

Homeroom Teacher Leadership and Digital Strategies in Chinese Classrooms: A Dual-Pathway Framework for Student Engagement

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Abstract

Under China's Education Informatization 2.0 reform, classroom management is shifting from administrative control toward leadership-driven and digitally mediated governance. Although homeroom teachers are expected to integrate humanistic leadership with AI-supported strategies, existing research rarely explains how their integration sustains authentic student engagement. This study examines how transformational and distributed leadership can be combined with digital strategies to enhance behavioral, emotional, and cognitive engagement. Using a qualitative literature-based approach, it analyzes 20 practitioner monographs and 9 recent academic journal articles (2020–2025). Inductive coding and thematic synthesis were employed to construct a dual-pathway framework. Findings indicate that leadership-oriented practices cultivate emotional safety and autonomy, while digitally-enabled strategies improve precision and personalized feedback. Sustainable engagement emerges from their synergy rather than isolated application. The study proposes a Dual-Pathway Framework that integrates moral leadership with intelligent governance, offering a human-centered model for classroom management in the AI era.

Keywords: Homeroom teacher leadership; Student engagement; Dual-pathway framework; Digital transformation; Classroom management

Introduction

Driven by the global movement for sustainable education, the philosophy of classroom management in the Chinese context is undergoing a profound transformation shifting from a control-oriented administrative model to one centered on strategic homeroom teacher leadership (Plass & Froehlich, 2025). Homeroom teachers (Banzhuren) have traditionally borne the heavy responsibility of managing large class sizes, often relying on administrative control to maintain order and discipline. Consequently, the traditional role has been largely defined by stewardship acting as a nanny who manages every trivial detail and surveillance, akin to a police officer maintaining order through strict control (Plass & Froehlich, 2025).

However, modern educational governance demands a departure from this exhaustion-prone model. It is argued that homeroom teachers must transition from managing affairs to leading people, advocating for a light and efficient approach that emphasizes wisdom and scientific management over mere surveillance (Ren, 2015). This shift highlights that the core of sustainable classroom ecology lies not in external control, but in cultivating an environment where students' intrinsic motivation is awakened through leadership (Chen, 2018).

The advent of the Education Informatization 2.0 era. Dawson et al, (2019) has further complicated this landscape. The integration of big data and artificial intelligence (AI) has broken the physical boundaries of

traditional classrooms and created Smart Classrooms that offer unprecedented possibilities for precision management (Zheng, 2024). Digital tools, such as mobile applications and data analytics platforms, have enhanced the transparency of class governance and facilitated efficient home-school collaboration, which furthers the visibility and data-driven nature of management processes (Zhang, 2020).

Yet, this digital transformation has its perils. While technology enhances efficiency, excessive reliance on cold data and surveillance risks dehumanizing education. Such a shift can diminish emotional interaction and reduce students to mere data points (Zheng, 2024). In the AI field, if teachers fail to act as emotional fillers, intelligent systems might induce superficial coping behaviors in students rather than deep engagement (Zhang, 2020). Thus, the challenge for modern homeroom teachers is how to balance technological efficiency with emotionally responsive leadership.

Despite the availability of advanced digital tools and established leadership theories, a critical gap persists in both research and practice: there is no integrative framework that explains how homeroom teachers can systematically combine transformational and distributed leadership with digital strategies to cultivate multidimensional student engagement. Existing scholarship tends to treat leadership and digital governance as parallel yet disconnected domains either emphasizing the moral artistry of humanistic classroom management (Zhao, 2016) or focusing on the technical efficiency of intelligent systems (Plass & Froehlich, 2025). This fragmentation limits our understanding of how emotional, relational, and technological mechanisms interact within contemporary classrooms.

The Chinese tradition of classroom leadership is deeply rooted in moral and relational philosophy, where teaching is conceptualized as a dialogical process grounded in empathy, trust, and shared growth (Dawson et al., 2019). However, this humanistic foundation remains theoretically under-integrated with the rapid digital transformations reshaping classroom governance. Emerging evidence further suggests that without emotional and cognitive alignment, adaptive technologies may induce superficial compliance rather than deep engagement (Zheng, 2024). Therefore, a systematic conceptual integration of leadership and digital strategies is urgently needed to explain how sustainable engagement can be achieved in the AI era.

Therefore, this paper seeks to bridge this gap by examining homeroom teacher leadership through a holistic lens. Drawing on monographs by distinguished Chinese homeroom teachers and recent empirical studies, this analysis elucidates how teacher-leaders can cultivate a classroom environment that fosters active student engagement. Specifically, it explores two complementary pathways of classroom management: 1) the leadership-oriented pathway, which integrates transformational and distributed leadership to reshape classroom culture, foster emotional connection, and empower student autonomy; 2) the digitally-enabled pathway, which employs data-driven strategies and AI tools to ensure management precision and personalized support. By synthesizing these two approaches combining the humanistic soul touch of leadership with the technological precision of digital tools the study aims to provide a roadmap for sustainable educational governance in the digital era.

Historically, Chinese homeroom teachers have borne extensive administrative and disciplinary responsibilities, often serving as both caregivers and enforcers (Chen, 2018). Contemporary scholarship redefined this role as one of educational leadership that prioritizes professional autonomy, emotional intelligence, and shared decision-making (Zheng, 2019; Tian, 2019). Moving beyond compliance based management, effective homeroom teachers lead through values, relationships and the cultivation of classroom

culture a process much like farming that necessitates patience, empathy, and respect for students' organic growth cycles (Zheng, 2019).

Within this evolving paradigm, the homeroom teacher emerges as a classroom leader who integrates transformational leadership motivating students through shared vision and moral influence (Dawson et al., 2019) (Fan, 2022) with distributed leadership, which empowers students through participatory decision-making and self-governance (Harris, 2014). This shift from external control to internal empowerment transforms classroom management into a process of guidance and shared responsibility and lays the foundation for genuine student engagement.

Student engagement is a multidimensional construct comprising behavioral, emotional, and cognitive dimensions. In the context of Chinese classrooms, engagement has often been mistaken for mere discipline or silence. However, recent scholarship challenges this superficial view, positing instead that engagement is a multidimensional construct. In this framework, behavioral engagement refers to participation in academic and class activities. When students participate in the formulation of class rules, their compliance transforms from passive obedience to active maintenance (Dawson et al., 2019). Emotional engagement involves students' affective reactions, such as a sense of belonging and interest. In the AI era, the teacher's role as an “emotional filler” is crucial; without strong emotional bonds, students cannot form a psychological attachment to the class community (Zhao, 2021). Cognitive engagement refers to the investment in deep learning and self-regulation. Empirical analysis using GTI data highlights that without appropriate teacher support and emotional safety, students may exhibit superficial coping rather than deep cognitive investment (Kizilcec et al., 2017). Fig. 1. demonstrates the multidimensional construct of student engagement.

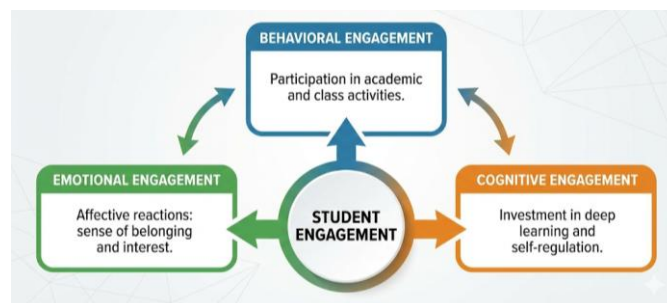


Fig 1. Multidimensional concept of student engagement.

Scholarship suggests that homeroom teacher leadership does not influence student engagement directly but operates through specific classroom management practices, which serve as a critical mediating mechanism. This mechanism functions by shaping the structural and psychological environment of the classroom.

First, classroom management translates abstract leadership visions into tangible structural support. Effective management establishes clear rules and routines, which reduces students' cognitive load regarding behavioral expectations and allows them to focus on learning tasks. As Wei Shusheng articulated, when management is systematized and “scientific”, it creates a predictable order that transforms chaotic energy into focused behavioral engagement (Dawson et al., 2019). Furthermore, recent studies in the digital era emphasize that management systems must evolve from rigid control to “precision governance”, where data-driven feedback loops help students self-regulate their learning behaviors (Leithwood & Jantzi, 2005).

Second, classroom management creates the psychological climate necessary for emotional and cognitive engagement. Research based on the Global Teaching Insights (GTI) data indicates a significant “perception gap” between teachers' intentions and students' actual experiences. Li Y (2025) found that teacher behaviors promote engagement only when students perceive them as supportive and emotionally safe (Kizilcec et al., 2017). If management is viewed merely as surveillance, it may trigger “superficial coping”; conversely, when management incorporates “emotional support” and respects student autonomy, it fosters a sense of safety that is a prerequisite for deep cognitive investment (Kizilcec et al., 2017; Zhao, 2021). Thus, classroom management acts as the bridge: it converts the “High-Tech” efficiency of digital tools and the “High-Touch” warmth of leadership into a cohesive ecology where students feel both organized (behaviorally) and supported (emotionally/cognitively).

Based on the literature review above, this study constructs a Dual-Pathway Framework to analyze how homeroom teachers enhance student engagement in the modern era. This framework posits that sustainable engagement is not achieved by relying solely on humanistic charisma or technological tools, but by the synergistic integration of both. As illustrated below, the framework consists of two complementary pathways:

- The Leadership-Oriented Pathway. This pathway focuses on cultural and interpersonal dynamics. It employs Transformational Leadership to build shared vision and Distributed Leadership to restructure power relations (Li, 2010). Its primary function is to satisfy students' psychological needs for autonomy and relatedness, thereby stimulating intrinsic motivation.
- The Digitally-Enabled Pathway. This pathway focuses on technical and methodological precision. It employs Data-Driven Strategies and AI Tools to transcend physical limitations and provide personalized support (Zhang, 2020; Leithwood & Jantzi, 2005). Its primary function is to optimize the management environment and feedback loops, ensuring that support is precise and timely (Li, 2024).

By synthesizing these two pathways, this research argues that sustainable student engagement is achieved not by choosing between humanity and technology, but by using leadership to guide technology, and technology to empower leadership.

Methodology

This study adopts the qualitative literature-based analysis approach to examine the mechanisms of homeroom teacher leadership in enhancing student engagement. Given the complex and context-dependent nature of classroom management (Tian, 2019; Dawson et al., 2019), a qualitative approach is well suited to uncover its underlying pedagogical logic. By combining the practical insights of experienced homeroom teachers (Li, 2010; Zheng, 2019) with recent empirical research (Kizilcec et al., 2017; Zhao, 2021), this study inductively develops a dual-pathway framework that explains how classroom management strategies enhance student engagement. To ensure analytical credibility, this study employed three validation strategies: peer debriefing with two experts in educational administration to review coding consistency; data triangulation across teacher monographs, policy texts, and journal research; and iterative verification between themes and evidence during synthesis.

Data were collected via purposive sampling from two complementary sources to construct the study's dual-pathway analysis. The leadership pathway is primarily informed by a dataset of 20 practice-oriented monographs authored by distinguished Chinese homeroom teachers. These works published by prestigious

houses such as Educational Science Publishing House provide rich, longitudinal narratives of leadership in authentic classroom contexts. In contrast, the digitally enabled pathway is grounded in 9 academic studies from CSSCI-indexed and international reputable journals. This reliance on journals reflects the emerging nature of digital class governance, a field currently lacking extensive practitioner-led documentation. Together, these sources allow for a comprehensive analysis that bridges established pedagogical wisdom with modern technological trends.

First, selection and coding. 20 expert monographs were screened for distinguished classroom practice and 9 journal articles were selected based on relevance to digital transformation and student engagement (2020–2025). Humanistic concepts such as vision, trust, and autonomy were coded under a leadership category, whereas technology-oriented concepts such as precision, data analytics, and efficiency were coded under a digital category. Second, categorization. Inductive clustering formed two pathways. Within the leadership-oriented pathway, practices such as democratic management (Li, 2010) and role systems (Harris, 2014) were categorized as expressions of transformational leadership through vision building and value guidance and distributed leadership, through shared roles and participatory governance. In contrast, within the digitally enabled pathway, practices such as smart classrooms (Zhang, 2020) and data portraits were categorized as data-driven strategies.

Finally, synthesis. Themes from both pathways were synthesized and mapped onto the behavioral, emotional, and cognitive dimensions of student engagement to explain their combined effects (Kizilcec et al., 2017; Zhao, 2021).

Results and Discussion

Leadership-Oriented Classroom Management

This section examines how transformational and distributed leadership practices shape classroom management and foster student engagement. By integrating vision, trust, shared responsibility and value-based influence, homeroom teachers build emotional safety and autonomy, thus strengthening the behavioral, emotional, and cognitive dimensions of student engagement through relational and value-based influence.

Transformational Leadership and Student Engagement

Transformational leadership emphasizes vision articulation, value guidance, and relational influence, enabling teachers to move beyond rule-based control toward meaning-centered leadership (Bass & Riggio, 2006). In classroom management, this form of leadership primarily shapes how students interpret norms, goals, and learning activities, thereby influencing student engagement through emotional and cognitive pathways rather than direct behavioral regulation (Fredricks et al., 2004).

In the Chinese context, transformational leadership fosters students' sense of belonging and psychological safety through emotionally intelligent relationship building grounded in calm guidance, empathy, and moral influence (Xu, 2019; Zhang, 2015). These emotionally grounded approaches characterized by self-regulation and non-punitive responses, such as pausing before reacting to misbehavior to prevent escalation transform discipline into a relational process of mutual respect and trust (Xu, 2019; Zheng, 2024). Building on this foundation, classroom leadership cultivates a culture of shared innovation and moral collaboration through culturally embedded practices, including rituals, shared narratives, and the teacher's moral example (Chen, 2018). Ultimately, as manifested in Chinese homeroom teacher literature, effective leadership stems from

relational practices attentive listening, empathetic communication, and individualized support that nurture emotionally secure environments where students feel valued and intrinsically motivated (Dawson et al., 2019; Li, 2010; Fan, 2022; Zheng, 2019; Zheng, 2024; Zhang, 2020).

At the cognitive level, transformational leadership deepens engagement by guiding students to perceive classroom norms and learning tasks as meaningful and purposeful. By linking behavioral expectations to values such as responsibility, self-development, and collective growth, homeroom teachers support students' internalization of norms and promote reflective self-regulation (Dawson et al., 2019; Li, 2010; Leithwood & Jantzi, 2005). Practice-based accounts further suggest that when students understand the underlying rationale of classroom expectations, compliance gradually transforms into commitment and sustained cognitive investment (Zheng, 2024).

Overall, transformational leadership contributes to student engagement by cultivating emotional security and cognitive orientation toward shared values. The convergence of evidence across Chinese homeroom teacher monographs illustrates a consistent pattern of value-based influence, in which engagement emerges through identification, trust, and meaning-making rather than external enforcement. This relational-cognitive pathway complements the behavior-focused mechanisms examined in the subsequent analysis of distributed leadership.

Distributed Leadership and Student Engagement

Distributed leadership in classroom management primarily contributes to student engagement through its behavioral dimension, as it restructures how responsibility for daily routines and order is enacted in practice (Spillane, 2005; Harris, 2014). Rather than functioning as a centralized control strategy, it operates through role allocation and shared participation in classroom governance (Gronn, 2002; Dawson et al., 2019).

Across the practice-oriented monographs by Chinese homeroom teachers, distributed leadership consistently appears as a set of concrete governance practices embedded in everyday classroom life, where class committees, rotating duties, and student-led evaluations exemplify shared responsibility in daily routines (Dawson et al., 2019; Li, 2010; Xiao et al., 2018; Zheng, 2024; Zhang, 2020). In such classrooms, students are assigned stable yet flexible roles related to discipline, learning organization, and collective affairs (Dawson et al., 2019; Li, 2010), responsibility for maintaining order is therefore distributed among students rather than monopolized by the teacher (Dawson et al., 2019; Leithwood & Jantzi, 2005). Over time, participation in these routines transforms behavioral norms into shared expectations that are enacted and reinforced through peer interaction rather than external enforcement (Li, 2010). Multiple authors report that once students assume visible roles in classroom governance, compliance with rules becomes more consistent and collective tasks are carried out with greater initiative (Dawson et al., 2019; Li, 2010; Leithwood & Jantzi, 2005). Small-scale participatory initiatives such as student-led projects, co-created class rules, weekly class meetings for collective discussion, rotating responsibility posts, and peer reflection activities enable distributed leadership to emerge organically in everyday classroom management, which improves students' behavioral participation and sense of shared ownership (Wu, 2018; Guan, 2019).

These Chinese practices illustrate how distributed leadership functions as a mechanism for behavioral engagement. By embedding authority in roles and routines, homeroom teachers reduce reliance on direct supervision while enabling students to regulate behavior through shared accountability and peer coordination (Harris, 2014; Dawson et al., 2019). From a student engagement perspective, such arrangements primarily generate observable participation attendance, task completion, and norm maintenance which constitutes the

most immediate form of engagement and provides the behavioral foundation for subsequent emotional and cognitive involvement (Fredricks et al., 2004). The specific classroom management practices through which distributed leadership supports students' behavioral engagement are summarized in Appendix A.

In summary, the leadership-oriented pathway enhances student engagement by fostering emotional safety, intrinsic motivation, and autonomy through transformational and distributed leadership. It moves classroom management beyond direct control to focus on the psychological and cultural foundations that sustain engagement and complement digital strategies.

Digitally-Enabled Classroom Management

This section examines how data-informed and AI-enhanced tools from monitoring systems to adaptive learning applications improve classroom visibility, precision, and personalization. It further shows how technology, when complementing human leadership, strengthens behavioral, emotional, and cognitive dimensions of student engagement through responsive, data-driven management.

Data-Informed Monitoring and Behavioral Visibility

Data-informed classroom monitoring systems enable teachers to visualize attendance, participation, and task completion patterns in real time (Zhang, 2020; Li, 2024). In both international and Chinese contexts, such data-informed practices reflect a growing emphasis on evidence-based decision making in education (Guan, 2019). The Education Informatization 2.0 Action Plan further institutionalized this approach by promoting the use of digital technologies and big-data analytics to enhance precision, efficiency, and personalization in classroom management (Schildkamp et al., 2012).

In Chinese schools, the integration of learning management systems (LMSs), parent-teacher communication platforms, and digital dashboards has created a multilayered system of visible management that supports real-time feedback and collaboration (Zhang, 2020; Li, 2024; Ministry of Education of the People's Republic of China, 2018). For instance, big-data driven dashboards in smart classrooms visualize students' behavioral trajectories and enable precision management (Zhang, 2020). GTI-based analytics in Shanghai schools reveal that data-informed monitoring of student engagement helps teachers refine their instructional behaviors and improve learning participation (Li, 2024). Intelligent education platforms construct multidimensional learner profiles through continuous data collection, offering teachers dynamic insights into behavioral and emotional states (Ministry of Education of the People's Republic of China, 2018). Collectively, these tools demonstrate how data-informed visibility transforms classroom management from intuitive observation to evidence-based orchestration.

Overall, data-informed monitoring has redefined classroom visibility by transforming scattered behavioral signals into actionable insights for timely and differentiated management. This technological infrastructure lays the foundation for the next stage of digital innovation, where AI-supported systems further enhance cognitive and emotional engagement in classroom interactions.

AI-Supported Cognitive and Emotional Engagement Tools

Artificial intelligence has expanded classroom management from behavioral monitoring to the support of cognitive and emotional engagement as adaptive systems can analyze attention, emotion, and motivation to

personalize feedback and sustain learning focus (Plass & Froehlich, 2025; Quan et al., 2024; Gutierrez et al., 2025).

In China, AI-supported engagement tools have developed rapidly under the Education Informatization 2.0 Action Plan, combining emotion recognition, learning analytics, and adaptive feedback (Schildkamp et al., 2012). Classroom systems now integrate multimodal data such as facial expressions, voice tone, and participation frequency to detect disengagement and help teachers adjust pacing or instruction accordingly (Ministry of Education of the People's Republic of China, 2018; Zhao, 2021). Studies in middle schools indicate that AI-assisted platforms can capture students' affective fluctuations, visualize emotional trends, and provide personalized support for motivation and confidence (Zheng, 2024). Teachers increasingly act as emotional interpreters by translating algorithmic outputs into empathetic responses that sustain classroom harmony (Dong & Ling, 2024; Li, 2024), and the Chinese approaches underscore that AI in education should enhance, not replace, human empathy and teacher involvement (Zhao, 2021; Dong & Ling, 2024; Li, 2024).

Overall, AI-supported engagement tools illustrate how cognitive and emotional learning processes can be co-regulated through human AI collaboration, yet their effective use ultimately depends on maintaining ethical balance and teacher agency.

Ethical Boundaries and Risks of Intelligent Classroom Governance

The growing integration of AI into classroom management introduces ethical and professional dilemmas. While emotionally intelligent and adaptive assistants enhance personalization, they also risk algorithmic bias and the erosion of teacher agency (Quan et al., 2024; Plass & Froehlich, 2025). Research further cautions that AI-driven emotional intelligence must support, rather than replace, human autonomy in learning and moral reasoning (Gutierrez et al., 2025).

In China, the Education Informatization 2.0 Action Plan explicitly calls for “intelligent support without replacement” and positions technology as a facilitator rather than a governing force (Schildkamp et al., 2012). Scholars also warn against the excessive reliance on algorithmic feedback in class governance, stating that teachers must remain ethical mediators who translate data outputs into humanized educational decisions (Zhao, 2021; Dong & Ling, 2024). They further argue that the moral dimension of education should guide the use of intelligent tools with virtue as the rudder, and data as the sail (以德为舵,以数为帆) to preserve empathy and pedagogical warmth (Zhang, 2020; Li, 2024). Empirically, case studies demonstrate that ethical literacy training and teacher-AI co-reflection mechanisms can mitigate risks of emotional alienation and ensure that data-driven systems function as formative, rather than disciplinary, instruments of classroom management (Zhang, 2020; Zheng, 2024; Li, 2024).

Thus, using AI-based digital tools changes classroom management from passive control to active guidance, where teachers and intelligent systems work together to support students' behavior, emotions, and thinking (Guan, 2019; Schildkamp et al., 2012). In summary, the leadership-oriented and digitally-enabled pathways jointly reveal that leadership provides the emotional and moral foundation for student engagement, while technology delivers precision and adaptability. When integrated, they form a cohesive classroom ecology that supports students' active, motivated, and reflective participation, which bridges human care and digital intelligence.

Integration of Dual Pathways for Synergizing Leadership and Technology

This study shows that strong classroom engagement depends on the integration of leadership and technology. The dual-pathway framework proposed combining leadership- oriented and digitally enabled strategies illustrates that sustainable classroom management requires both human warmth and technological efficiency. Leadership provides vision and moral direction, while technology offers information and precision. The key is not to choose between them, but to make them work together in guiding student growth.

In practice, integration begins when teachers use technology through a leadership lens. Data should not dictate decisions but support reflective judgment. Teachers can model ethical use of data, communicate values behind each digital choice, and guide students to interpret technology critically rather than passively follow it, just as China's Education Informatization 2.0 Action Plan suggested, technology should support, not replace human teaching ([Schildkamp et al., 2012](#)).

In this balanced model, leadership gives technology meaning, and technology give leadership reach. When teachers lead with empathy and interpret data with purpose, digital tools become instruments of understanding rather than control. Through such integration, sustainable classroom leadership evolves as an ongoing process of reflection and self- real, in which teachers continuously learn from classroom experiences and transform their leadership through inquiry, collaboration, and adaptive use of technology ([Zhao, 2021](#); [Xiao et al., 2018](#)).

Reinterpretation of Student Engagement in the AI Era

In the AI era, student engagement should be understood as more than discipline or quiet behavior. It involves observable participation, emotional investment, and cognitive effort students who ask questions, collaborate with peers, reflect on feedback, and stay motivated even when tasks are challenging. The dual-pathway framework highlights that genuine engagement grows from both digital insight and human care. While digital tools can make these behaviors visible through data, they cannot foster the intrinsic motivation behind them. Only when teachers interpret data with empathy and respond to students' emotional needs can students feel understood, thus making their participation self-directed rather than enforced. Yet over-reliance on analytics may lead students to appear active on the surface while remaining mentally disengaged ([Holstein et al., 2019](#); [Kizilcec et al., 2017](#)). Teachers should therefore use data as a mirror for reflection, not as a mechanism of control. Ultimately, technology can reveal patterns, but leadership gives them meaning and meaning is what sustains motivation.

Redefinition of Homeroom Teacher Leadership for Contemporary Education

In contemporary education, homeroom teacher leadership is more about educational guidance and teachers are expected to lead learning communities, not just manage them. When homeroom teachers combine empathy with judgment and empower students to co-lead, classroom management becomes an act of moral and emotional leadership that supports both autonomy and community well-being.

Specifically, teachers need to build classroom culture through shared values using rituals, class meetings, and reflective discussions to strengthen belonging and collective identity. Moreover, they can empower students through participatory governance, assigning leadership roles and encouraging students to take responsibility for classroom routines and decision-making. More importantly, teachers should engage in reflective practice, using data, observation, and dialogue with students to continually adjust their approach and model self-awareness.

Ethical and Pedagogical Implications of AI-Enhanced Management

The use of AI in classroom management raises issues of privacy, transparency, and teacher autonomy. Data collected through digital platforms must be used responsibly to avoid bias and excessive surveillance. Teachers should decide when and how to apply data in ways that protect student dignity and emotional safety. In practice, schools can address these risks by setting clear ethical guidelines for data use, establishing teacher AI reflection meetings to review algorithmic outcomes, and providing regular ethics training for teachers.

AI-enhanced management also reshapes how teachers organize and interact with learning. While digital tools make participation measurable, they cannot replace empathy or trust. Teachers should use AI data as formative feedback via combining quantitative information with qualitative observation. Schools can support this through peer-learning groups that help teachers interpret learning analytics and link them to emotional or motivational factors. Leadership in this context means using technology to understand students more deeply, not to control them. After all, AI can assist with classroom efficiency, but it is the teacher's presence that turns information into meaningful learning.

Practical Implications for Policy and Teacher Development

At the policy level, education authorities should promote a balanced framework that values both human leadership and technological innovation. First, national and local policies should include ethical standards for AI use in classrooms to guarantee data transparency and student privacy. Second, evaluation systems should reward teachers for leadership, reflection, and emotional competence, not only for digital performance indicators. Third, cross-school innovation hubs could be established to test and share best practices for human-AI collaboration in classroom management. These measures would guide schools toward balanced, human-centered digital governance.

For schools and training institutions, professional development should integrate leadership training with AI literacy for teachers to learn how to use digital tools to support not replace empathy and judgment. Regular peer reflection groups can help teachers analyze classroom data collaboratively and align it with student well-being goals. Meanwhile, Reflective communities and mentorship programs pairing experienced homeroom teachers with younger educators can strengthen professional identity and train the latter to guide technology toward meaningful learning and student well-being.

Limitations and Future Research Directions

This study acknowledges several limitations. First, as a qualitative inquiry based on secondary literature rather than direct classroom observation or interviews, the findings may lack the granular detail of field-based research, thus limiting their generalizability. Second, while the dual-pathway framework offers conceptual clarity, the data sources are inherently imbalanced; the leadership pathway is rich in long-standing practitioner wisdom, whereas the digitally enabled pathway relies on a smaller pool of recent academic studies due to the emerging nature of the field. Third, the discussion is primarily situated within the Chinese policy and cultural context, and the proposed framework still requires empirical validation through longitudinal or mixed-method research in diverse educational settings. Consequently, the conclusions should be viewed as interpretive and heuristic rather than universally predictive.

Future research may build on this conceptual model through data-driven inquiry. Specifically, empirical studies could examine how homeroom teacher leadership interacts with AI-supported systems in daily practice. Comparative studies across regions or school levels could reveal how cultural and institutional contexts shape

leadership-technology integration. And future work could explore students' perspectives, investigating how human AI collaboration affects their motivation, agency, and emotional experience. These directions would deepen the understanding of sustainable classroom governance in the digital era.

Conclusion

This study examined how homeroom teacher leadership enhances student engagement in the digital era through a dual- pathway framework that integrates leadership-oriented and digitally-enabled strategies. The findings demonstrate that sustainable classroom management depends on the synergy between human leadership and technological support leadership provides moral direction, emotional connection, and vision, while technology ensures precision, timeliness, and adaptability. When teachers lead with empathy and interpret data reflectively, digital tools become instruments of understanding rather than control.

Furthermore, the study reframes student engagement as a multidimensional process that extends beyond behavioral compliance to include emotional investment and cognitive effort. Authentic engagement arises when digital insight complements, rather than replaces, human care. In this sense, homeroom teachers act as moral and pedagogical leaders who interpret data with sensitivity, foster shared responsibility, and cultivate classroom cultures grounded in trust and belonging.

Theoretically, this research contributes a dual-pathway model that integrates humanistic leadership and digitally- enabled management within the Chinese context, offering a lens to understand how emotional, moral, and technological dimensions jointly shape sustainable engagement. Practically, it provides actionable guidance for developing reflective, ethical, and technology-competent teacher leaders who can balance empathy with innovation. Ultimately, the balance between leadership and technology forms the foundation for a human-centered, sustainable, and equitable education in the AI era.

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Appendix A

Pathway	Behavioral Engagement	Emotional Engagement	Cognitive Engagement
Leadership-Oriented Classroom Management	- Promotes active participation and shared responsibility through distributed leadership (e.g., rotating roles, participatory rule-making). - Encourages collective maintenance of classroom order rather than teacher-imposed control.	- Builds trust, belonging, and psychological safety through transformational leadership that emphasizes empathy and respect. - Fosters intrinsic motivation via supportive teacher-student relationships.	- Links classroom norms and tasks to shared values and collective purpose. - Encourages reflection and self-regulation through vision-driven guidance.
Digitally-Enabled Classroom	- Enhances behavioral visibility and participation through data-informed monitoring and precision feedback. - Supports consistent engagement via real-time	- Detects and supports emotional states with AI-assisted tools. - Strengthens affective connection when teachers respond empathetically to data insights.	- Promotes adaptive learning and self-regulation through personalized feedback loops. - Integrates data insights with teacher judgment to sustain meaningful engagement.