in preschool education. *Journal of Luohe Vocational and Technical College*, 23(5), 56-61. <https://doi.org/10.3969/j.issn.1671-7864.2024.05.010> [in Chinese]
- Lin, Y., & Chen, J. (2021). Blended learning in early childhood teacher education: Effects on learning engagement and professional practice. *Early Childhood Education Journal*, 49(5), 827-838.
- Meadseena, A., Chano, J., & Nithideechaiwarachok, B. (2023). Needs analysis of English language teaching and learning in upper secondary schools. *Journal of Educational Issues*, 9(1), 174-191. <https://doi.org/10.5296/jei.v9i1.20633>
- Ministry of Education of the People's Republic of China. (2018). *Education informatization 2.0 action plan* (in Chinese). http://www.moe.gov.cn/srcsite/A16/s3342/201804/t20180425_334188.html
- Organization for Economic Co-operation and Development (OECD). (2021). *Starting strong VI: Supporting meaningful interactions in early childhood education and care*. OECD Publishing.
- State Council of the People's Republic of China. (2015). *Guiding opinions on actively promoting the "Internet Plus" action plan*. http://www.gov.cn/zhengce/content/2015-07/04/content_10002.htm [in Chinese]
- United Nations Educational, Scientific and Cultural Organization (UNESCO). (2021). *Reimagining our futures together: A new social contract for education*. UNESCO Publishing.
- Wang, Y., Sariwat, L., & Julsuwan, S. (2025). Enhancing art teacher competence in Chinese vocational education: A needs-assessment-based framework. *Journal of Education and Learning*, 14(6), 319-332. <https://doi.org/10.5539/jel.v14n6p319>
- Yurayat, P., & Seechaliao, T. (2021). Needs assessment to develop online counseling program. *International Education Studies*, 14(7), 59-71. <https://doi.org/10.5539/ies.v14n7p59>