International Journal of Education and Humanities
ISSN: 2770-6702 | Vol. 22, No. 1, 2026

AI-Enabled Behavior Modification System and Method for Preschool Inclusive Education: Integration of Teaching and Practice

Changxiu Zhai, Ke Lyu, Xi Li, Xinran Wu

Faculty of Education, Qingdao Binhai University, Qingdao 266555, China

Abstract: To bridge the systemic gap between theoretical instruction and clinical application in "Behavior Modification" courses for preschool and inclusive education majors, this study develops an AI-enabled behavioral intervention framework. Addressing prevalent issues such as pedagogical stagnation and the scarcity of contextually relevant teaching materials , the proposed system integrates seven functional modules-ranging from multi-modal data acquisition to intelligent pedagogical feedback. This technical architecture facilitates a "Five-Step" instructional paradigm: Preview, Guidance, Lecture, Expansion, and Practice. By synthesizing regional cultural resources with the core tenets of appropriateness and contextualization, the system enables the high-precision identification of behavioral issues and the generation of culturally resonant, personalized intervention schemes. Empirical data indicates a transformative impact: the intervention success rate improved by over 30% compared to conventional manual methods, while the average recovery cycle was curtailed by 20%. Furthermore, the system enriched the pedagogical repository with real-time case data, driving the course objective attainment rate to exceed 0.78. This research provides a robust technical trajectory for synchronizing behavior modification technologies with local cultural heritage, offering a high-value reference for optimizing talent cultivation in early childhood inclusive education.

Keywords: AI Empowerment, Preschool Inclusive Education, Behavior Modification, Integration of Teaching and Practice, Local Cultural Inheritance, Intelligent Teaching System.

1. Introduction

The accelerating trajectory of inclusive education, coupled with an intensified focus on cultural transmission, has catalyzed a critical demand for preschool practitioners who possess a dual mastery of behavioral intervention and cultural literacy[1]. As a cornerstone of the curriculum for preschool and inclusive education majors, the "Behavior Modification" course is instrumental in developing essential competencies, including behavioral diagnostics, strategic formulation, and clinical execution[2]. Nevertheless, contemporary instructional paradigms grapple with several systemic bottlenecks: primarily, a reliance on localized adaptations of foreign pedagogical frameworks that often misalign with China's unique socio-cultural and educational landscape ; secondly, a monochromatic teaching methodology that lacks the interactive depth and practical rigor necessary to integrate indigenous cultural nuances ; and finally, a pronounced decoupling of theoretical instruction from clinical practice, which hinders students' ability to translate abstract knowledge into culturally-resonant behavioral interventions[3][4].

While AI-driven advancements offer transformative potential for curricular innovation , existing systems frequently overlook the cognitive specificities of early childhood or fail to bridge the gap between technological intervention and cultural continuity[5][6][7]. Consequently, there is an exigent need to architect an AI-enabled behavior modification framework tailored for preschool inclusive settings—one that not only optimizes intervention efficacy but also fosters a symbiotic relationship between clinical practice and local cultural inheritance[8][9]. Leveraging the high-level course development initiatives at Qingdao Binhai University, this study synthesizes AI technology with behavior modification theories and regional cultural assets. The following sections delineate the system architecture, operational workflows, and empirical outcomes, providing a blueprint for reconciling technological progress with cultural and pedagogical reform.

2. System Architecture and Technical Solution

2.1. Overall System Architecture

The AI-enabled behavior modification framework developed for preschool inclusive education is architected as a cohesive, closed-loop ecosystem. It comprises seven functional pillars: Data Acquisition, Intelligent Analytical Processing, Correction Resource Repository, Multi-terminal Interactive Execution, Real-time Physiological Monitoring, Efficacy Evaluation, and Pedagogical Feedback. The synergy between these modules facilitates a seamless transition from initial diagnostics to clinical feedback, as conceptualized in the "Data-Analysis-Intervention-Evaluation" cycle.

A. Data Acquisition Module This module serves as the primary gateway for multi-dimensional data harvesting. It aggregates demographic profiles (age, cognitive baseline, socio-cultural background), behavioral metrics (frequency, topography, and antecedent triggers), and environmental variables within the pedagogical setting. While raw behavioral data is captured via high-definition optical sensors and structured observational logs, qualitative inputs from educators and guardians are integrated through a dedicated mobile interface. Crucially, the module quantifies children's receptivity to localized cultural stimuli, providing an empirical baseline for culturally-responsive interventions.

B. AI Analytical and Processing Core Representing the "cerebellum" of the system, this module integrates three specialized units:

Behavioral Recognition Unit: Employs an optimized CNN-LSTM (Convolutional Neural Network - Long Short-Term Memory) hybrid architecture to decode complex behavioral patterns. This model achieves an automated classification accuracy exceeding 90% by processing temporal dependencies in behavioral sequences.

Feature Extraction Unit: Synthesizes individual feature vectors that encapsulate behavioral idiosyncrasies, emotional response latencies, and cultural affinity levels.

Scheme Generation Unit: Leveraging a fusion of collaborative filtering and decision-tree algorithms, the unit autonomously constructs personalized intervention blueprints. It strategically maps extracted features against the Correction Content Library, embedding regional cultural philosophical tenets-such as "Benevolence" and "Propriety" from Qilu heritage-into the corrective protocols.

C. Correction Content Library (Backend Knowledge Base) Engineered on a MySQL relational database, this repository functions as a high-density knowledge hub. It archives over 500 validated clinical cases, 20+ specialized behavior modification techniques tailored for early childhood, and a digital pedagogy suite containing 100+ micro-courses and interactive gamified scenarios (e.g., simulations of traditional folk games).

D. Multi-terminal Interactive Execution Module Developed via the Flutter cross-platform framework, this module ensures operational continuity across teacher, parent, and student interfaces. The child-facing interface utilizes a gamified, cartoon-centric UI to present corrective tasks through immersive animations and traditional folk-game simulations, thereby reducing the "clinical resistance" typical of traditional interventions.

E. Real-time Physiological Monitoring Module To ensure participant safety and emotional regulation, the system synchronizes with wearable biosensors to track vital signs: respiratory rate (target: 15-25 breaths/min), heart rate (target: 80-120 bpm), and galvanic skin response (target: 10-100 kΩ). The system is programmed with a fail-safe mechanism that autonomously suspends activities and triggers alerts if vitals deviate from predefined safety thresholds.

F. Efficacy Evaluation and Strategy Optimization This module utilizes a weighted scoring matrix (100-point scale) to quantify progress: behavioral remediation (40%), physiological stability (30%), and interactive participation/cultural perception (30%). Risk levels are categorized into four tiers: Negligible (0-25), Mild (26-50), Moderate (51-75), and High (76-100). Scores exceeding the 51-point threshold automatically trigger the AI core to recalibrate and optimize the intervention strategy.

G. Pedagogical Feedback and Knowledge Transfer The system interfaces directly with the university's Learning Management System (LMS), synchronizing clinical data and cultural integration insights with the "Behavior Modification" curriculum. This bridge ensures that real-world clinical evidence directly enriches classroom instruction, effectively bridging the theory-practice gap.

2.2. Implementation Process of the Method

The intervention methodology powered by the aforementioned system follows a structured six-phase lifecycle: Baseline Acquisition, Synthetic Analysis & Strategic Generation, Clinical Implementation, Longitudinal Evaluation, Pedagogical Integration, and Iterative Refinement.

Phase I: Multi-modal Baseline Acquisition. In this initial stage, the system establishes comprehensive digital archives by aggregating children's demographic data, behavioral patterns, and environmental variables. Simultaneously, the physiological monitoring module records baseline vitals to provide a calibrated benchmark for subsequent therapeutic assessment.

Phase II: Diagnostic Synthesis and Algorithmic Customization. The AI core deciphers the etiology of behavioral challenges and extracts feature vectors regarding the child's cultural receptivity. By cross-referencing the Correction Content Library, the system embeds indigenous elements-such as the Qilu principle of "Integrity" or Yellow River Delta folk games-into a bespoke intervention blueprint. Upon educator validation, this scheme is synchronized across parent and student terminals.

Phase III: Participatory Clinical Implementation. Under the dual guidance of educators and guardians, children engage in training via the interactive module. The system captures real-time interaction logs and physiological feedback, adhering to the principles of "active participation" to foster cultural resonance throughout the modification process.

Phase IV: Dynamic Efficacy Evaluation. The system conducts weekly longitudinal analyses, comparing pre- and post-intervention behavioral and physiological metrics. If the composite efficacy score exceeds 50, the AI engine triggers a strategic recalibration, specifically fine-tuning the intensity of cultural integration.

Phase V: Pedagogical Synchronization. Corrective outcomes, anonymized datasets, and successful cultural integration cases are funneled back into the university's teaching platform. This ensures the perpetual evolution of the instructional resource pool and teaching material library.

Phase VI: Iterative Refinement and Formal Termination. The cycle of implementation and evaluation persists until the child achieves an efficacy score of ≤25 for two consecutive intervals. At this juncture, the system generates a comprehensive summative report and cultural education impact analysis for permanent archiving.

2.3. Key Technology Description

The system's effectiveness is built upon four practical technical breakthroughs:

Smart Behavior Recognition (CNN-LSTM): We optimized a hybrid AI model that acts like a "digital eye". It uses CNN to capture body movements and LSTM to understand the sequence of actions. After being trained on a large dataset of over 1,000 behavior videos of preschool children, the system can identify problem behaviors with an impressive accuracy of over 92% (with an F1-score of 0.89).

Culturally-Tailored Recommendations: Instead of a "one-size-fits-all" plan, the system uses a recommendation engine (combining biasSVD and C4.5 algorithms). It looks at the child's personality, family background, and cultural comfort to suggest personalized plans. For instance, it might suggest using traditional Qilu values or local folk games as tools for behavior change.

Multi-Data Fusion: The system doesn't just look at behavior; it connects the dots between body signals (like heart rate), actual actions, and how a child feels about cultural elements. This "triple-check" approach makes our evaluations and analysis of cultural education much more scientific and reliable.

Live Link between Class and Practice: We created a bridge

that connects real-world correction data with the college classroom. This means students in the "Behavior Modification" course get to study fresh, real cases and learn how to pass down local culture while practicing their professional skills.

3. Application Practice and Effect Evaluation

3.1. Application Background

The proposed AI-enabled framework was rigorously implemented within the "Behavior Modification" curriculum at Qingdao Binhai University. This course functions as a mandatory pillar for inclusive education majors and a core elective for preschool education students, encompassing 32 contact hours and 2 academic credits. Throughout two semesters from 2023 to 2024, the system facilitated the learning of 669 students. The instructional delivery was spearheaded by a five-member faculty team, comprising one associate professor and four lecturers/assistants, all of whom possess extensive expertise in theoretical modeling, practical mentorship, and cultural pedagogy.

The implementation highlights a sophisticated synthesis between technological intervention and regional cultural identity:

Strategic Cultural Integration: Core tenets of Qilu culture, the "open and pragmatic" ethos of Qingdao, and the folk traditions of the Yellow River Delta were systematically woven into both the syllabus and the clinical practice.

Pedagogical Governance: The application strictly adhered to the tripartite principles of appropriateness, active participation, and contextualization, ensuring the intervention remained developmentally and culturally relevant.

Symbiotic Objectives: By leveraging this AI-driven system, the team realized an organic fusion of behavioral modification technology, curriculum-based instruction, and the preservation of local cultural heritage.

3.2. Implementation of Teaching Reform

Leveraging the AI framework, the course orchestrates a "Five-Step" blended instructional model, facilitating a seamless transition between theoretical acquisition and clinical mastery:

Preview: The online terminal dispatches targeted learning objectives and regional cultural artifacts, facilitating autonomous learning through micro-lectures and shared cultural narratives.

Guidance: Pre-class analytics consolidate student feedback and cultural perceptions, allowing instructors to clarify objectives and encourage inquiry-driven learning.

Lecture: Complex theoretical bottlenecks are deconstructed into collaborative group tasks. By integrating indigenous cultural cases, faculty provide intensive, high-impact instruction and real-time clarification.

Expansion: The digital forum serves as a hub for disseminating cutting-edge research and cultural inheritance experiences, extending the boundaries of traditional classroom knowledge.

Practice: A multi-faceted evaluation system-comprising online assessments, intervention design, and simulative operations-ensures the consolidation of professional skills and cultural literacy.

During the high-fidelity practice phase, students utilize the AI system for advanced case modeling and engage in clinical sessions across 22 off-campus training bases. A key highlight is the active integration of cultural elements, such as repurposing traditional folk games as behavioral reinforcers, allowing children to cultivate pro-social behaviors within a familiar cultural context. The system’s real-time data harvesting generates comprehensive analytics on both intervention efficacy and cultural receptivity, providing an empirical foundation for refining pedagogical strategies and student skill-building.

3.3. Effect Evaluation

3.3.1. Correction Effect and Cultural Inheritance Effect on Children

To validate the system's clinical efficacy, an empirical study was conducted involving 30 preschool children, comprising 15 diagnosed with autism, 8 with attention deficits, and 7 typically developing children exhibiting behavioral challenges. The comparative outcomes are summarized as follows(refer to Table1):

Table 1. Comparative Efficacy of AI-Enabled vs. Traditional Methods

Evaluation Metric	Traditional Manual Method	AI-Enabled System	Improvement Delta
Correction Success Rate	53%	85%	↑32%
Average Correction Cycle	5.3 Weeks	4.2 Weeks	↓21%
Teacher Satisfaction	Lower Baseline	92%	Significant Increase
Parent Satisfaction	Lower Baseline	89%	Significant Increase
Cultural Acceptance Rate	N/A	88%	New Metric Established

Correction Efficacy: The system achieved an 85% success rate in behavioral remediation, representing a substantial 32% improvement over traditional manual intervention protocols (53%).

Intervention Latency: The average correction cycle was optimized to 4.2 weeks, effectively reducing the duration by 21% compared to the 5.3-week benchmark of conventional methods.

Cultural Internalization: The integration of regional heritage yielded profound results, with 88% of participants actively engaging in culturally-infused activities and 82% demonstrating an emergent understanding or preference for localized cultural elements.

Stakeholder Approval: Satisfaction metrics from educators and guardians reached 92% and 89%, respectively, highlighting a significant preference for the AI-enabled approach over traditional paradigms.

Individual Case Analysis: A 5-year-old child with autism, characterized by significant social withdrawal, underwent a 4-week program integrating the "Eagle Catches Chickens" folk game and Qilu "mutual assistance" values. Post-intervention, the subject's spontaneous social interactions surged from twice per day to 10 instances, demonstrating a newly acquired capacity for simple communicative initiation.

With an efficacy score of 20 (categorized as "No Risk"), the child exhibited both behavioral mastery and an emotional affinity for the cultural games. This successful trajectory has been archived on the teaching platform as a quintessential case study.

3.3.2. Curriculum Teaching Effect

The systemic reform has yielded substantial improvements across four key dimensions: instructional objectives, student competencies, resource depth, and faculty development.

Elevated Achievement of Course Objectives: Post-reform metrics indicate that the achievement degree for all predefined course objectives has surpassed 0.78, a marked ascent from the pre-reform baseline of 0.65. Survey data reveals that over 90% of the students demonstrated a profound grasp of core behavioral modification skills and successfully executed the integration of regional cultural elements into their clinical practice.

Measurable Growth in Student Competencies: Assessment results show that the average score in critical components-including intervention design, simulative operations, and cultural synthesis-rose to 82 points, reflecting a 15-point increase compared to previous cohorts. Furthermore, students' clinical proficiency in identifying behavioral triggers and implementing culturally-embedded schemes received high accolades from cooperative kindergartens during practical internships.

Expansion of the Pedagogical Knowledge Base: The implementation has generated a robust repository of over 120 empirical cases and an extensive longitudinal behavioral dataset. This wealth of cultural integration experience has effectively addressed the historical deficits of stagnant content and monochromatic teaching materials.

Faculty Advancement and Scholarly Output: The instructional team has demonstrated significant professional growth, presiding over 3 provincial-level and 5 school-level pedagogical reform projects. This period also saw the publication of 10 academic papers and the editing of a specialized textbook. Notably, the enhancement of teaching and research capabilities was underscored by one faculty member receiving the "Teaching Expert" distinction at Qingdao Binhai University.

4. Conclusion and Future Work

This study successfully engineered an AI-enabled behavior modification framework specifically designed for the preschool inclusive education landscape. By integrating automated data acquisition, intelligent analytics, and real-time pedagogical feedback, the system effectively mitigates long-standing challenges such as stagnant instructional content, didactic teaching methods, and the theory-practice gap. The synthesis of regional cultural assets with AI-driven diagnostics has not only facilitated high-precision identification of behavioral triggers but also elevated intervention success rates while significantly curtailing recovery timelines. Within the academic sphere, the "Five-Step" blended instructional model has demonstrably enriched the pedagogical repository, fostering a generation of practitioners with superior clinical proficiency and cultural literacy.

Moving forward, the research team aims to refine this framework across four strategic dimensions:

Curricular Evolution and Material Development: We intend to iteratively update the syllabus with cutting-edge behavioral research and broader cultural resources, culminating in the compilation of standardized textbooks that resonate with China's unique national and cultural context.

Digital Resource Expansion: Efforts will be channeled into optimizing the online repository, completing the production of open-access courses on the Zhihuishu platform, and developing immersive virtual experience scenarios for cultural education.

Strengthening Clinical Partnerships: The team will actively expand collaborative networks with special education centers, psychological counseling clinics, and cultural institutions to provide students with diverse internship and practical engagement opportunities.

Advanced Scholarly Inquiry: Future initiatives involve pursuing high-level research grants to explore more sophisticated pathways for integrating heritage into behavioral science. This will ultimately drive innovation in behavioral technology, pedagogical reform, and cultural preservation within the realm of preschool inclusive education.

Acknowledgments

The authors would like to formally acknowledge the financial and institutional support that facilitated the construction and research of the high-level course "Behavior Modification". This work constitutes a key phased achievement of the third batch of cultivation and construction projects for high-level courses at Qingdao Binhai University, and is supported by the Teaching Reform Research Project of Qingdao Binhai University entitled "Research on the Construction of Virtual Simulation Teaching Platform for Preschool Inclusive Education in the Digital Context" (No. 2024JC20).

The authors are profoundly indebted to the faculty and students who actively engaged in the pedagogical experiments. We also extend our sincere gratitude to the cooperative kindergartens that served as vital practice bases and the various cultural institutions whose expertise and resources were instrumental to the success of this study.

References

[1] China National Standardization Management Committee. Specifications of Inclusive Education for Preschool Children (China Standardization Press, China 2021), p. 12-15. (In Chinese)

[2] Zhai, C.X., Li, A.X., Chen, J.Y.: Research on the Teaching Reform of "Behavior Modification Technology" Based on the Integration of College and Kindergarten. Journal of Qingdao Binhai University, Vol. 39 (2023) No. 2, p. 89-94. (In Chinese)

[3] Miltenberger, R.G.: Behavior Modification: Principles and Procedures (Cengage Learning, USA 2019), p. 45-67.

[4] Liu, J., Zhang, Y.H.: Current Situation and Development Trend of Behavior Modification Teaching in Preschool Education Majors. Journal of Early Childhood Education Research, Vol. 41 (2022) No. 5, p. 34-39. (In Chinese)

[5] Li, X., Lü, K.: Application of AI Technology in Preschool Education Behavior Intervention. Computer Engineering and Applications, Vol. 59 (2023) No. 12, p. 234-240. (In Chinese)

[6] Sun, W.J., Kong, H.Q.: Research on Practical Pathways for Integrating Qilu Culture and the Spirit of the Qingdao into Adolescents' Moral Education. International Journal of Education and Humanities, Vol. 21 (2025) No. 2, p. 204-208.

[7] Zhang, Z.W., Wang, J.N.: Research on Intelligent Behavior Correction System for Special Groups (China Railway Press, China 2018), p. 102-105. (In Chinese)

[8] Kong, H.Q., Sun, X.W., Zhao, H.M., Deng, W.Y.: Research on the Construction of Kindergarten-Based Curriculum Rooted in the Yellow River Delta Culture. Frontiers in Humanities and Social Sciences, Vol. 5 (2025) No. 11, p. 212-218.

[9] Cai, D.Y.: Principles and Strategies for Implementing Minnan Culture Courses from a Child's Perspective. Preschool Education Research, (2024) p. 87-90. (In Chinese)