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Lightweight Digital Resources for Rural Primary School Traditional-Culture Teaching: A Case Study of the "Jingyun Tongzhi" Pilot

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ABSTRACT

The substance of the urban–rural gap in traditional-culture education is shifting from "access to equipment" to "access to teachers and curriculum." Taking "Jingyun Tongzhi" - a digital platform for primary-school Chinese classical learning (guoxue) - as an instrumental case, and combining its project proposal with published policy documents, official statistics and empirical studies, this paper examines the conditions, pathways and limits through which lightweight digital resources enter rural primary schools. Three findings are reported. First, "threshold-removing" designs - a zero-deployment WeChat mini-program, 1–3 MB augmented reality (AR) assets, and an offline resource pack - do lower both the technical and the financial threshold for quality cultural resources to reach rural classrooms. Second, the participation rate, knowledge-point recall rate and preparation-time reduction reported by the project team constitute weak evidence of feasibility only: with no control group, no pre-test and no third-party measurement, they cannot support a causal claim. Third, the paper's reading of the evidence suggests that AR raises interest and engagement more reliably than knowledge acquisition, so novelty-effect decay and the "use divide" remain the principal threats to validity. The paper argues that the value of lightweight resources lies in acting as a catalyst - transferring scarce teacher effort from material production to cultural guidance - and that whether this translates into genuine teaching capacity depends on whether local teacher provision and teaching-research structures intervene in parallel. Three figures unpack the core constructs: the three-level digital divide, the four-pathway practice framework, and the catalyst mechanism.

KEYWORDS

Educational digitalization; Traditional-culture education; Urban–rural education gap; Lightweight technology; Left-behind children; Case study.

1. INTRODUCTION

1.1 Policy Context: Two Agendas Converging

Bringing Chinese excellent traditional culture into schools rests on firm legal and policy foundations. Article 34 of the Intangible Cultural Heritage Law requires schools to conduct intangible-cultural-heritage education in accordance with the regulations of the education authority [1]. Two subsequent documents issued by the general offices of the CPC Central Committee and the State Council (2017 and 2021) call for traditional culture to be integrated into all phases of schooling and for "specialised intangible-cultural-heritage courses" to be established in primary and secondary schools [2, 3]. At curriculum level, the Compulsory Education Curriculum Scheme (2022) asks curricula to "make good use of excellent traditional Chinese culture resources … and strengthen practical and experiential learning," and to "fully exploit the advantages of new technologies and explore the development of

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digital textbooks" [4]. On the digitalization front, the "AI + Education" Action Plan issued jointly in 2026 by the Ministry of Education and four other departments explicitly supports rural and remote schools in delivering courses through national platforms [5], while the Beijing Municipal Education Commission proposes forming urban–rural AI education consortia to narrow the urban–rural gap [6]. Two policy agendas - cultural transmission and educational digitalization - thus converge and open institutional space for technology-mediated provision in rural schools.

1.2 A Shifting Divide: From the Access Divide to the Use Divide

Yet the shape of the gap has changed. Official statistics show that equipment provision in primary schools has reached high levels - sports fields, music instruments and art materials all record compliance rates above 97 percent [7] - indicating that the "access divide" marked by devices and connectivity has narrowed substantially under sustained state investment. The binding constraint has moved to teachers and curriculum: although the national offering rate for music, art and physical education reaches 96.8 percent, the corresponding rate of qualified specialist teachers is only 78.3 percent, and in some remote rural areas it falls below 50 percent, leaving many rural schools dependent on language and mathematics teachers teaching across subjects [8]. The operative question therefore shifts from "can technology deliver resources?" to "once resources arrive, who teaches, and how?"

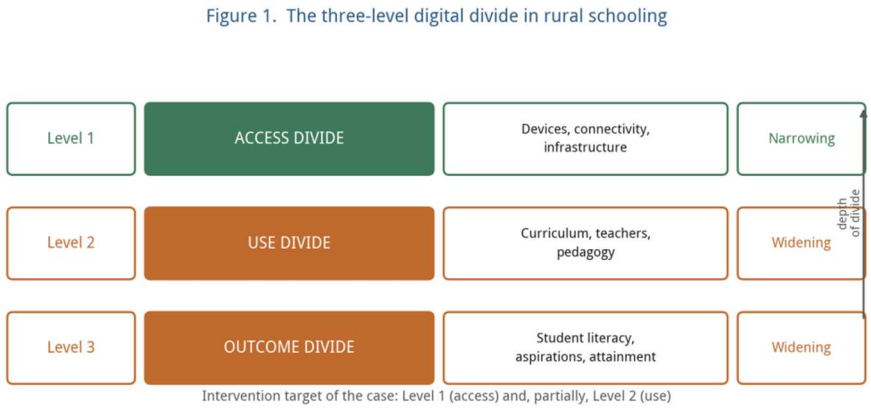


Figure 1. The three-level digital divide: access (narrowing), use (widening) and outcome (widening). The case intervenes principally at Level 1 and partially at Level 2. Sources: [7, 8].

1.3 Literature: Three Positions and One Consensus

Research on whether educational digitalization narrows the urban–rural gap falls into three positions. The accessibility thesis holds that low-cost, offline-capable tools bypass infrastructural constraints and carry urban resources to the periphery. The conditionality thesis counters that delivery is not teaching: what rural schools lack is "curriculum, teachers and pedagogy," and "equipment entering a rural school does not necessarily mean the subject entering a rural classroom" [8]. The risk thesis warns that without teacher and companionship support, digitalization can widen rather than narrow disparities [9]. Analytically, these map onto three nested layers of the digital divide: the access divide (devices, connectivity), the use divide (curriculum, teachers, pedagogy) and the outcome divide (literacy, aspirations, attainment) [8]. Regarding effects, a quasi-experimental study of 53 Grade-2 pupils found no significant difference in knowledge acquisition between an AR group and a control class, but significantly higher learning interest, collaboration and confidence in oral expression in the AR group [10]; a synthesis of 2,451 studies covering roughly 1.9 million participants likewise reports only low-to-moderate associations between educational AR and learning outcomes [11]. The

consensus is that technology improves accessibility, while its educational value depends on instructional organisation and teacher capacity.

1.4 Research Questions

Three questions follow. (i) How do the technical and cost designs of lightweight digital resources respond to the real constraints of rural schools? (ii) To what extent do existing pilot data support the claimed effects? (iii) If digital resources cannot replace teachers, what role do they actually play in rural traditional-culture teaching?

2. RESEARCH DESIGN AND DATA SOURCES

An instrumental case study design is adopted. Where the research question asks "how" and "why," where the investigator has little control over events, and where the focus is a contemporary phenomenon in a real-life context, the case study enjoys methodological priority [12]. This paper does not test intervention effects; it explores the operating mechanism of a form of practice. Two bodies of material are used: the project proposal submitted to the Beijing division of the 9th Chinese Vocational Education Innovation and Entrepreneurship Competition (undergraduate group, Beijing City University, 2025) [13], and public policy texts, official statistics and academic literature used for external corroboration.

Three limitations must be stated plainly. The pilot covered only 80 left-behind children in two remote mountain primary schools (plus a one-month trial with one Grade-3 class in Shunyi District). There was no control group, no pre-test and no third-party measurement, and all outcome data are self-reported by the project team. Furthermore, competition proposals carry a "contest attribute": their figures are largely programmatic statements computed under assumed premises [14]. The present paper therefore treats the reported outcomes as declaratory commitments, suitable for mechanism exploration but not for effect evaluation.

3. THE CASE: FOUR PATHWAYS OF "JINGYUN TONGZHI"

Figure 2. Four-pathway framework of the "Jingyun Tongzhi" case

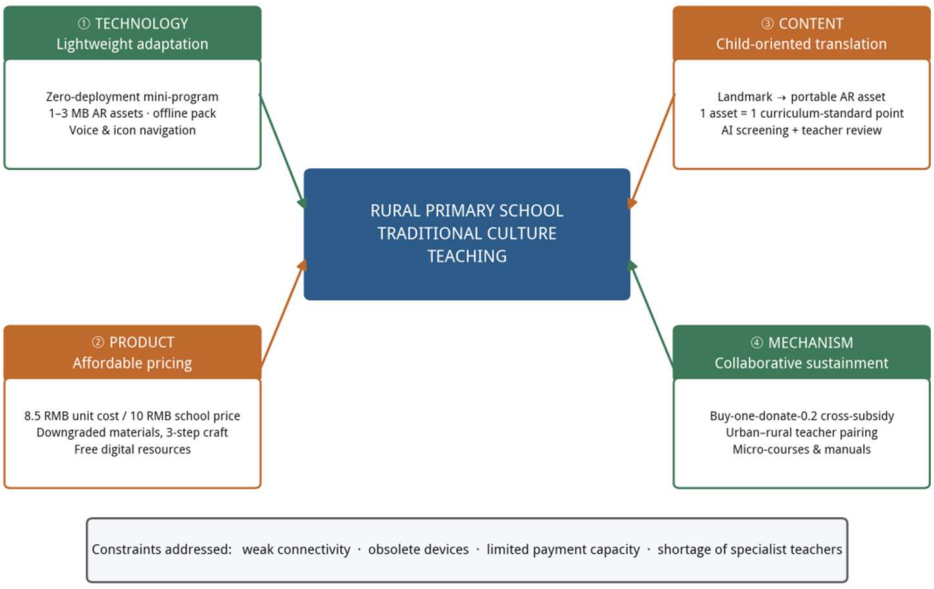


Figure 2. The four-pathway framework: lightweight technology, affordable pricing, child-oriented content translation and collaborative sustainment, directed at four rural constraints. Source: [13].

Developed by a student team at Beijing City University, the platform uses a "WeChat mini-program + digital study box" to integrate Beijing classical-learning landmarks (the Temple of Heaven, the Imperial College) with intangible-heritage aesthetic resources (swallow kites, Peking opera masks, traditional calligraphy). Its practice can be decomposed into four pathways, summarised in Figure 2.

3.1 Technology: Lightweight Adaptation

The team adopted a "light technology, heavy scenario" principle. The mini-program runs natively in WeChat: teachers scan a code and use it, with no download, registration or dedicated hardware, and no school IT support or server. AR animations are compressed to roughly 3 MB, with a rural version further compressed to below 1 MB for weak networks; 3D craft tutorials are reduced to under 2 MB through model simplification. An offline pack stores all digital assets on a companion storage device so that classrooms with poor or no connectivity can operate the full digital function set, avoiding the "network-dependent, frequent-stalling" failure common to comparable products. Interfaces use cartoon icons and voice navigation, and automatic speech recognition plus text-to-speech enable spoken interaction with virtual historical figures, with content differentiated by grade.

3.2 Product: Reconstructing the Cost Structure

A dedicated affordable product line contrasts sharply with the urban line: the basic study box is priced at 88 RMB per set (unit cost 20.23 RMB) and the advanced box at 98 RMB (38.31 RMB), whereas the rural version costs 8.5 RMB to produce, is sold to schools at 10 RMB (at cost) and to families at 28 RMB. Compression rests on three designs: material downgrading without lowering the safety floor (ordinary coated paper for interaction cards); radical simplification of operation (three-step craft procedures with large-print diagrams requiring no parental guidance); and free digital resources, with the basic mini-program functions permanently free of charge.

3.3 Content: Child-oriented Digital Translation

Narrowing the gap is a problem of translation as much as delivery. For children in remote areas the Temple of Heaven is a distant cultural sign; AR renders landmark culture "portable" through a standardised production routine of simplified landmark modelling, cartoon narration scripts and curriculum-standard knowledge-point matching. Each interaction maps onto one curriculum-standard point, converting abstract historical content into dialogue a child can follow; term replacement and difficulty grading are screened by primary-education specialists and Chinese language teachers under an "AI pre-screening + human review" procedure. This is what allows schools without specialist teachers to use pedagogically vetted curricularised resources directly.

3.4 Mechanism: Collaborative Sustainment

For sustainability, urban profit subsidises the rural market through a "buy-one-donate-0.2" channel: each urban set sold triggers a donation of 0.2 sets to rural schools. For teacher capacity, the project supplies simplified teaching manuals and training micro-courses, and operates an urban–rural teacher mutual-aid platform pairing urban teachers with rural counterparts for online mentoring - a direct response to the "no one able to teach" dilemma.

4. EVIDENCE EXAMINATION: THE DISTANCE FROM FEASIBILITY TO EFFECTIVENESS

4.1 Self-reported Data Establish Only that it "Can Be Done"

The team reports 100 percent AR interaction participation, 85 percent of pupils able to recall the "unity of heaven and humanity" point associated with the Temple of Heaven, and a reduction in lesson preparation time from 12 hours to 1.5 hours. All three require downgrading. Participation of 100 percent is subject to a ceiling effect in a closed trial embedded in compulsory classroom routines, and measures behavioural arrival rather than cognitive engagement. The 85 percent recall figure is a single-point, low-order memory indicator with unspecified scoring criteria, vulnerable to social-desirability bias when respondents face the developers, and recall is not comprehension of cultural meaning. Preparation time is self-reported, and the "with pack" and "without pack" conditions are not equivalent in content or quality standard. Because there is neither a control group nor a pre-test, internal-validity threats such as maturation and the Hawthorne effect remain uncontrolled [15].

4.2 External Evidence Cuts Both Ways

The quasi-experiment cited above offers a two-way reference. On one hand it corroborates the immediate indicators of high participation and classroom attentiveness: technological novelty does arouse interest. On the other hand, its null finding on knowledge acquisition is a direct caution that participation is not mastery [10]. Novelty-effect decay is the most predictable threat to such interventions, and a one-month pilot cannot observe it. At the macro level, the "use divide" reminds us that what rural schools lack most is teachers, not resources: a digital pack does not answer the question of who explains cultural meaning [8].

4.3 Gaps in the Cost and Business-model Accounts

Three points need clarification. First, recomputing from an 88 RMB price and a 20.23 RMB cost gives a gross margin of 77.01 percent, not the 68.3 percent stated in the proposal. Second, whether the 8.5 RMB rural unit cost includes the companion storage device is unspecified: if it does, the figure is hard to reconcile with rising storage prices; if it does not, the distribution channel for offline resources is left hanging. Third, at a donation rate of 0.2 sets per sale, reaching 5,000 pupils requires roughly 25,000 urban sales - an optimistic assumption - and post-contest attrition of a student team further fragilises the cross-subsidy chain [16].

4.4 Citation and Data Hygiene

Several referenced items require correction. The quotation attributed to the 2022 curriculum scheme - "encouraging digital technology to empower teaching" - could not be located in the source and should be rendered as paraphrase. The Beijing Implementation Plan for Deepening AI Education in Primary and Secondary Schools (2026–2030) shows no sign of public release as of November 2026 and should not be cited as established policy; the relevant official document is titled the Beijing "15th Five-Year Plan" for Education Reform and Development. Regional counts of higher-education institutions and Double First-Class universities lack authoritative sourcing and should follow the Ministry of Education's second-round list: 147 institutions nationally, 87 in the eastern region and 60 in the central and western regions combined [17].

5. DISCUSSION: LIGHTWEIGHT RESOURCES AS CATALYST

Taken together, the evidence supports a mechanism hypothesis awaiting test: under conditions of structural teacher shortage in rural schools, the core function of lightweight digital resources is to

lower the entry threshold for quality cultural resources. Their value lies not in replacing teachers but in transferring scarce teacher effort from material production (roughly 12 hours of courseware development per lesson) to cultural guidance and meaning-making. They are a catalyst, not the principal agent. Figure 3 sets out the mechanism and its enabling conditions.

Figure 3. Lightweight resources as a catalyst: from delivery to teaching capacity

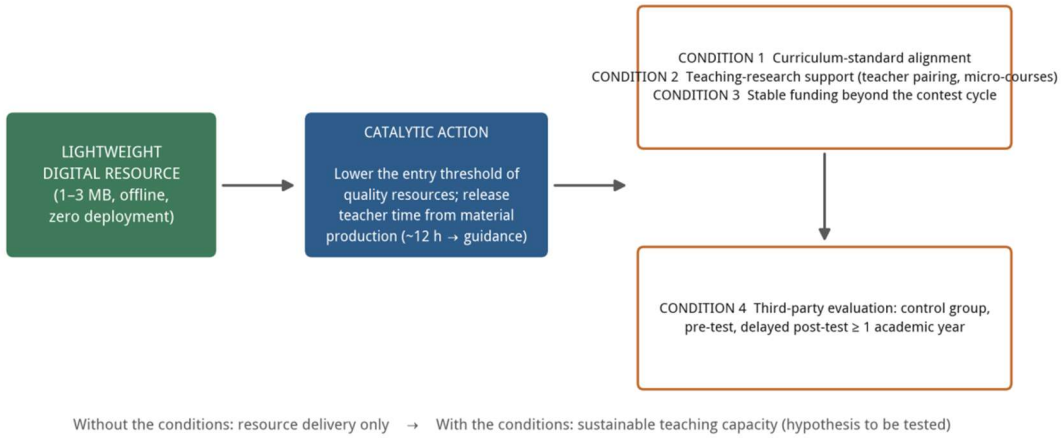


Figure 3. The catalyst mechanism: lightweight resources reduce the entry threshold and release teacher time, but conversion into teaching capacity depends on four conditions.

Three conditions are constitutive and one is evaluative. Resources must be aligned precisely with curriculum-standard knowledge points and pedagogically vetted, so that non-specialist teachers can use them directly. Teaching-research organisations must absorb the resources - urban–rural teacher pairing, micro-course training - to address the use divide; the Beijing policy of forming AI education consortia between paired urban and rural schools provides an institutional interface for exactly this link [6]. Stable funding and staffing must embed a point solution in routine provision rather than depend on enthusiasm within a competition cycle [14]. Finally, evaluation must be independent. For this case, the weak-network adaptation and teacher-workload-reduction designs are genuinely transferable, but the claim of "narrowing the urban–rural gap in traditional-culture education" remains a proposition to be tested rather than an established finding.

6. CONCLUSION AND OUTLOOK

This paper has examined the conditions and limits under which lightweight digital resources enter rural primary-school traditional-culture teaching. Zero-deployment, small-footprint and offline-capable tools do lower the technical threshold of resource entry; affordable pricing and cross-subsidisation respond to the payment-capacity constraint; and child-oriented digital translation partly circumvents the shortage of specialist teachers that otherwise blocks content supply. These three experiences offer a reference for comparable practice.

The strength of the evidence, however, is bounded by case scale and by the self-reported nature of the data. To convert "technologically reachable" into "educationally effective" with due caution, future evaluation should make three improvements: adopt a quasi-experimental or randomised design with a control group and pre-test, measured by a third party; include a delayed post-test over no less than one academic year to observe effects after novelty decay; and upgrade outcome indicators from

low-order recall to cultural understanding, cultural identity and transfer into cultural practice, with baseline assessment established before outcome measurement.

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