

Emotional Analysis of Language Learning Apps Based on the KANO Model

Ziyi Jin

*School of Automotive Engineering, Jilin University, Changchun, China
3861398812@qq.com*

Abstract. Considering issues such as homogeneity among existing language learning apps and diminished user novelty, this study integrates emotional design principles into the innovative design of language learning apps to optimize their functionality and user experience. User needs for language learning apps were summarized through surveys. Following affective design principles, these needs were categorized into visceral, behavioral, and reflective levels. The Kano model was applied to classify and identify needs across these levels, clarify user demand attributes, assess importance, and conduct preliminary screening. Based on joint analysis, innovative design strategies were proposed for language learning apps that effectively address user learning needs and foster long-term emotional value binding. The Kano model-based affective design strategy for language learning apps provides a conceptual framework for designing such applications.

Keywords: Emotional Design, Kano Model, Language Learning App

1. Introduction

In recent years, the market scale of language learning apps has continued to expand with the deep penetration of mobile internet technology and the rapid development of the "Internet + Education" model. According to the "2023-2024 China Online Language Education Industry Operation Big Data and Development Outlook Report," China's online language education market reached 70.16 billion yuan in 2023, with over 109 million users. The market is projected to exceed 100 billion yuan by 2025 [1]. Against this backdrop, language learning apps—as key vehicles for online education—directly impact learning outcomes and user retention through their user experience and emotional design quality. Yet behind this market boom lies intensifying competition driven by product homogenization. Many applications still heavily concentrate their functional design on foundational aspects like vocabulary memorization and grammar exercises, with severely insufficient investment and research in user experience and affective design [2,3]. Users, during selection and usage, no longer settle for single-dimensional, tedious knowledge delivery functions. Instead, they increasingly seek affective experiences and personalized intelligent services that effectively stimulate learning interest, sustain motivation, and deliver pleasure and a sense of accomplishment.

Currently, scholars have explored language learning product design from multiple perspectives. Wang Haiyan et al. examined AI applications in language learning from a technical standpoint,

focusing on the implementation of intelligent speech recognition and adaptive learning technologies [3]. Li Xiaohong analyzed interface usability issues in mobile learning platforms through user testing methods from an interaction design perspective, proposing optimization recommendations [4]. Regarding requirements analysis methods, Zhang Ming et al. applied the Kano model to online education product requirements analysis, validating its effectiveness in requirement classification [5]. Liu Qiang examined the user experience of educational products from an affective design perspective, emphasizing the importance of emotional factors in the learning process [6]. Existing research predominantly focuses on surface-level functional needs while neglecting users' deeper emotional needs and reflective-level experiences. Most studies apply the Kano model independently to functional requirement analysis, lacking systematic integration with affective design theory. This paper proposes an affective design methodology for language learning apps based on the Kano model. Through user interviews and questionnaires, it collects learners' needs across visceral, behavioral, and reflective levels. The Kano model classifies these needs into attributes, identifies key affective requirements, and generates corresponding design strategies for different demand types: For basic needs, ensure functional completeness and stability; for expected needs, optimize user experience; for exciting needs, emphasize innovation and emotional resonance. This approach provides design guidance for the affective design of language learning apps, enhancing users' learning experiences and emotional satisfaction.

2. Research methodology

2.1. Multi-level needs analysis based on emotional design theory

Emotional design theory, proposed by Donald Norman, centers on the idea that product design should satisfy user needs across three levels—visceral, behavioral, and reflective—transcending traditional functionalism to prioritize emotional experiences and psychological resonance [7]. This theory provides a crucial framework for user experience design in digital products. Luo Shijian et al. explored the specific manifestations of affective design across these three levels, arguing that the visceral level concerns sensory elements like product form and color; the behavioral level focuses on usage efficiency and human-computer interaction; while the reflective level involves users' emotional memories, cultural identity, and self-actualization [8]. This study analyzes language learning app needs across three hierarchical levels: visceral (interface, audio), behavioral (learning workflows, feedback), and reflective (achievements, community). This structured framework supports subsequent prioritization of user requirements.

2.2. User requirement attribute classification and screening based on the Kano model

The Kano model is a classic tool for identifying user demand attributes and revealing the nonlinear relationship between product performance and user satisfaction. It effectively distinguishes demand priorities and guides design resource allocation [9]. This model categorizes user needs into five types—Must-be Quality, One-dimensional Quality, Attractive Quality, Indifferent Quality, and Reverse Quality—through dual positive and negative questioning. Zhang Junxia et al. conducted Kano analysis on user needs for online education products, finding that "personalized learning content recommendations" typically fall under delight attributes, while "accuracy and synchronization of learning records" are considered must-have attributes [10]. This study utilizes the Kano model to categorize user needs from affective design, identifying basic, one-dimensional, and

attractive attributes through quantitative analysis. This approach provides a factual basis for prioritizing design decisions.

2.3. Emotional design research methodology for language learning apps based on the Kano model

Through research on affective design theory, this paper establishes an affective design methodology for language learning apps based on the Kano model, as illustrated in Figure 1. Initially, user needs identified through surveys are preliminarily extracted using characteristics from the three levels of affective design. The Kano model then classifies and identifies needs across different levels. Based on the analysis results, differentiated design strategies are formulated to systematically guide the affective design of language learning apps.

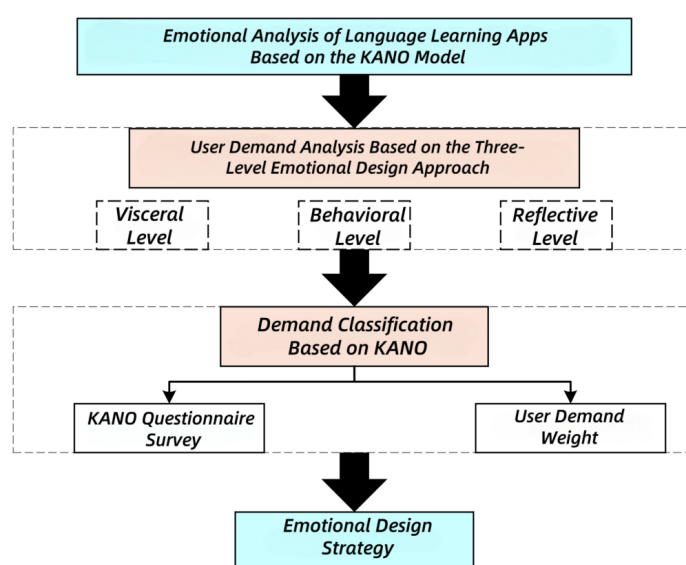


Figure 1. Emotional design process of Kano model

3. Case studies

3.1. User research/competitor analysis—summarizing user needs

3.1.1. User profile analysis

Language learning apps rank among the most widely used online education products in China. According to the 2024 China Online Language Education Industry Research Report, China's online language education user base reached 67.8 million in 2023, with a market size of 57.2 billion yuan. Industry data indicates that the primary user base consists of individuals aged 22-40 residing in first- and second-tier cities, possessing higher education, and earning above-average incomes. Tencent Education's 2023 big data reveals that due to the practical and ongoing nature of language learning, users predominantly comprise college students, office professionals, and individuals with overseas needs. Gender distribution is relatively balanced, though differences emerge in usage patterns for speaking practice and exam-focused applications.

3.1.2. Competitor analysis

Duolingo, English Fun Dubbing, and Starry Sky occupy distinct positions in the language learning app market: Duolingo targets the mass market with gamified introductory content, English Fun Dubbing serves niche users through film-based speaking practice, and Starry Sky caters to professionals with AI-powered conversational drills. Their content strategies also differ—Duolingo provides standardized multilingual courses, English Fun Dubbing integrates K-12 and entertainment materials, while Starry Sky generates dynamic professional scenarios. Through differentiated technological and content approaches, these apps form a complementary ecosystem that collectively advances the language learning industry.

3.1.3. User interviews

To deeply explore core user needs and pain points during language learning app usage, this study employed semi-structured interviews with 28 users (aged 18-45, 12 male, 16 female) who had experience with language learning apps. In-depth discussions centered on learning motivation, usage habits, feature preferences, and personalized needs. The interviews authentically reflected users' language learning demands and experiential barriers across multiple scenarios.

Based on raw interview data, the study categorized user statements and initially identified 37 specific requirements. Through focused discussions, ambiguous, redundant, and non-universal demands were eliminated. After consolidation and linguistic normalization, 12 core user needs were finalized. The functional requirements for language learning apps are presented in Table 1.

Table 1. Functional needs of language learning APP

No.	User Requirement	Requirement Description
1	Systematic learning	Tiered course system
2	Personalized content	learning contents based on user proficiency and goals
3	Pronunciation correction	Phoneme-level pronunciation assessment and feedback
4	Conversation simulation	Provides real-life scenario dialogues
5	Progress visualization	Learning progress illustration and competency maps
6	Multi-modal interaction	Supports multiple interactions including voice and touch controls
7	Community interaction	Community features like study groups and achievement sharing
8	Scenario-based training	Scenario-specific training for business, travel, exams, and more
9	Review reminders	Recommends review content based on the forgetting curve
10	Multilingual learning	Supports multilingual learning
11	Timely feedback	Provides immediate feedback after each learning task
12	Attractive interface	Employs visually appealing design aesthetics and layout

3.2. User needs classification based on three levels of emotional design

User interviews were conducted to gather requirements from actual language learning app users. Participants included language enthusiasts, students, working professionals, and foreign language teachers—totaling 28 individuals. User needs identified through research were categorized based on the three levels of affective design.

3.2.1. Sensory needs at the visceral level

Visceral-level needs represent users' most immediate sensory experiences with a product and are key drivers of emotional engagement. These sensory elements manifest primarily through visual and auditory experiences, including: whether icon designs possess high recognizability; whether animations are smooth and natural, enhancing engagement without disrupting learning; and whether sound effects and voiceovers are clear and pleasant, with accurate pronunciation and moderate speaking pace. These sensory elements collectively form the user's initial emotional experience with the product.

3.2.2. Functional requirements at the behavioral level

Behavioral-level requirements focus on the product's functionality and usability. This level directly impacts users' learning efficiency and experience. Behavioral-level needs serve as the bridge between users and the product, encompassing requirements for language learning apps such as: comprehensive feature sets covering all aspects of listening, speaking, reading, and writing training; tiered course systems; simple and intuitive operational workflows; timely and accurate feedback mechanisms; and learning plans supporting personalized adjustments. These functional requirements directly influence users' learning outcomes and willingness for sustained use.

3.2.3. Reflective level experience requirements

Reflective-level needs encompass users' overall experience and feelings throughout the mini-program's usage journey. They foster lasting emotional connections and form the foundation for building enduring relationships between users and the mini-program. Reflective-level requirements for language learning apps include: establishing an achievement system with level badges and shareable certificates to enhance user accomplishment; creating a community learning ecosystem with language partner matching and interactive platforms to foster belonging; allowing users to create personalized avatars to boost immersion and identity; and providing periodic learning reports to reinforce perceived learning value. Through this three-tiered analysis of emotional design requirements, the essential elements users seek in language learning apps are identified, as shown in Table 2.

Table 2. Need elements of language learning APP

Emotional level	Visceral Level	Behavioral Level	Reflective Level
Required Elements	Harmonious and unified Interface colors	Comprehensive and targeted functionality	Fostering a sense of accomplishment
	High icon recognition	Systematic learning content	Foster social interaction
	Vivid and fluid animations	Comprehensive and effective feedback	Enhances learning immersion
	Crisp and pleasant sound effects	Simple and convenient operation	Establish value Recognition
	Clear voice with Accurate Pronunciation	Personalized learning plans	
		Supports multiple languages	

3.3. User need classification based on the Kano model

This study applies the Kano model to identify user demand types. By incorporating fuzzy theory, a fuzzy Kano questionnaire was developed. Survey data was collected and demand importance calculations were performed to ultimately determine demand categories. This method balances qualitative judgment with quantitative analysis, enabling the prioritization of demands in product optimization.

3.3.1. Kano questionnaire design

The Kano model employs a questionnaire with both positive and negative statements to explore user reactions to the presence or absence of a feature. This categorizes needs into six types: Attractive Quality(A), One-dimensional Quality (O), Must-be Quality(M), Indifferent Quality(I), Reverse Quality(R), and Questionable Quality(Q). The questionnaire poses questions from two dimensions: "possesses this attribute" and "does not possess this attribute." Each question offers five options (corresponding to scores of 1–5 points): unsatisfied, tolerable, indifferent, natural, and satisfied.

3.3.2. Kano analysis results

This survey primarily targeted actual and potential users of language learning apps. A total of 200 questionnaires were distributed online, yielding 175 valid responses with an 87.5% recovery rate. Data statistics were conducted according to the Kano model classification criteria, as shown in Table 3.

Table 3. Kano model classification standards

Requirement Element		Positive Questions				
		Satisfied	Natural	Neutral	Tolerable	Dissatisfied
Opposite Question	Satisfied	Q	R	R	R	R
	Natural	A	I	I	I	R
	Neutral	A	I	I	I	R
	Tolerable	A	I	I	I	R
	Dissatisfied	O	M	M	M	Q

The Better-Worse coefficient analysis was introduced, where the Better value ranges from 0 to 1, reflecting the satisfaction gain when the feature is present, and the Worse value ranges from -1 to 0, indicating the satisfaction loss when the feature is absent. The Kano model analysis results are shown in Table 4. The Better-Worse coefficients are illustrated in Figure 2.

Table 4. Kano model analysis results

No.	Feature	A	O	M	I	R	Q	Better	Worse	Classification Results
1	Harmonious and unified interface colors	122	7	12	34	0	0	10.86%	-73.71%	Must-be Quality
2	High icon recognition	3	79	91	2	0	0	97.14%	-46.86%	Attractive Quality
3	Vivid and fluid animations	98	1	8	68	0	0	5.14%	-56.57%	Must-be Quality
4	Crisp and pleasant sound effects	90	1	8	76	0	0	5.14%	-52.00%	Must-be Quality
5	Clear voice with Accurate Pronunciation	171	0	2	2	0	0	1.14%	-97.71%	Must-be Quality

6	Simple and convenient operation	150	0	3	22	0	0	1.71%	-85.71%	Must-be Quality
7	Systematic learning content	35	70	31	39	0	0	57.71%	-60.00%	One-dimensional Quality
8	Personalized learning plans	6	95	72	2	0	0	95.43%	-57.71%	One-dimensional Quality
9	Comprehensive and effective feedback	143	2	11	19	0	0	7.43%	-82.86%	Must-be Quality
10	Comprehensive and targeted functionality	4	93	72	6	0	0	94.29%	-55.43%	One-dimensional Quality
11	Supports multiple languages	3	4	101	67	0	0	60.00%	-4.00%	Attractive Quality
12	Fostering a sense of accomplishment	4	89	79	3	0	0	96.00%	-53.14%	One-dimensional Quality
13	Foster social interaction	1	2	70	97	5	0	42.35%	-1.16%	Indifferent Quality
14	Establish value Recognition	19	70	41	45	0	0	56.57%	-57.71%	One-dimensional Quality
15	Enhances learning immersion	2	0	96	77	0	0	54.86%	-1.14%	Attractive Quality

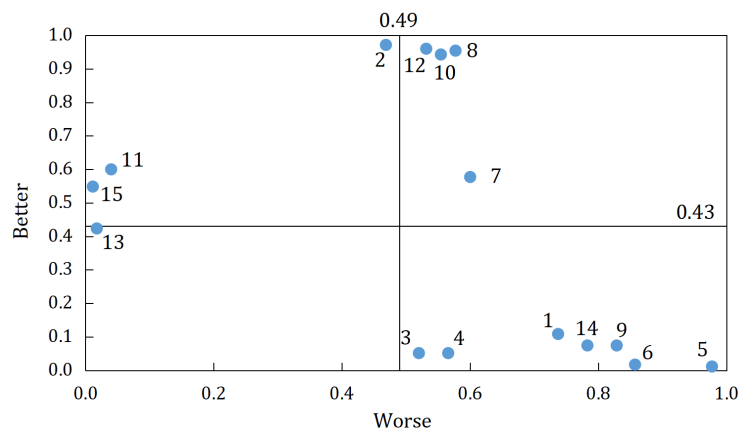


Figure 2. Better-Worse coefficient diagram

The Better-Worse coefficient diagram visualizes design metric attributes. The horizontal axis represents the absolute value of the Worse coefficient, reflecting user dissatisfaction when the metric is absent. Higher values indicate the element is more fundamental to basic needs. The vertical axis represents the absolute value of the Better coefficient, indicating the degree to which the metric enhances user satisfaction when present. Higher values signify a more pronounced role in improving the experience. First Quadrant indicators (7, 8, 10, 12) are one-dimensional qualities, exhibiting both high Better and Worse values, significantly boosting satisfaction. Second Quadrant indicators (2, 11, 15) are attractive qualities, featuring high Better values and low Worse values, offering appeal beyond user expectations. Fourth Quadrant indicators (1, 3, 4, 5, 6, 9, 14) are must-be qualities with high Worse values and low Better values, representing core product functionality whose absence causes significant dissatisfaction. Third Quadrant indicators (13) are indifferent qualities with minimal impact and can be disregarded in design.

4. Design strategies

Based on the Kano model's classification of user needs and the analysis of Better-Worse coefficients, this study integrates the three-level theory of emotional design with demand prioritization. It proposes the following four design principles to systematically guide emotional design innovation in language learning apps, aiming to strengthen product foundations, optimize user experience, and establish deep emotional connections.

4.1. Functional operation convenience principle

Among essential requirements, "simple and convenient operation," "clear voice and accurate pronunciation," and "comprehensive and effective feedback" form the foundational prerequisites for app usage. The absence of these features directly triggers strong dissatisfaction, while their implementation becomes the "default baseline" in user perception. Design must prioritize "lowering operational barriers and enhancing usage efficiency." In navigation design, core functions like course learning and review check-ins should be accessible within two clicks to avoid cumbersome multi-level transitions. Voice interaction must incorporate high-precision speech recognition technology, ensuring not only clear and accurate playback but also phoneme-level pronunciation assessment—accurately distinguishing easily confused sounds and providing textual correction suggestions. Feedback mechanisms must be instantaneous and multidimensional. Upon completing each learning task—such as a set of vocabulary memorization or a dialogue practice session—users receive immediate feedback combining accuracy statistics, highlighted knowledge gaps, and personalized next-step learning recommendations. This enables real-time progress tracking and prevents learning confusion caused by delayed or ambiguous feedback.

4.2. User experience optimization principles

Desired needs exhibit a linear growth relationship with user satisfaction—higher fulfillment leads to greater satisfaction. Analysis reveals that demands such as "systematic learning content," "personalized learning plans," and "building a sense of value recognition" possess high absolute values for both Better and Worse ratings, making them key differentiators in competition. These needs span both behavioral and reflective levels, directly impacting learning efficiency and deep motivation. Accordingly, design should focus on deep functional optimization and meticulous refinement of the experience. For instance, constructing a CEFR-standardized graded curriculum covering modules like listening comprehension, oral expression, reading analysis, and writing training, while dynamically adjusting learning paths and content recommendations based on user proficiency and goals. Generating visual learning reports (e.g., polygonal language proficiency analysis), competency maps, and shareable learning achievements (e.g., continuous learning badges) helps users clearly perceive progress and reinforces their sense of value in learning. Sustained investment in such features effectively boosts user retention and satisfaction.

4.3. Emotional resonance innovation principle

Charm-driven needs are key to surprising users and enhancing product appeal. When present, they significantly boost satisfaction; when absent, they cause no dissatisfaction. Examples include "high icon recognition," "multilingual learning," and "enhanced learning identity immersion" listed in Table 4. These needs often correspond to visual novelty at the visceral level or deep emotional appeals at the reflective level, serving as breakthrough points for achieving product innovation and emotional bonding. Design should dare to break conventions and pursue forward-thinking innovations. Strategies may include: designing unique, highly recognizable brand visual symbols like icons or IP characters to establish distinct product personalities; supporting flexible multilingual learning and switching to satisfy users' exploratory learning motivations; introducing features such as virtual avatar customization and scenario-based role-playing to enhance immersion and enjoyment during learning. Though non-essential, these elements form the core of building long-term product competitiveness and user emotional loyalty.

4.4. Sensory experience synergy principle

visceral needs like "harmonious and unified Interface colors," "vivid and fluid animations," and "crisp and pleasant sound effects" are key to boosting initial user affinity. While not directly determining learning outcomes, these sensory experiences influence learning motivation and focus. Design should prioritize "non-intrusive learning with enhanced sensory pleasure," achieving visual and auditory synergy. Visually, employ low-saturation soft color palettes (e.g., light blue, beige) as primary tones to prevent visual fatigue from high-saturation hues. Keep motion effects minimalistic, with 0.3-second smooth transitions during page shifts. Trigger minimal particle effects upon task completion to convey positive feedback without obscuring core content. Auditory design aligns with learning scenarios: correct answers trigger crisp "ding" sounds below 50 decibels, while errors use gentle "prompt tones" to prevent negative reactions. Users can independently toggle sound effects to accommodate diverse usage contexts.

5. Conclusion

Addressing issues such as severe homogenization, insufficient emotional engagement, and unclear priority of needs in language learning apps, this study proposes a product design analysis method integrating the three-level theory of emotional design with the Kano model. Through user interviews and surveys, this method systematically collects and analyzes user needs across the visceral, behavioral, and reflective levels. It then employs a fuzzy Kano model to categorize attributes and rank importance levels for each need, precisely identifying demand characteristics. Based on the Kano model's findings, it further proposes design principles. These principles provide clear guidance for formulating core design strategies, ensuring reliable foundational functionality while optimizing the core learning experience and creating delightful surprises that evoke emotional resonance. This methodology not only enhances user satisfaction and emotional engagement but also offers valuable theoretical references and practical pathways for future innovative designs in intelligent learning products.

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