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Insights into the Demand for Children's Education and Entertainment Products in Family Settings

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Abstract: Children's education and entertainment products play a crucial role in children's growth by integrating knowledge transfer, skill development, and enjoyable experiences. As family education concepts continue to evolve, parents' demands for these products have become increasingly diverse. This study focuses on children under 12 and their parents, aiming to explore the demands for education and entertainment products in family settings and understand the core needs and expectations of both parents and children when using these products. The research employs qualitative and quantitative methods, including user interviews, the KJ method, literature review, analytic hierarchy process (AHP), and surveys, to comprehensively explore the hierarchical structure of user needs. Additionally, the weighted average and scoring methods are used to rank the priority of these needs. The findings reveal the key factors parents consider most important when selecting education and entertainment products and provide clear guidance on the priority of these demands for product innovation and development.

Keywords: Family Settings; Children's Education and Entertainment; Product Design; User Needs

1. Introduction

The family, as the first classroom in a child's life, profoundly influences their educational and entertainment experiences. Childhood is a critical period for developing characters, fostering interests, and building foundational knowledge. During this phase, education and entertainment products children engage with subtly shape their thinking patterns, values, and cognitive abilities [1]. From the parents' perspective, they aspire for their children to acquire knowledge in a relaxed and enjoyable environment while enhancing their overall skills. However, the abundance of education and entertainment products on the market often leaves parents struggling to make informed choices, worrying whether the selected products truly meet their child's developmental needs. Additionally, differences in parental educational philosophies and family environments result in varying priorities when selecting products [2]. From the children's perspective, different age groups exhibit varying psychological traits and interests. Younger children are drawn to products with vibrant colors, pleasant sounds, and strong interactivity, which help them explore and understand the world. Older children, in contrast, prefer products that stimulate creativity, curiosity, and a sense of challenge [3]. Despite the expanding scale of the children's education and entertainment product market, significant challenges remain. For instance, some products lack depth and variety in interactivity, leading to disengagement over time. Others fail to adapt dynamically to children's developmental needs, making them unsuitable across different growth stages [3]. Therefore, a comprehensive analysis and insight into user needs within the context of children's education and entertainment products are crucial.

This paper focuses on the demand insights for children's education and entertainment products in the family context. Section 2 provides an overview of the basic concepts and characteristics of these products, as well as a review of the current research and directions in the relevant fields. Section 3 elaborates on the research framework and methodology. Sections 4 to 6 outline the key steps in constructing the demand hierarchy model, including data calculation, validation, and

ranking, ensuring the rigor of the research. Finally, we highlight the main conclusions and discuss the study's limitations.

2. Overview of Children's Education and Entertainment Products

2.1 Definition and Characteristics

Children's education and entertainment products aim to integrate knowledge transfer, skill development, and enjoyable experiences. These products leverage various carriers, such as smart toys, digital applications, and interactive media, to seamlessly incorporate educational content into entertaining formats. For instance, digital games are a crucial tool that provide both entertainment and the development of critical thinking, problem-solving, collaboration, and other key skills through interaction and engaging experiences [4]. By creating rich scenarios and interactive elements, these products spark children's curiosity and enthusiasm for learning, enabling cognitive expansion, skill enhancement, and emotional development, thus meeting the developmental needs of different growth stages.

Children's education and entertainment products have multidimensional characteristics, which can be classified into core and non-core features. Core features include educational and entertainment aspects. The educational element is reflected in integrating subject knowledge, life skills, and cognitive training, helping children enhance abilities such as logical thinking and language expression through immersive learning experiences. The entertainment aspect engages children's interest through diverse forms of expression, creating a relaxed and enjoyable atmosphere that reduces resistance to learning and enhances participation and enthusiasm. Non-core features include interactivity [5], safety [6], and age adaptability [7], among others (for a detailed breakdown of features, see Table 1).

Table 1. Product Characteristics

Attributes	Features	Definitions
Core	Educational value	Integrating subject knowledge, life skills, and cognitive training, through immersive learning experience helps children improve logical thinking, language expression, and other abilities.
	Entertainment value	Through diverse formats, it sparks children's interest, creates a relaxed atmosphere, and reduces resistance to learning, enhancing engagement and enthusiasm.
Non-core	Interactivity	Emphasizing interaction between children and the product, as well as between children and others, to enhance communication and collaboration skills.
	Safety	Providing dual assurance at both the physical and content levels to ensure the product's safety for children's physical and mental health.
	Age adaptability	Adjusting content difficulty and format dynamically based on the physical and mental development of children at different ages.

2.2 Research Trends

The integration of AI technology has become a key trend in developing children's education and entertainment products. With the help of AI, the development of these products has accelerated and, in turn, driven changes in consumer demand. AI enables products to offer personalized interactive experiences and precise educational services. For example, in English learning, AI can customize personalized speaking practice plans based on a student's pronunciation weaknesses and enhance training through fun games and scenario-based dialogues, thereby improving learning efficiency and engagement [8]. However, despite the significant positive impact of AI in children's education and entertainment products, there are still some challenges. For example, cultural bias and lack of real interpersonal interaction may impact the fairness and inclusivity of education [8]. Additionally, challenges such as technological complexity, cost, and acceptance by teachers and parents need to be addressed.

Parental involvement is also a key focus. Parental participation not only strengthens parent-child relationships but also

effectively promotes the overall development of children. Environmental design also significantly influences parent and child participation. Research indicates that in highly interactive or freely-playable exhibition environments, the involvement of both parents and children is higher [9]. Furthermore, parental involvement extends beyond the physical environment to include emotional support and social development. For example, painting have been shown to help regulate children's emotions, with parents playing an essential role in this process [10]. This suggests that education and entertainment products can foster parental involvement by providing emotional regulation tools or activities.

3. Methodology

This study divide into four steps: construction of the demand hierarchy model, calculation and ranking, validation and comparison, and comprehensive ranking. The specific details are presented in Table 2. Among these steps, the KJ method and the AHP are the key techniques, and it is worth noting their significance. The KJ method is a technique for collecting and organizing linguistic data on unknown problems, opinions, or ideas. By analyzing the inherent relationships among the data, it classifies them into diagrams to help clarify thinking and find solutions to complex issues. In this study, the KJ method was primarily used for the data collection and organization phase [11].

AHP is a decision-making method that decomposes decision-related elements into hierarchical levels, such as goals, criteria, and alternatives, and then conducts both qualitative and quantitative analysis. Its principal function is to provide a systematic analytical framework for multi-criteria decision-making problems, quantifying subjective judgments to assist decision-makers in integrating various factors and selecting the optimal solution [12]. In this study, AHP was primarily applied in the calculation and ranking of demand indicators.

Table 2. Research Steps

Stage	Research/analysis method	Output content
Construction of the demand hierarchy model	Desk research, literature review, user interviews, KJ method	Forming a "Demand tree" framework based on the goal layer, criterion layer, and indicator layer
Calculation and ranking	AHP	Construct a judgment matrix based on the expert perspective and calculate the weights and rankings of each indicator
Verification and comparison	Survey method, cross-analysis, frequency analysis	Obtain the user ranking of the importance of needs and compare it with the expert perspective results
		Summarize the conclusions on indoor layout and children's education and entertainment preferences
Comprehensive ranking	Weighted average method, scoring method	Integrate the expert and user demand rankings to obtain the final ranking results

4. Construction of the Demand Hierarchy Model

4.1 Target User Interviews

The user interviews aimed to deepen the understanding of user needs, covering but not limited to topics such as family background, living space, and parent-child interaction. The goal was to develop a demand hierarchy model for children's education and entertainment products. The interviews were semi-structured, conducted mainly through face-to-face and online voice communication, with each session lasting no more than 20 minutes. Audio recordings and transcriptions were made with the participants' prior consent. The interview outline is shown in Table 3, with specific questions adjusted based on the actual situation. Following the principle of information saturation, the study involved 8 participants (2 males and 6 females), aged between 25 and 40, all with children under 12 years old. Their professional backgrounds varied, including teachers, corporate managers, and entrepreneurs, and they all had previous experience purchasing or owning children's education and entertainment products.

Table 3. Interview Outline

Category of questions	Content	Specific questions
Family background	Family members	Position, job nature, etc. Income, expenditure, preferred brands, etc. Child's age, gender, education level, interests, etc.
	Living situation	Residence location, house type, space size Whether pets are kept, types of pets
Living space	Space layout	Distribution of functional areas within the house Whether specific areas are reserved for children's learning or play, and how many areas used for education or entertainment
	Product usage	The level of intelligence of products in the home
Children's education situation	Educational philosophy	Aspects of children's growth that are emphasized Preferred methods of communication with children Modern educational tools or resources that are used
	Entertainment methods	Regular entertainment activities with children Changes in entertainment preferences as children age Modern entertainment products used
Summary and feedback	Needs and expectations	Expectations for family education and entertainment activities Desired improvements in family environment or layout Needs in family interaction and children's education

4.2 Model Construction Process

During the interview, we extracted statements closely related to children's education and entertainment needs, supplemented by desktop and literature reviews. To facilitate the reader's understanding and maintain the research focus on user needs, we removed certain colloquial expressions, repetitive views, and brand-related descriptions while ensuring the accuracy of the interview responses. Subsequently, we refined the key statements into phrases to facilitate the construction of the demand hierarchy model. Given the numerous elements involved, we also assigned numbers (n1-n49) for more effortless organization and classification. For example, the statement "The three of us play some small games together after dinner" was refined into "Family Interaction" (n3), and "We usually play riddles, brain teasers, and games like Ludu at home" was refined into "Immediate Engagement" (n6). Based on element numbering, the KJ method was used to further organize and classify the requirements, resulting in 12 secondary indicators and 4 primary indicators. Subsequently, experts were invited to evaluate the indicators, adjusting and optimizing the names to ensure consistency, comprehensiveness, and clarity. This process led to developing the demand hierarchy model for children's education and entertainment products in family settings. The model consists of three layers: the goal layer, the criterion layer, and the indicator layer, with the indicator layer and criterion layer corresponding to the secondary and primary indicators in the table, respectively. The specific details are presented in Table 4.

Table 4. Demand Hierarchy Model

Goal layer	Primary indicator/ Criterion layer	Secondary indicator/ Indicator layer	No.
The demand for children's education and entertainment products in family settings	Family and interaction (A)	Family communication and expression enhancement (A1)	n7, n43, n44
		Family rituals and emotional connection (A2)	n28, n29, n49
		Family balance and respect (A3)	n12, n36
		Deep companionship and guardianship (A4)	n3, n14, n20, n21, n30, n33, n34, n38
	Learning and growth (B)	Self-directed learning and creative inspiration (B1)	n19, n32
		Cognitive expansion and reading (B2)	n15, n37, n41, n45
		Morality and quality (B3)	n2, n39, n40, n27, n24, n16

		Behavioral norms and self-regulation (B4)	n23, n31, n35, n25, n26
	Space and environment (C)	Home space layout optimization (C1)	n8, n10, n11, n18
		Children's entertainment and functional expansion (C2)	n9, n17, n5, n48
	Play and action (D)	Hand-eye coordination and physical strengthening (D1)	n1, n4, n6, n13, n46
		Entertainment guidance and control (D2)	n47, n22, n42

5. Calculation of Weights for Demand Indicators

5.1 Constructing the Judgment Matrix

Based on the AHP, pairwise comparisons were made between the factors in the criterion and indicator layers to assess their relative importance. To ensure objectivity, the study invited a panel of five designers with experience in children's product design. These experts used a 1-9 scale to rate the pairwise factors within the same layer. In this scale, 1 indicates that the two factors are equally important; 3 denotes that one factor is slightly more important than the other; 5 represents a clearly more important factor; 7 signifies an enormously more important factor; 9 indicates an extremely more important factor; while 2, 4, 6, and 8 are intermediate values, representing degrees of importance between the above points. After discussion, the expert panel reached a consensus, and the results are presented in Tables 5 through 9.

Table 5. Judgment Matrix (Criteria Layer)

	A	B	C	D
A	1	2/1	3/1	3/1
B	1/2	1	2/1	2/1
C	1/3	1/2	1	1/3
D	1/3	1/2	3/1	1

Table 6. Judgment Matrix (A)

	A1	A2	A3	A4
A1	1	1/2	1/2	1/3
A2	2/1	1	1/3	1/2
A3	2/1	3/1	1	1/1
A4	3/1	2/1	1/1	1

Table 7. Judgment Matrix (B)

	B1	B2	B3	B4
B1	1	3	1/3	1/2
B2	1/3	1	1/5	1/2
B3	3/1	5/1	1	3/1
B4	2/1	2/1	1	1

Table 8. Judgment Matrix (C)

	C1	C2
C1	1	1/4
C2	4/1	1

Table 9. Judgment Matrix (D)

	D1	D2
D1	1	3/1
D2	1/3	1

5.2 Demand Weights and Ranking

Table 10 presents the results of the demand weights and consistency check. The ranking results indicate that among the demands for children's education and entertainment products, family relationships, parent-child bonding, and hands-on activities for children are of higher importance. In contrast, the demand for space optimization and cognitive expansion is relatively lower. Additionally, when making comparisons, there may be logical biases in the judgments of importance or inconsistencies in the level assignments. Therefore, it is necessary to perform a consistency check on the matrix. A consistency

ratio of less than 0.1 indicates that the results meet the standard.

Table 10. Requirement Ranking Results

Criterion layer	Weights	Indicator layer	Weights	Comprehensive weights	Ranking	Consistency results
A	0.443	A1	0.124	0.054932	8	0.037<0.1
		A2	0.174	0.077082	6	
		A3	0.355	0.157265	1	
		A4	0.347	0.153721	2	
B	0.255	B1	0.177	0.045135	10	0.047<0.1
		B2	0.088	0.022185	11	
		B3	0.517	0.131835	4	
		B4	0.219	0.055845	7	
C	0.110	C1	0.200	0.022000	12	0<0.1
		C2	0.800	0.088000	5	
D	0.192	D1	0.751	0.144192	3	-0.003<0.1
		D2	0.249	0.047808	9	

6. Validation and Ranking of Demand Weights

6.1 Survey Design and Conclusion

This survey aims to validate the differences in demand indicator weights between experts and users, and to supplement the interview findings. The survey covers user demographics, family space layout, and children's education and entertainment methods. A total of 214 valid responses were collected, with 116 male and 98 female participants from various professional fields. About 95% of the children are under 12 years old. Regarding home space, over 75% of households have an area between 50-100 square meters. Detailed information and living conditions are shown in Figures 1 to 3.

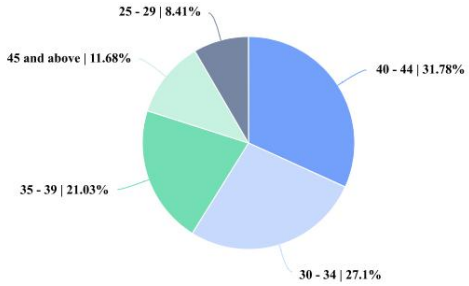

Figure 1. Parents' Age

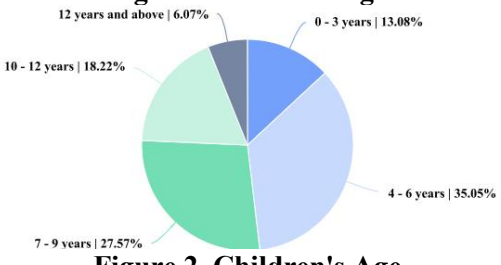

Figure 2. Children's Age

6.1.1 Family space

Regarding space layout (Figure 4), 80% of families adopt an open or integrated design, maintaining a certain level of spatial flow and avoiding complete room isolation. Cross-analysis (see Figures 5 and 6) reveals that, regardless of whether the layout is open, traditional, or integrated, over 80% of families indicated that they regularly adjust their home layout based on their children's growth. More than half of these families stated that the adjustments are relatively limited, primarily involving small-scale space optimization. Additionally, as children grow older, the frequency of home layout adjustments decreases, primarily due to the stabilization of their lifestyle and habits, along with the accumulation of personal belongings.

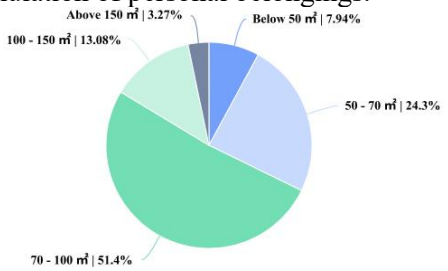

Figure 3. Home Space Size

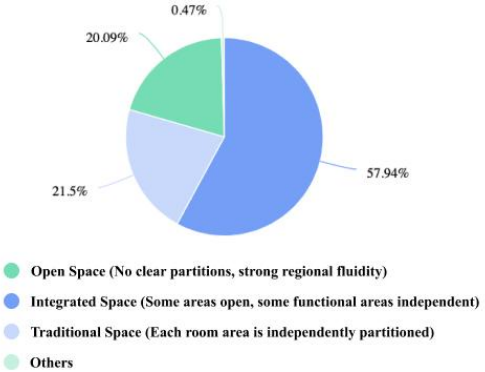

Figure 4. Family Space Type

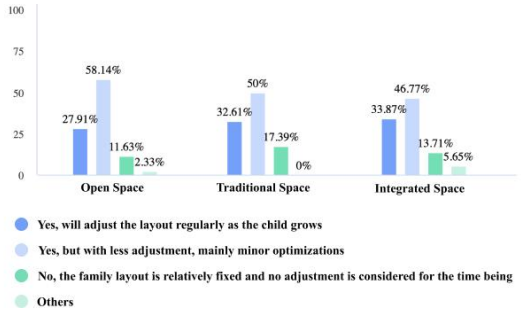

Figure 5. Cross-Analysis of Home Space Type and Whether Space is Adjusted Regularly

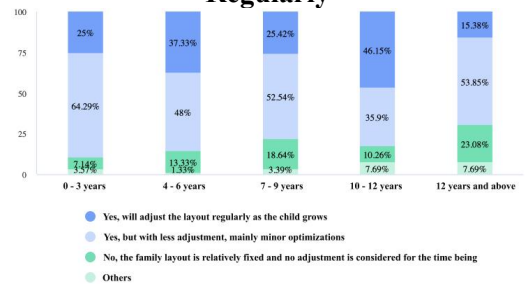

Figure 6. Cross-Analysis of Children's Age and Whether They Regularly Adjust Their Space

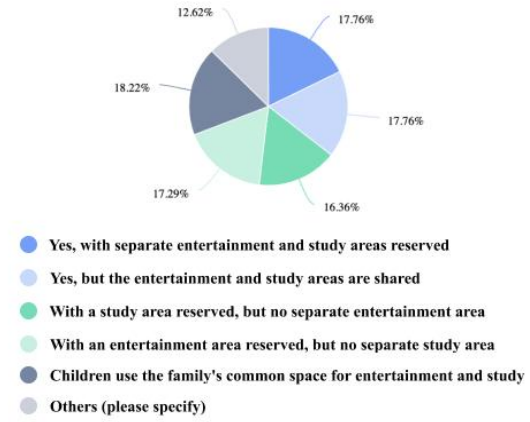

Figure 7. Whether to Reserve a Separate Entertainment Area or Study Area

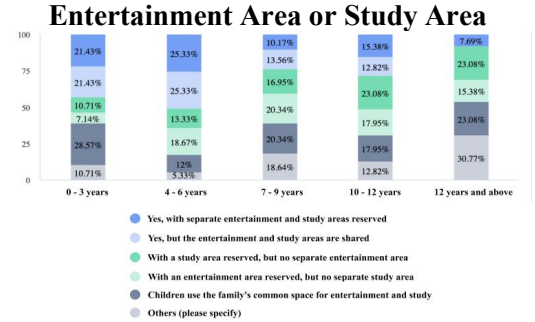

Figure 8. Cross-Analysis of Children's Age and Whether to Reserve a Separate Entertainment Area or Study Area

6.1.2 Education and entertainment ways

Figure 10 illustrates the participation in children's entertainment activities. According to the data, children tend to choose activities such as interacting with pets (45.33%), hands-on games (39.25%), and reading books or storytelling (38.79%). In contrast, activities like cooking (22.9%), board games, card games, or chess (18.22%), and watching movies or TV shows (10.75%) have lower participation rates. Overall, activities with the higher frequency of choice tend to have more substantial educational significance.

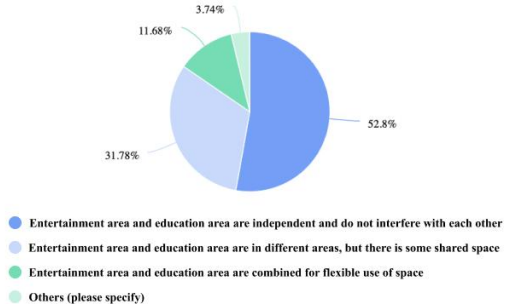

Figure 9. How to Layout the Entertainment Area and Education Area

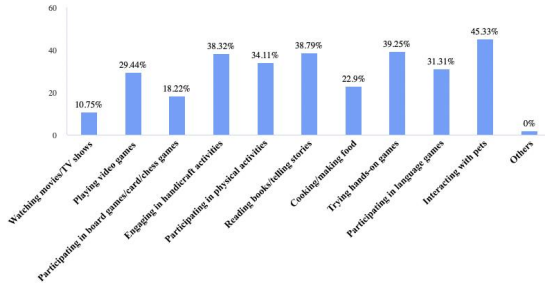

Figure 10. Children's Entertainment Ways

In the survey results regarding learning platforms (see Figure 11), experiential enhancement devices (60.75%) and educational gaming consoles (59.81%) are the most recognized learning methods by parents. Next, the choice rates for television or projection devices (42.52%), smart learning devices (39.25%), and screen-free learning tools (38.79%) all exceed one-third. By comparison, traditional paper-based tools and online education platforms are selected less frequently. This outcome reflects the trend of integrating technology with education, highlighting parents' emphasis on digital literacy education.

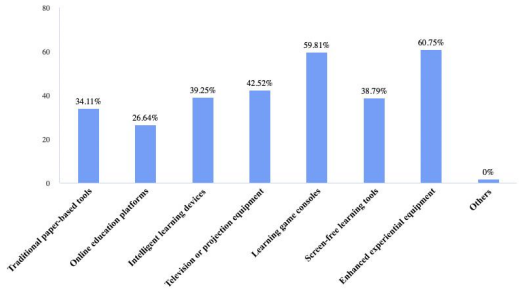

Figure 11. Learning Carriers

6.2 Comprehensive Demand Ranking

The survey also investigated the key factors for arranging children's educational and entertainment areas. Frequency analysis determined the ranking of demand indicators from the user's perspective, as shown in Figure 12.

Figure 12. Demand Ranking from the User's Perspective

Comparing the demand rankings from both user and expert perspectives revealed significant differences. To unify the results and effectively guide design, this study combined weighted average and scoring methods to determine the demand weights. The final weights were set at 0.6 for the expert perspective and 0.4 for the user perspective. Demand rankings were assigned scores based on an arithmetic sequence (from 12 to 1). After calculating the comprehensive ranking, the demands were categorized into priority levels: the top four ranked demands were classified as P0 (highest priority), ranks 5 to 8 as P1 (medium priority), and the bottom four as P2 (lowest priority). The comprehensive ranking results (see Table 11) show that children's entertainment and functional expansion (C2) is the highest priority demand, followed by deep companionship and protection (A4), character and literacy (B3), and family balance and respect (A3). The four items—behavioral norms and self-management (B4), family rituals and emotional connection (A2), cognitive development and reading (B2), and home layout optimization (C1)—are categorized as lower-priority demands.

Table 11. Comprehensive Ranking Results

Indicator layer	Expert ranking	Expert scores	User ranking	User scores	Comprehensive scores	Comprehensive ranking	Priority
C2	5	8	1	12	9.6	1	P0
A4	2	11	6	7	9.4	2	
B3	4	9	5	8	8.6	3	
A3	1	12	10	3	8.4	4	
D1	3	10	11	2	6.8	5	P1
A1	8	5	4	9	6.6	6	
D2	9	4	3	10	6.4	7	
B1	10	3	2	11	6.2	8	
B4	7	6	7	6	6	9	P2
A2	6	7	12	1	4.6	10	
B2	11	2	9	4	2.8	11	
C1	12	1	8	5	2.6	12	

7. Conclusion

This study constructs a user demand hierarchy model for children's education and entertainment products in the family context, primarily using interviews and the KJ method. The AHP was applied to rank the importance of the indicators, and questionnaire-based quantitative validation was conducted to reconcile the results from expert and user perspectives. The study provides the following insights: 1. Parents place high importance on the entertainment and educational value of products, focusing on parent-child relationships and family harmony, with a priority on fostering character development to support children's holistic growth. 2. Video games hold an essential position in modern family entertainment, with parents increasingly recognizing their educational value in supporting learning, indicating a growing acceptance of video games among parents. 3. Parents are more inclined to engage in interactive activities that promote active participation, creating a positive family atmosphere to foster the healthy development of their children.

Overall, the outcomes of this study provide valuable guidance for designers and developers to prioritize core user needs during the product development process. This approach ensures the competitiveness and user satisfaction of the products in the market, thereby driving innovation in functionality and user experience

for children's education and entertainment products. Finally, due to limitations such as sample selection, this study has certain constraints, and future research is expected to address them.

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