Empirical Study on Enhancing Fundamental Education Administration through Digital Intelligence Integration

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Abstract: In the milieu of the new epoch, propelling high-quality development via digital transformation stands as a pivotal challenge in contemporary elementary education. This study, taking Shengli Primary School in Hangzhou, Zhejiang Province as an example, focuses on four key areas of digital intelligence: teaching methods, research and teacher training, evaluation techniques, and overall support services. By integrating with digital intelligence platforms, it erects a governance framework aimed at facilitating the school's high-caliber evolution through digitization. Firstly, it champions a learner-focused educational metamorphosis across all realms, leveraging AI to augment the pedagogical landscape for both educators and pupils. This fosters an organic expansion in the exploration and collaborative utilization of technology, thereby refining the efficacy of intelligent support systems. Secondly, the study introduces a multi-modal, converged approach to research and professional training, catalyzing sustained professional maturation among teachers. This is achieved through the establishment of diverse resource repositories and the cyclic refinement of these resources. Thirdly, it advocates for a three-dimensional, evidence-driven shift in assessment practices, infusing joyousness into the assessment journey and stimulating growth through the integration of offline evaluation tools for precise, smart diagnostics. Lastly, the research promotes an inclusive, cross-boundary decision-making support structure, harnessing the collective strengths of families, communities, administrative bodies, businesses, think tanks, and more. This collaborative ecosystem enriches the experience of the school and students, while also pooling premium extracurricular service provisions.

1. Introduction

The evolution and deployment of educational digital assets play a pivotal role in fostering premium growth within fundamental education. These assets, in primary and secondary institutions, encompass both tangible entities like digital devices and infrastructure, and intangible wealth accrued within digital learning environments. This intangible cache involves a myriad of data amassed from school administration, teacher professional development and student progress, among others. As digital transformation sweeps across the education sector, institutions accumulate generative data, giving rise to intricate, abundant, and multifaceted data repositories.

Yet, transitioning raw data into actionable insights necessitates overcoming pragmatic hurdles: data inconsistencies, lack of coherence and inefficiencies. Addressing this "last mile" challenge[1]—

whereby massive data must be mined, categorized, analyzed, visualized, and feedback loops established—is vital for realizing a data-driven revamp of educational decision-making, management frameworks, and service delivery.

Embedding digital transformation seamlessly into educational governance reform hinges on adherence to a "demand-driven, application-focused, service-oriented" mantra. By harnessing digital assets and aligning with the pragmatic necessities of administrators, educators, and students, the focus shifts toward exploring educational and pedagogical contexts. This deep dive enables integrated data governance and value extraction, culminating in tailored, diversified services for all stakeholders involved.[2]

Reimagining the governance of basic education through digital campus enablement pivots around three pivotal queries. Firstly, understanding the 'why' behind digitization—defining precise implementation scenarios within school reform. Secondly, unraveling the 'origin'—leveraging digital resources to proficiently gather educational data at the unit level of application scenarios. Lastly, exploiting 'mathematical intelligence'—employing educational data analytics to refine, enhance, and optimize the digital campus blueprint, thereby maximizing the practical impact and value of digital empowerment.

2. Embracing the Principle of "Application Supremacy": Establishing a Governance Framework Rooted in Digital Intelligence Scenarios

Hangzhou Shengli Primary School, nestled in Shangcheng District, Hangzhou, aspires to become a "digital exemplar" under the "new integration" initiative. Centered around the welfare of students, educators, administrators, parents, businesses, communities, government bodies, academia, research institutes, and a myriad of cloud users, the school harnesses digital technology to fuse online and offline educational resources, creating an ecosystem where school-based practices intertwine with digital intelligence across four dimensions: teaching and learning, research and professional development, assessment, and services. This fusion promotes cost-effective, high-efficiency transformations in school governance.

In the realm of teaching and learning, AI broadens the interactive space between tutors and pupils, fostering organic growth through tech-driven exploration and collaboration, thereby optimizing the impact of smart companionship. For research and training, a multifaceted resource infrastructure propels continuous teacher growth amidst the fluidity of these resources. Assessment scenarios embed offline diagnostic tools for precision feedback, infusing enjoyment into evaluations and stimulating progress. Lastly, service scenarios consolidate diverse entities—households, communities, administrative bodies, industries, and think tanks—to collectively offer premium extracurricular support.

By leveraging the four pillars of digital intelligence application scenarios, the Shengli Cube binds the scene's digital assets to its operational dashboard, transitioning from mere environmental aggregation to an optimized, integrated educational landscape. This forges a governance framework grounded in digital-intelligence scenarios, marked by a distinct systemic character that delineates resource logic within each scenario unit, harmonizes spatial components, fosters collaboration among faculty, learners, guardians, and administrators, and employs modular scene units to dismantle silos in governance, clarifying hierarchical and lateral relationships, defining roles and responsibilities in scenario activities, and facilitating problem-solving from interconnected perspectives.

The Shengli Cube Workbench, a multi-port platform interface, is steered by enhancing the alignment of school digital resources with daily governance's focal issues. These portals, encompassing comprehensive evaluations, student codes, academic forums, teacher profiles, and

performance assessments, interconnect with the scene's digital backbone. Through data handling on these interfaces, the digital footprint of educators, students, and cloud users is multidimensionally visualized and analyzed, empowering self-awareness, learning advancement, and enabling the school to delve deeper into the dynamics and tendencies within the educational ecosystem, informing sound governance strategies.

The Shengli Cube setting encompasses layers from intelligent sensing to application manifestation, with each facet empowering transformative governance. Each transformative aspect corresponds with designated infrastructure and application tiers, simplifying stakeholders' comprehension of the modular linkages between these infrastructures and application platforms. While certain aspects of educator and learner conduct find support solely in the application tier, deeper engagement necessitates their comprehension and utilization of the infrastructure layer. This dual understanding facilitates the comprehensive gathering, storage, processing, analysis, and appraisal of the worth and transformative outcomes of digital technology's application.

3. Implementing the "Shengli Cube" Strategy: Enhancing Education Transformation with a Smart Digital Campus

3.1. Transformative Learning Environment: Comprehensive Student Companionship

Empowered by the Internet and AI, the learner-centered pedagogical revolution aims to establish a seamless wireless teaching-learning ecosystem within campuses, extending into infinite virtual realms. It integrates physical and virtual spaces to forge a versatile, adaptive learning ambiance[3], augmenting opportunities for students to explore and practice anytime, anywhere. By optimizing communication modes, curating relevant learning resources, and stimulating intrinsic motivation, this approach fosters self-directed exploration, learning regulation, enthusiastic collaboration, and communication, thereby realizing an inclusive learning scenario.

3.1.1. Enhancing Efficiency and Real-Time Learning Insights

Leveraging mobile apps, students promptly grasp their academic standing in class, catalyzing a shift in study approaches and amplifying enthusiasm. Instructors can dynamically gauge effectiveness and recalibrate strategies, addressing constraints like limited class time. With tools like Explain Everything on iPads, teachers swiftly gather and compare student responses via QR codes, promoting a progression from diverse ideation to refined thinking. This mechanism ensures that even reserved students contribute actively, leveraging technology as a voice amplifier.

3.1.2. Data-Driven Governance and Decision Making

Digital technologies expedite the collection of learning analytics, enabling swift, informed governance adjustments. For instance, insights from student engagement on digital reading platforms guide library management. Teachers, analyzing cloud-based reading patterns, statistically inform the procurement of popular or make-up reading gaps, ensuring a tailored offline book collection. This precision enhances access to print materials, balancing screen time with traditional reading, and fostering healthy study habits.

Through these practices, the "Shengli Cube" model harnesses digital intelligence to revitalize education, creating a responsive, adaptive campus ecosystem where learning thrives continuously and comprehensively.

3.1.3. Amplify Impact and Showcase Learning Dynamics

Incorporate technology's demonstrative and interactive capabilities to offer students a more immersive experience, facilitating prompt feedback on learning achievements and augmenting interaction possibilities. For instance, educators can disseminate sports lesson videos via the Shengli Cube platform, enabling students to access these lessons remotely. This alleviates instances where parents, occupied with work, may momentarily miss their child's physical activities.

3.1.4. Boost Efficacy and Personalized Support

Harness in-class performance and analytical data to precisely illustrate students' learning progress and administer tailored individual assistance grounded in data insights. The "AI Companion Assistant" app, featured on the Shengli Cube workstation, employs AI-powered image recognition to track jump rope counts, synchronized with sensory controls to gather comprehensive exercise data. It generates comparative scores and monitors real-time heart rates, thereby assessing students' fitness levels.

By analyzing exercise patterns through the AI tool, customized workout plans are recommended, alongside establishing a record of each student's fitness and wellness journey. This dual insight—students understanding their own health and avenues for improvement, alongside teachers leveraging this data for strategic group formations—paves the way for voluntary or data-driven team challenges. Such an approach motivates students across varied athletic proficiencies to engage actively, nurturing their resilience and competitive spirit in a supportive, growth-oriented environment.

3.2. Research & Training Scenario: Advancing Multimodal Integrated Intelligent Cycles

Online Observation and Assessment Classes integrate seamlessly with routine teaching and research activities, infusing the vitality of digital scenarios characterized by liveliness, self-selection, interconnectedness, and adaptive push technology. By digitally tracing the teaching procedures, data on instruction and discussions are gathered, assessed, and channeled back, furnishing precise analytics and guidance for the discourse, recommending tailored learning resources, and instituting a recurrent loop of assessment, dissemination, learning, and feedback within teaching and research engagements. This fosters a new paradigm of intelligent pedagogical research, marked by human-machine synergy, propelling teachers' professional development. The "Lesson Observation" portal presents comprehensive class analytics alongside past trial teaching datasets for facile comparative study, encompassing instructor queries, student responses, focused attention metrics, segment timing, and observer feedback.

3.2.1. Calendar Synchronization and Pre-Research Preview

Preamble to teaching and research activities, an activity hub is initiated, disseminating preparatory materials. Each disciplinary session establishes a cloud-linked thematic zone within the training app, outlining themes, columns, and pre-event packages inclusive of discussion points, curriculum outlines, textbooks, instructional designs, and student profiles. This primes participants for informed engagement and proactive reflection.

3.2.2. Real-time Lesson Observation and Data Sharing

The "Lesson Observation" digital intelligence scenario integrates the vibrancy, autonomy, connectivity, and adaptability of digital platforms into a sophisticated teaching-research dynamic.

Classroom proceedings captured digitally, facilitate iterative cycles of measurement, dissemination, learning, and feedback, embodying human-machine work together. Lessons unfold in a cognitive monitoring lab, with the tech interface auto-generating lesson transcripts and multimedia recordings for live streaming. Classroom metrics—questioning patterns, student replies, time allocation—are collated and instantaneously displayed, enabling educators to offer contemporaneous feedback, log reflections, and access peers' real-time inputs on specific lesson segments.

3.2.3. Harnessing Multimodal Data for Enhanced Research Efficiency

Ahead of concentrated discussions, the scenario showcases exhaustive class analytics, including prior trial teaching datasets for comparative insights. It categorizes instructor feedback, question types, and attention focal points, and employs word clouds to highlight prevalent feedback keywords, complemented by accessible video records. These rich data sets and analyses within the digital intelligence framework facilitate traditional discourse formats while relaying on-site exchanges in real time, generating actionable data insights.

3.2.4. Construct a Data Repository & Foster Collaborative Scholarship

Post-teaching and research engagements, consolidate derived data to forge a centralized data repository. Showcase all pertinent details, figures, and analytical insights from the event, encompassing classroom instruction, debates, exchanges, and instructor feedback within a thematic context. This framework fosters ongoing discourse, transcending the temporal and spatial bounds of in-person meetings. Facilitating anytime, anywhere access to discussions, data, and insights, empowers educators to refine teaching methodologies based on seminar insights, sharing enhancements widely. Moreover, interested participants are encouraged to author articles reflecting on these discussions, uploading them to designated thematic zones, thereby converting singular documents into rich resource collections.

3.3. Assessment Scenario: Evidence-Based Framework to Ignite Intelligence and Interest

In alignment with the district bureau's digital platforms, the school integrates assessment reforms emphasizing inter-school collaboration, technological facilitation, and optimized resource allocation. By connecting the Shengli Cube workstation to tools such as electronic happiness cards, digital amenity trackers, and card exchange infrastructure, a holistic evaluation ecosystem emerges, blending formative and summative assessments, evidence-based appraisal, and incentivization strategies. This digital scenario-driven comprehensive quality assessment underscores the multidimensionality of student growth.

3.3.1. Refined Assessment Criteria for Enhanced Standardization

Grounded in the "Fivefold Education" morality system, the school devises detailed implementation frameworks, delineating criteria for card acquisition, advancement systems, evaluative methodologies, and recognition ceremonies. Strengthening the assessment's uniformity and engagement quotient, student evaluations span five domains: moral evolution, academic prowess, physical and mental well-being, aesthetic appreciation, and practical skills and social engagement. Correspondingly, five card categories—"Ethics," "Scholarship," "Fitness," "Artistry," and "Industry"—are instituted.

Students are tasked with designing patterns for these card types, followed by a popularity vote. Custom-designed award cards boast a "Fivefold Education" theme on the front, hand-drawn by pupils, paired with a unique QR code on the reverse. Post-recycling through on-site devices, these

cards are reincorporated each semester, promoting eco-friendliness. Newly issued cards, upon scanning at the quality assessment kiosk, enter a cleaning and retrieval cycle managed by the school. Teachers can reactivate these cards via scanning, ensuring cyclic utilization and, a low-carbon footprint. In harmony with the belief that "all are moral educators," teachers receive a batch of physical award cards at the semester start, to dispense in accordance with established metrics throughout the term. Activation occurs through the Shengli Cube's comprehensive quality assessment portal, enabling seamless online distribution and utilization.

3.3.2. Cultivate a Reward Card Ecosystem to Augment Engagement

Leverage the digital realm to its fullest, fostering an interconnected environment where interactive screens and card inputs serve dual purposes as metrics for assessment and tokens redeemable for rewards within the digital platform's reward store. This fosters an all-encompassing ambiance of joy and encouragement.

Pupils can trade in a designated quantity of digital 'Happiness Cards' for advancement cards on the Shengli Cube workstation's interface or physically at the "Happiness Card Kiosk." Meanwhile, educators and institutions benefit from real-time visibility of appraisal records and classroom analytics, facilitating prompt diagnostics and refining pedagogical strategies.

3.3.3. Harness Data Profiling for Enhanced Precision

Through meticulous process evaluations and the creation of radar charts, educators and guardians promptly grasp students' performance and evaluation standings. Visualized data continually adjusts, aligns, and inspires student progression. The digital Happiness Card evaluation supersedes the limitations of traditional paper-based systems. Accumulated across categories and quantified within the comprehensive evaluation framework, these accolades culminate as pivotal evidence in students' semester-end assessments, offering a tangible benchmark for holistic grading. The ultimate appraisal marries process metrics with qualitative summaries, furnishing a well-rounded, scientifically grounded evaluation of student growth. Teachers digitally issue dimensional certificates at term-end, mirroring pupils' card achievements, thereby streamlining manual tabulation efforts.

3.3.4. Petrel Incubation Mechanism to Amplify Motivation

Introduce the 'Happy Seagull' incubation system, incentivizing students based on the accumulation and variety of Happiness Cards, igniting their pursuit with excitement and drive. Aligning with students' multidimensional capabilities, comprehensive appraisal events are orchestrated, blending virtual and physical elements to create a profound sense of ritual. Innovatively, the 'Little Seagull Incubation Mechanism' is enacted on the Shengli Cube platform, traversing the entirety of primary education. Students advance through various levels, transitioning from 'Seagull Eggs' to 'Doctorate Little Seagulls,' with each step enhancing their intrinsic motivation and eagerness to earn badges.

3.4. Service Scenario: Intelligent Integration for Collaborative Decision-Making

The institution fosters an open, cooperative, extensively applied, and efficient ecosystem that seamlessly integrates on-campus and off-campus services, highlighting the social nature and extensive reach of its offerings. This involves engaging universities, research bodies, corporations, local government agencies, community organizations, and families, encouraging the school to transcend boundaries and foster collective growth. This underscores a multi-stakeholder integration,

cooperation, and intelligent collaboration within service scenarios, ultimately driving comprehensive enhancement of service functionality.

3.4.1. Cultivating a Unified, Beneficial Future Service Community

In tune with community needs, the school spearheads an education-focused service community that mutually benefits internal and external stakeholders, integrating streets, communities, societal forces, and schools. A case in point is the Shannan Lower School Campus, nestled amidst the historically rich sites of the Southern Song Dynasty and Wu Yue Kingdom, now surrounded by the innovative Nanxingli neighborhood center, which embodies a fusion of entrepreneurship, education, information, and transport, exemplifying a multifaceted future-oriented scenario.

3.4.2. Centralized Leadership for Multi-Point Scenario Co-construction

Centered around the Shengli Cube's innovative landscape, the school envisages an outstanding traditional culture-based community education service scenario, radiating excellence through various touchpoints. This focus on prudent spatial design, diversified resource deployment, and digital platforms ensures a three-dimensional cooperation framework. The initiative fosters the co-building and sharing of open Songyun cultural learning hubs and reading areas among think tanks, families, communities, authorities, and businesses. By integrating premium educational services into the community fabric, it orchestrates curriculum design, teacher integration, and shared spaces, fostering harmonious synergy among families, schools, society, and enterprises, thereby piloting an alliance-driven, sustainable model for future community education scene development.

3.4.3. Comprehensive Scene Resource Provision for Spatial Elements

Harnessing the Internet and digital intelligence platforms ensures the provision of high-quality service resources across all service scenario elements, encompassing teacher talent, spatial infrastructure, and digital education services. This fosters a compact learning ecosystem, breeding neighborhood smart learning and communication zones. The vision for future community education landscapes is geared towards eco-friendliness and smart inclusivity, crafting a proximate community lifestyle for residents, catering to the varied learning and interaction needs of diverse groups, and nurturing a new breed of urban learning hubs imbued with a sense of belonging, comfort, and futurism. This, in turn, bolsters community vitality and fosters a thriving learning ambiance within neighborhoods.

3.4.4. Establish a Sustainable Framework for Dynamic Service Scenario Resource Optimization

Digital empowerment equips community residents to navigate learning pathways independently and engage in courses that pique their interest via the Shengli Cube Workbench. Integrating visual, auditory, and tactile dimensions in the audio-visual hall's video content and the digital audio hall's cultural immersion, we offer a holistic blend of online and offline knowledge and cultural experiences. Leaning on a vast reservoir of digital cultural assets and platforms, we cater to the community's needs.

By showcasing community engagement metrics on a large screen, we glean user feedback and demand trends, invigorating enhancements in our service delivery strategies. This approach tackles the issue of unused resource development and the disconnect between infrastructure creation and its intended audience, thereby transcending the conventional barriers between provision and utilization. Ultimately, it fuels continuous improvement in the quality of our offerings, anchored in real-time

community response, fostering an agile, user-centric ecosystem of learning and cultural enrichment.

4. Conclusions

In the context of the new era, promoting high-quality development through digital transformation is an important issue in current basic education. This study takes Shengli Primary School in Hangzhou City, Zhejiang Province as an example, focusing on four major digital intelligence scenarios: learning and teaching, research and training, evaluation, and service. By linking with digital intelligence platforms, a governance system is constructed to promote high-quality development of the school through digital transformation.

References

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