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AI-Enabled Japanese Grammar Teaching: Model Construction and Practical Application

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Abstract: Artificial Intelligence (AI) technology is reshaping the landscape of foreign language teaching, driving a paradigm shift from standardized, collective instruction to a learner-centered, data-driven model characterized by precision and personalization. However, current research and practice exhibit a significant imbalance across languages, with most advancements concentrated in English teaching, while studies on AI applications for less-commonly-taught languages like Japanese remain nascent. This study addresses this gap by constructing and applying an AI-enabled teaching model specifically for Japanese grammar instruction. The model is designed to address inherent challenges in traditional Japanese grammar teaching, such as the tension between collective instruction and individual learning needs, the disconnection between memorizing rules and applying them, and the lack of personalized, timely feedback in consolidation phases. Leveraging the core functionalities of the Zhihuishu platform (e.g., course setup, resource push, data statistics) and the natural language processing capabilities of AI tools like DeepSeek and Doubao, the model follows a three-stage progressive structure: "Pre-class Diagnosis–In-class Internalization–Post-class Consolidation", forming a complete teaching loop supported by a data feedback mechanism. A detailed case study on the challenging "Honorifics System" demonstrates the model's practical implementation, showing how data-driven diagnosis, interactive scenario-based exploration, and personalized consolidation tasks are operationalized. Practice indicates that this model effectively mitigates the shortcomings of traditional teaching in personalized tutoring, immediate feedback, and application transfer, significantly enhancing students' grammar mastery and usage capabilities. The study concludes that the AI-enabled model provides a viable, operational solution for achieving precise, contextualized, and personalized Japanese grammar teaching, while also pointing to future directions for optimizing AI's analytical capacity for complex grammar and pragmatic nuances and balancing technological integration with the teacher's guiding role.

Keywords: Artificial Intelligence (AI); Japanese language teaching; Grammar instruction; Personalized learning; Data-driven teaching; Teaching model

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1. Introduction

1.1. Research background

Artificial Intelligence technology is transforming the practical forms of foreign language teaching. Core technological applications centered on natural language processing, machine learning, and big data analysis have given rise to practical

outcomes such as intelligent adaptive learning systems, automated writing evaluation tools, and personalized content push platforms. These are propelling foreign language teaching from a uniform-pace, collective instruction model towards a learner-centered, data-driven model characterized by precision and personalization. The integration of technology and education constructs a new learning framework, making it possible for Artificial Intelligence to provide every learner with a customized and personalized educational experience [1]. Indeed, scholars emphasize that AI holds vast potential for enhancing personalized learning, student interaction, and learning resources [2]. The key value of this transformation lies in leveraging technological means to alleviate the inherent contradiction between "collective teaching" and "individual differences" in traditional classrooms, making instruction more aligned with students' actual learning needs.

However, a noticeable imbalance exists in current related research and practice across different languages. Existing achievements are predominantly concentrated in the field of English teaching, while research on instructional technology for less-commonly-taught languages like Japanese is still in its early stages. In the CNKI database, searches using "Japanese AI" and "Japanese teaching artificial intelligence" as themes yield only 8 and 20 results respectively. This scarcity is corroborated by recent research specifically focusing on Japanese pedagogy, which notes that while studies on AI in English teaching are abundant, targeted exploration for languages like Japanese remains limited [3]. This significant quantitative disparity reflects the considerable room for expansion in the depth and breadth of research in this area, particularly concerning the systematic construction of Japanese teaching models and empirical studies. In this context, scholars argue that the future of foreign language education lies in the synergistic integration of AI's analytical capabilities with the irreplaceable guidance of human teachers [4].

It is noteworthy that the Japanese grammatical system itself possesses distinct characteristics: a high degree of rule formalization, a rigorously hierarchical honorific system, and strong context-dependency. These features often lead to pronounced learning disparities among students and disconnects in knowledge application within traditional teaching practices. Yet, they also provide clear optimization directions and rich application scenarios for the targeted application of AI technology. Based on this, exploring and constructing a set of AI-enabled Japanese grammar teaching models grounded in teaching practice, possessing operability and scalability, can not only address the insufficiency in instructional technology research for non-primary languages but also provide an effective pathway for utilizing AI to solve practical teaching pain points.

1.2. Pain points in traditional Japanese teaching and opportunities for AI empowerment

Traditional Japanese grammar teaching has formed a stable paradigm through long-term practice, yet it has gradually revealed structural limitations, mainly manifested in the following three aspects:

(1) The contradiction between group-based teaching and individualized needs. The distribution of difficulties in grammar acquisition shows significant individual differences: some students need to consolidate the functional distinction of case particles, while others need to master the practical application of grammar such as tense agreement, conditional sentence patterns, and the honorific system. In resource-constrained teaching environments, it is challenging for teachers to conduct continuous, precise learning diagnostics and personalized interventions. This often results in the repeated reinforcement of common content while individual learning obstacles remain unresolved, constraining the overall improvement of teaching effectiveness.

(2) Students commonly face the dilemma of "knowing the rules but being unable to use them" in grammar learning. Although they can memorize and understand grammatical rules, they struggle to apply them correctly and naturally in actual communication or writing. The fundamental reason lies in the lack of sufficiently authentic and diverse language practice scenarios in traditional teaching, creating a clear disconnect between rule memorization and practical application.

(3) In the post-class consolidation phase, traditional teaching often relies on uniform exercise formats, failing to provide targeted reinforcement based on individual student error types. Feedback is generally characterized by long cycles and vague directions, while review arrangements often lack scientific adherence to memory principles

(such as the spacing effect). These factors collectively lead to students easily confusing morphologically or functionally similar grammar rules, resulting in poor knowledge retention and difficulty in ensuring long-term learning efficacy.

In response to these teaching challenges, Artificial Intelligence technology offers effective solutions. It can help teachers more accurately understand each student's specific problems by analyzing learning data, create more authentic language practice scenarios for students, and intelligently arrange review content based on individual learning progress. These functionalities provide technical support for addressing the dilemmas in traditional teaching.

This study aims to design and validate a learner-centered, data-driven smart teaching model through theoretical construction and teaching practice. The model strives to organically integrate the analytical capabilities, scenario-building abilities, and path-planning functions of AI technology into the complete closed loop of Japanese grammar teaching, thereby providing an operational solution and practical reference for achieving precise, contextualized, and personalized Japanese grammar instruction.

2. Construction of the AI-enabled Japanese grammar teaching model

Building upon the ecological perspective of language teaching, which views instruction as a dynamic system harmonizing learners, teachers, technology, and environment, this study constructs a smart teaching model for Japanese grammar courses. It further integrates the principles of constructivist learning environments and systematic blended teaching frameworks [5–7]. Specifically, the model responds to the identified needs within Japanese language pedagogy, aligning with calls to leverage AI technology for creating authentic scenario-based practice, providing personalized learning pathways, and bridging the gap between grammatical knowledge and real-world application [8].

Leveraging the core functionalities of the Zhihuishu platform, such as course setup, resource push, and data statistics, and combining them with the advantages of AI tools like DeepSeek and Doubao in natural language processing and personalized tutoring, the model aims to create a balanced digital learning ecosystem. The core logic of the model follows a three-stage progressive structure: "Pre-class Diagnosis–In-class Internalization–Post-class Consolidation", safeguarded by a "Data Feedback Loop", forming a complete and cyclical teaching model. This structure aligns with the "Input–Internalization–Output" principle of second language acquisition and can be efficiently implemented using existing platform functionalities and AI tools.

(1) Pre-class

Personalized Preview and Pain Point Diagnosis The core objective is to precisely identify students' grammatical weaknesses, providing a clear and data-driven basis for classroom teaching. In implementation, teachers distribute preview task packages via the Zhihuishu platform, containing 5–8 minutes core grammar micro-lectures (created using the platform's recording function) and basic practice questions (selected from the platform's Japanese grammar question bank, focusing on key points for the week, such as modules on honorifics, transitive/intransitive verbs). After students complete the exercises, the platform automatically grades them and generates detailed individual error reports, specifying error types (e.g., scenario misuse, rule confusion, form selection error). Simultaneously, it aggregates and analyzes class-wide data to identify common pain points and knowledge gaps. Based on this comprehensive data, teachers can strategically adjust teaching content, listing common pain points as classroom focal points, and provide personalized preview suggestions (e.g., re-watching specific sections of the micro-lecture) for struggling students. This data-informed approach to tailoring instruction exemplifies how AI empowers educators to design learning experiences aligned with individual student needs, proficiency levels, and interests, thereby laying a solid foundation for targeted classroom intervention [9]. The theoretical underpinnings are the principle of individualized instruction and the concept of data-driven teaching.

(2) In-class

Interactive Exploration and Knowledge Internalization The core aim is to address the abstract nature of grammar

rules and the pervasive “knowing but not using” dilemma, thereby achieving meaningful and contextualized application of knowledge. First, teachers, based on platform learning data, provide focused explanations on high-frequency class errors (e.g., misuse of the honorific system, confusion of similar particles) via PPT projection and comparison of typical example sentences. Then, using the platform’s “Classroom Interaction” function, they release instant scenario-based multiple-choice questions that simulate real-life situations. After students answer online, the platform displays real-time accuracy statistics, and the teacher immediately analyzes common wrong choices, clarifying misconceptions. Finally, authentic scenario tasks are assigned (e.g., writing a workplace leave email, designing a daily direction-asking dialogue, role-playing a business phone call). Students complete these tasks using the week’s grammar points and submit in real-time. The teacher quickly annotates common grammatical errors, selects typical cases for whole-class commentary, focusing on guiding corrections for issues of “grammatically correct but unnatural expression” and pragmatic inappropriateness. The theoretical support is Communicative Language Teaching theory, which posits that language learning must occur through the process of using language for communication, with a focus on developing practical competence in authentic contexts [10]. This approach fundamentally shifts the focus from mere knowledge of language forms to the development of the ability to use them appropriately and effectively in real-world situations, facilitated by AI-supported interactive tools.

(3) Post-class

Precise Extension and Consolidation The core objective is to strengthen personalized error correction, prevent the accumulation of knowledge gaps, and promote long-term retention. The platform automatically pushes personalized error-review tasks, intelligently matching students with similar practice questions based on their specific error types (e.g., directing push related scenario questions for honorific usage errors, targeted drills for particle confusion). After completion, students can view detailed explanations (including rule review, scenario expansion, and contrastive examples). Concurrently, teachers set up a “Daily 3 Questions” grammar check-in, pushing review questions based on spaced repetition memory principles, allowing students to utilize fragmented time for consistent review. The platform synchronously records check-in data, tracking progress. The theoretical basis is spaced repetition theory, which is realized through the platform’s sophisticated personalized question bank function for precise and adaptive consolidation, aiming to move knowledge from short-term to long-term memory efficiently.

(4) Closed loop

Teaching Optimization Based on Learning Data A robust “Teaching-Learning-Assessment” integrated closed loop is constructed to ensure continuous improvement. The platform automatically collects full-process student data (preview accuracy, in-class response speed and patterns, post-class assignment error rate and types, check-in completion and performance), generating comprehensive individual student grammar mastery analysis reports and class-level knowledge point mastery heatmaps. Teachers can use these insights to supplement instruction, for example, by creating additional micro-lectures or designing extra exercises based on issues reflected in the data (e.g., persistently high error rates for a specific point post-class). Personalized tutoring suggestions can be sent via platform private messages to consistently weak students. Students, empowered by their personal grammar mastery analysis, can accurately identify their weaknesses and independently select relevant platform exercises for intensive, self-directed training. This process forms a virtuous, self-reinforcing cycle of “data feedback–informed intervention–autonomous improvement”, fostering greater learner agency and metacognitive awareness.

3. Practical application of the AI-enabled Japanese grammar teaching model: A case study of “honorifics” teaching

Based on the aforementioned AI-enabled Japanese grammar teaching model, this section uses the challenging and

culturally significant “Honorific System” in Japanese teaching as a specific case to elaborate on the model’s practical, step-by-step implementation in a real teaching context.

3.1. Pre-class stage: Data-driven precise diagnosis and targeted preview

The core objective of this stage is to accurately diagnose differences in students’ prior knowledge and preconceptions regarding honorifics through intelligent, pre-emptive diagnosis, providing a granular data basis for differentiated classroom teaching. Implementation involves three specific, interconnected steps:

First, the teacher utilizes the Zhihuishu platform to distribute a preview task package containing a specially designed micro-lecture video and a set of adaptive practice questions three days before class. The micro-lecture (approximately 10 minutes) focuses clearly on the core rules, conceptual distinctions, and typical social/business scenarios of “Respectful Language (Sonkeigo), Humble Language (Kenjōgo), and Polite Language (Teineigo)”, embedding authentic workplace dialogue clips and visual aids to enhance context awareness and cultural understanding. The accompanying 20 practice questions are carefully crafted to examine the ability for honorific form transformation, scenario-appropriate selection, and error identification.

Second, after students complete the preview tasks and supporting exercises within the stipulated time, the system instantly generates a personalized diagnostic report for each student. This report analyzes specific errors (e.g., “Humble verb conjugation error”, “Misuse of respectful language towards an in-group superior”) and intelligently links them to the corresponding timestamps and explanations in the micro-lecture, providing students with a direct pathway for self-directed, targeted gap-filling before class.

Finally, the teacher accesses and reviews the class-wide data report via the platform’s dashboard. For instance, if data reveals that over 60% of students systematically struggle with the concept of “using appropriate respectful language towards external clients”, the teacher can accordingly and decisively adjust the instructional design and time allocation, focusing the upcoming classroom explanation and activities intensively on common pain points like distinguishing “in-group/out-group (uchi/soto) relationships” and the nuances of vertical hierarchy within Japanese society.

3.2. In-class stage: Interactive exploration focusing on difficulties and contextualized internalization

Classroom teaching, grounded firmly in the pre-class diagnostic data, is strategically oriented towards solving the identified common difficulties and promoting deep, functional knowledge internalization. It designs a series of progressive, interactive activities:

First, the teacher spends the initial 20 minutes providing focused, in-depth instruction on the 1–2 core difficulties with the highest error rates (e.g., “pragmatic differences in honorifics used towards superiors versus clients”, or “choosing between sonkeigo and kenjōgo based on the action’s relation to the speaker”). The explanation moves beyond mere rule repetition, incorporating rich original language materials from the platform’s resource library, such as authentic emails from Japanese companies or transcripts of business meetings, to elucidate the underlying logic that “the relationship between the action agent, the receiver, and the listener determines the honorific form” from a pragmatic and cultural perspective.

Subsequently, a 30-minute interactive reinforcement and application practice session is conducted. The teacher releases a series of nuanced, scenario-based multiple-choice questions via the platform’s classroom interaction function for real-time student response. The system instantly generates a clear visual answer distribution chart, allowing the teacher to provide immediate, targeted analysis and feedback for questions with notably low correct rates (e.g., below 50%). The teacher can use built-in scenario animations or real-life video snippets to dissect the social context and decision-making process, thereby deepening student understanding beyond the textbook.

Finally, a 40-minute comprehensive, collaborative application task is arranged, serving as the climax of the in-class phase. Students work in small groups within the platform’s dedicated collaboration area to complete complex, realistic tasks like “writing a formal workplace email requesting leave from a department manager” or “designing and scripting

a reception dialogue for a visiting client". An integrated AI assistant provides real-time, contextual error correction and optimization suggestions during the writing process (e.g., indicating that "orareru" might be grammatically possible but is unnatural in typical respectful language, suggesting "irassharu" or "oide ni naru" as more appropriate alternatives). After task completion, the teacher selects several typical positive and negative cases for comparative, whole-class commentary, focusing intensely on guiding students to critically distinguish the subtle yet crucial difference between "grammatically correct" and "situationally appropriate and natural", a key to achieving advanced proficiency.

3.3. Post-class stage: Personalized consolidation and skill transfer

The post-class stage is critical for achieving the transition from discrete knowledge mastery to stable, automatic application ability. It designs highly personalized and creative consolidation paths:

Firstly, based on the synthesis of students' full-process learning data from both pre-class and in-class stages, the system automatically curates and pushes a unique set of personalized exercise packages to each student. For example, for students exhibiting a pattern of "overuse of humble language in neutral contexts", the system focuses on pushing questions and scenarios that train the discernment of in-group/out-group relationships; for students with "vague or inaccurate memory of respectful verb conjugations", it intensively pushes related conjugation drills and error-correction exercises. Each exercise is accompanied by intelligent, AI-powered explanations that not only state the correct answer but also explain the root cause of the likely error, offering comparative examples.

Secondly, to foster creative application and synthesis, the teacher assigns a substantial creative writing task on an engaging theme like "A Day in the Life of a Workplace Newcomer", requiring students to compose short, coherent dialogues or narratives that comprehensively and appropriately utilize all three types of honorifics across different simulated interactions. After the AI completes an initial, automated assessment focusing on honorific form accuracy and basic grammar, the teacher then provides deeper, qualitative evaluation from the more subjective dimensions of "expression naturalness", "scenario appropriateness", and "cultural sensitivity", publishing select excellent works in the platform's public display area to promote peer learning and model exemplary usage.

Thirdly, to combat forgetting and ensure long-term retention, the teacher sets up a week-long, spaced series of fragmented review tasks on the platform. The system, algorithmically following the Ebbinghaus forgetting curve, daily pushes a small set of exercises that intelligently integrate the newly learned honorific knowledge with previously learned grammar points, helping students consolidate memory traces, build interconnected knowledge networks, and promote robust long-term knowledge internalization.

3.4. Closed-loop phase: Data-driven continuous assessment and dynamic adaptation

Based on the aggregation and analysis of the full-process, multi-dimensional learning data from the entire "Honorifics" teaching unit, a sophisticated closed-loop system of "Teaching-Learning-Assessment-Improvement" is firmly established. The Zhihuishu platform automatically aggregates data points including students' pre-class preview accuracy and time spent, in-class interactive response efficiency and patterns, post-class assignment completion quality and error evolution, and performance on creative tasks. It synthesizes this data to generate both a macro-level class-wide honorifics mastery profile (highlighting overall strengths and weaknesses) and micro-level individual diagnostic reports. Through granular data analysis, teachers can identify not only overall persistent weak areas (such as class-wide confusion regarding "in-group/out-group distinctions in complex scenarios") but also individual learning trajectories. This enables timely pedagogical actions: providing supplementary targeted micro-lectures, organizing focused review sessions, or facilitating peer tutoring for common issues; and for individual students whose learning progress lags or plateaus, the platform supports the delivery of customized practice exercise bundles or triggers alerts for one-on-one tutoring suggestions.

Simultaneously, students are given agency within this loop. They can conduct self-directed reinforcement training based on their personal, data-rich learning reports, while the platform, acting as an intelligent tutor, recommends review content and practice schedules according to principles of memory optimization and personalized learning paths. This

integrated closed-loop mechanism enables the truly dynamic optimization of the teaching process and the personalized adaptation of learning pathways. It effectively drives the evolution of "Honorifics" instruction from a traditional, unidirectional knowledge transmission model towards a modern, responsive, data-driven approach characterized by diagnostic precision, timely intervention, and evidence-based continuous improvement. This system provides the necessary structured, adaptive support for the long-term consolidation, durable retention, and flexible, transferable application of complex grammatical knowledge like honorifics.

4. Conclusion

This study focuses on the specific domain of Japanese grammar teaching, constructing and detailing a comprehensive AI-enabled Japanese grammar teaching model. The model systematically locates and analyzes learning conditions through pre-class diagnostic data, focuses instructional energy on overcoming key difficulties through interactive and contextual exploration during class, and provides sustained, personalized consolidation and creative application tasks after class. This entire process is seamlessly integrated and dynamically optimized by a full-process learning data feedback mechanism. Teaching practice and preliminary implementation indicate that this model effectively mitigates the longstanding shortcomings of traditional grammar teaching, particularly in the areas of scalable personalized tutoring, provision of immediate and actionable feedback, and fostering the transfer of knowledge to practical application, thereby significantly enhancing students' depth of grammar mastery and their confidence and competence in usage capabilities. Future work needs to delve deeper into further optimizing AI's analytical and generative capacities for handling even more complex grammatical structures and subtle pragmatic nuances inherent in languages like Japanese. Equally important is the ongoing need to thoughtfully balance deep technological integration with the indispensable guiding, mentoring, and culturally mediating role of the human teacher. Addressing these challenges will be crucial to propelling foreign language teaching towards a more intelligent, adaptive, human-centered, and efficacious direction of development.

Disclosure statement

The author declares no conflict of interest.

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