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Research on the Design of Learning Apps Based on the Needs of Elderly Users

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Abstract:

The objective is to explore the design of a short video learning app for the elderly by investigating their acceptance of short video learning. Firstly, the basic theory was discussed by literature research, then the acceptance of short video learning by the elderly was investigated by in-depth interview and questionnaire, and finally, the usability of the practice achievement "Interesting Learning" APP was tested by expert survey and user testing. Results "learning content" and "learning time cost" were the main factors affecting the elderly's acceptance of short video learning. The elderly's "unfamiliar with smartphones" and "poor usability of existing apps" would reduce the elderly's acceptance of short video learning. In conclusion by investigating the acceptability of the elderly to short video learning and analyzing the main factors affecting the acceptability, the design points of the app for short video learning for the elderly are obtained. This method provides a reliable basis for design practice, which is of great significance to the design of short video learning app that is more acceptable to the elderly. The trend of aging makes the educational resources of the elderly increasingly scarce in the future. With the rapid development of the mobile Internet, how to use a short video to carry out online education will be an important breakthrough to solve this problem. "Short video" not only brings a lot of happiness to people's lives but also makes people generally accept the phenomenon of a short video. Therefore, "education for the elderly" is associated with "short video", to explore the elderly's acceptance of "short video learning", a new thing, and to study the design of short video learning apps for the elderly on this premise.

1. Research Status

1.1. Research Status of Short Video App Design

In recent years, short video has developed rapidly, and various short video apps have appeared on the market. In the academic field, experts and scholars also began to conduct a preliminary discussion on the design of a short video app. Leikaixu (2018) [1] and tianxinghan et al. (2020) [2] took Tiktok as an example to study the

interaction design of a short video app; Yin Jun et al. (2020) [3] analyzed and compared the advantages and disadvantages of "Tiktok" and "Kwai" short video apps based on user experience, and proposed that users' sensory, interactive and psychological experiences should be fully considered in the design of short video apps.

To sum up, at present, the research of experts and scholars on short video apps focuses on the preliminary discussion on the design of existing apps in the market, for example, the analysis of the interface design and interaction design of Tiktok and Kwai short video app. Some scholars began to combine the advantages of a short video to discuss the combination of short video and teaching, but lack of relevant research on design practice, It is even more difficult to see relevant research results on the design of short video learning apps for the elderly. Therefore, based on the understanding of the elderly's acceptance of short video learning, a short video learning app that is easy to use for the elderly is designed by combining theory with practice.

1.2. Research status of "App Design for the elderly"

The elderly began to use apps to adapt and integrate them into their current life. However, most of the apps in the existing market are not tailored for the elderly. Only a small number of apps have developed the elderly model to improve the user experience of the elderly. At this stage, domestic and foreign scholars mainly study the design of apps for the elderly in the following two parts. The first part is to obtain the real needs of the elderly by investigating the acceptance of the elderly, to provide the basis for the design. The second part is the relevant research on the design practice of apps for the elderly. The above research results reflect the particularity of cognitive and physiological functions of the elderly. When designing apps for the elderly, we need to focus on the following aspects: interactive design should reduce the difficulty of operation, and simplify the operation process and information input; In terms of visual design, we should scientifically and reasonably design fonts, icons, color combinations and interface layout according to the special needs of the elderly.

2. Acceptance Survey

This stage of research mainly uses the questionnaire survey method. First of all, it makes a theoretical discussion on the acceptance model, uses Fred D Davis' Technology Acceptance Model for reference, analyzes the factors that affect the acceptability of the elderly on the short video learning app, and obtains the dimensions of the questionnaire. Then, through questionnaire survey and data analysis, this paper discusses the elderly's acceptance of short video learning and the correlation between various influencing factors and acceptance, which is the premise for the design and practice of short video learning apps for the elderly.

2.1. Acceptable model theory

The technology acceptance model (TAM) proposed by Fred D Davis has become the most widely used model. This model has been used by many researchers to explore the impact of users' acceptance of new technologies [4]. The original model of TAM has four dimensions: perceived usefulness (PU), perceived ease of use (PEOU), attitude (ATT), and behavioral intention (int). The relationship between these variables will be affected by the gender, age, and technical familiarity of the subjects [5]. Some researchers have further expanded and improved Tam models, such as TAM2 [6], UTAUT [7], and utaut2 [8], but their basic principles have not

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changed. Technology promotes the development of learning forms. Applying advanced technology to the education of the elderly can help the elderly easily acquire knowledge. Therefore, it is a prerequisite for design practice to verify whether the elderly accept the new technology of "short video learning" and change their deep-rooted learning style.

2.2. Research hypothesis

This study continues to draw on Fred D Davis' Technology Acceptance Model and puts forward five hypotheses according to the influencing factors of the elderly's acceptance of short video learning. Hypothesis 1: there is a significant correlation between the elderly's acceptance of short video learning and their familiarity with smartphone use (b); Hypothesis 2: there is a significant correlation between the elderly's acceptance of short video learning and the usability (c) of existing apps; Hypothesis 3: there is a significant correlation between the elderly's acceptance of short video learning and their online learning content (E); false Hypothesis 4: there is a significant correlation between the elderly's acceptance of short video learning and their learning time cost (f); Hypothesis 5: the elderly have a higher acceptance of short video learning (g).

2.3. Questionnaire design

The paper uses the questionnaire designed by hearing et al. For reference and uses the Likert 7-point scale to score. Through user interviews and literature discussion, the dimensions and items of the questionnaire were obtained, and three modifications were made according to expert suggestions. A questionnaire containing 8 dimensions and 43 questions was determined. The questionnaire is mainly distributed online and offline. The distribution and collection time is from January 7, 2020, to April 12, 2020.

2.4. Research results

2.4.1. Questionnaire collection and reliability test

A total of 124 valid questionnaires (n) were collected and analyzed by IBM SPSS statistics 26. Firstly, the reliability of the questionnaire was analyzed: naire Cronbach's alpha. The analysis results are shown in Figure 1. The overall reliability score of the questionnaire is 0.913, and each dimension exceeds 0.7, indicating that the questionnaire has high reliability (Table 1).

2.4.2. Correlation between acceptability and influencing factors

Pearson correlation coefficient is used to analyze the correlation between the elderly's acceptance of short video learning and various influencing factors, as shown in Figure 2. The results show that the elderly's acceptance of short video learning has a significant positive correlation with the six main influencing factors (a, B, C, D, e, f), indicating that the hypotheses 1, 2, 3, and 4 proposed in this paper are valid (Table 1).

2.4.3. Acceptance

Analyze the elderly's acceptance of short video learning, and calculate the average to obtain the degree of attitude and perceived usefulness. The results show that the average number of short video learning acceptance (g) of the elderly is 4.22, the median is 4.00, and the P values are all less than 0.05, indicating that these dimensions are statistically significant, as shown in (Table 3). The results show that

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the elderly have a neutral attitude towards the acceptance of short video learning, and Hypothesis 5 is not tenable.

2.5. Improve learning acceptance

The elderly maintain a neutral attitude toward short video learning, so it is necessary to analyze the factors that affect the elderly to maintain a neutral attitude towards short video learning and put forward design strategies to improve the elderly's acceptance of short video learning.

First, the survey results show that "online learning content" has a significant positive correlation with the elderly's acceptance of using short video learning (Pearson correlation coefficient is 0.592**), indicating that the elderly pay more attention to the content of short video learning. Therefore, in the design practice of the content module of the short video learning app, we should consider the richness, practicality, and high quality of the learning content for the elderly. "Learning time cost" also has a significant positive correlation with the elderly's acceptance of using short video learning (Pearson correlation coefficient is 0.519**), indicating that the elderly attach great importance to the length of time for short video learning. In the specific questionnaire, respondents prefer to spend "2-5 minutes" learning a knowledge point. Therefore, in design practice, the time for short video learning content needs to be controlled within "2-5 Min". Second, the survey results show that "ease of use of existing apps" is an important factor affecting the elderly's acceptance of short video learning (Pearson correlation coefficient is 0.379**). The questionnaire shows that the elderly will encounter many inconveniences when using existing mobile apps, such as "too many operating steps" and "complex information transmission". Explain the existing App Design for the elderly

Poor usability. Therefore, in terms of the functional design, visual design, and interaction design of the "Bingzhu" app, we should aim to improve usability, minimize the error rate when the elderly use the app, and focus on the fault tolerance of the "Bingzhu" App Design, so as to improve the elderly's acceptance of the short visual frequency learning app.

Third, the survey results show that "familiarity with smartphone use" is an important factor affecting the elderly's acceptance of short video learning (Pearson correlation coefficient is 0.360**). The questionnaire shows that most of the elderly are unfamiliar with smartphone use, which reduces their acceptance of short video learning. Therefore, attention should be paid to "use" in design practice

The "tutorial" is designed to teach the elderly to quickly use the "Bingzhu" app and improve their use intention.

3. Design Practice - "Interesting Learning" APP as an Example

By analyzing the results of the previous questionnaire, a short video learning app for the elderly is designed to improve the acceptability of the elderly. This paper introduces the design idea of "fun learning" app from the following three aspects: efficient function module design; Reasonable and standard interface design; Attach importance to usability testing, so as to improve the ease of use of the "fun learning" app and improve the acceptability of the elderly.

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**Table 1.** *Cronbach's Alpha of the Research Constructs (N = 124).*

Number of Issues	The number of issues	Cronbach's alpha
Factors affecting online learning (a)	5	0.742
Smartphone proficiency (b)	4	0.934
APP's usability (c)	5	0.879
Acceptance of learning style (d)	4	0.742
Content of online learning (e)	4	0.827
Learning time cost (f)	5	0.767
Acceptance of short video learning (e)	4	0.881

Table 2. *Correlation between acceptability of short video learning and various influencing factors (N = 124).*

	Factors affecting online learning (a)	Smartphone proficiency (b)	APP's usability (c)	Acceptance of learning style (d)	Content of online learning (d)	Learning time cost (e)
Acceptability	0.265**	0.360**	0.379**	0.406**	0.592**	0.519**

Table 3. *Attitudes towards short video learning (N = 124).*

	Mean	Median	SD	Range	P-Value
(g)	4.22	4.00	1.357	1.00-7.00	0.048
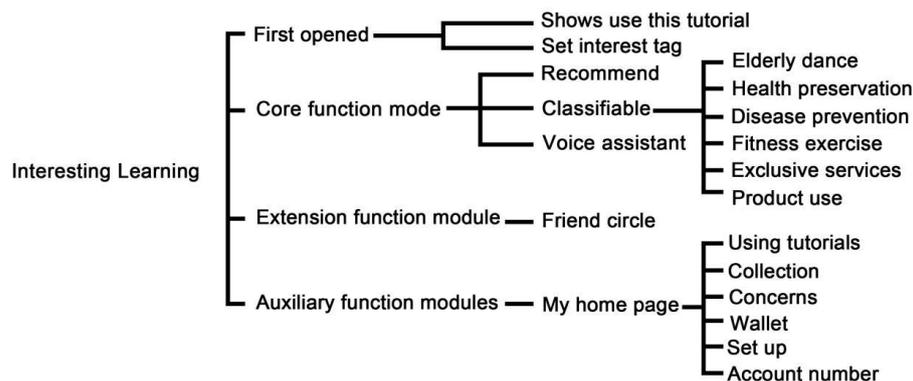
Figure 1. *The module design of "Interesting Learning" APP.*

3.1. "Interesting Learning" APP Function Module Design

"Interesting Learning" APP The function modules of the system include core function modules, extension function modules, and auxiliary function modules. (Figure 1).

When the elderly start the "interest learning" app for the first time, they will show a "tutorial", which aims to solve the problem that the elderly are unfamiliar with the use of smartphones, so as to teach the elderly to use the "interest learning" app and improve their use intention. Due to the memory loss of the elderly, it is necessary to remind the elderly to show the "use tutorial" in the "I" module for a long time. In addition, after learning the "use tutorial", the elderly also need to select the tags they are interested in to assist the background to complete the accurate push of the "recommendation" module.

The core function module consists of "recommendation", "classification" and "voice assistant". The "recommendation" module is designed with intelligent and accurate recommendation functions. Through big data and artificial intelligence technology, we can remember the learning content that the elderly often browse, and

accurately recommend high-quality learning content for the elderly, so that they can quickly access the learning content they are interested in after opening the app. The design of the "classification" module meets the needs of the elderly for the richness and high quality of short video learning content and covers all the needs of the elderly for short video learning. According to the most desired knowledge of the elderly, the learning content of the short video is divided into knowledge related to interests, health preservation, and disease prevention.

The time of the above short videos shall be controlled within 2 to 5 minutes, which is the most acceptable time for the elderly. The "voice assistant" function module is designed to improve the ease of use of the "interesting learning" app. The results of previous research and in-depth interviews show that most elderly people do not input text when using the existing app and do not operate the auxiliary functions in the settings. Therefore, the "interest learning" App Adds a voice assistant to run the voice assistant through each page. In the "recommendation" and "classification" modules, the elderly can use the voice assistant to search for learning content; In the "circle" module, the elderly can use the voice assistant to find friends and interest groups in the address book, and view friends' circles; In the "I" module, the elderly can use the voice assistant to edit their personal data and set the font size. This design can quickly and efficiently meet the operational needs of the elderly.

Extension function module: the "circle" module is designed to meet the emotional needs of the elderly, with social function. This module follows the presentation form of WeChat chat and circle of friends. Due to the relatively weak adaptability of the elderly, appropriate use of mature presentation forms is conducive to reducing the use cost of the elderly, who can use it quickly without secondary learning. This module provides a social place for the elderly. In this module, they can chat with friends, establish learning interest exchange groups, and see the status released by other elderly people to meet their emotional needs.

Auxiliary function module: the "I" module is designed to meet the needs of the elderly for auxiliary functions, mainly including a tutorial, collection, attention, wallet, settings, and account editing. Compared with ordinary apps, the "I" module of the "interest learning" app emphasizes the long-term display of the "use tutorial" to improve the familiarity of the elderly with the app.

3.2. "Interesting Learning" APP Interface design

3.2.1. Visual interface design for the elderly

According to the previous literature discussion on App Design for the elderly, most scholars put forward interface design suitable for the elderly by using various experimental methods according to the physiological characteristics of the elderly. On this basis, the visual interface design of the "interested learning" app is proposed from four aspects. First, in terms of color matching design, the "interesting learning" app interface uses dark blue, light gray, and white as the main colors, and orange and green as the auxiliary colors, so that the overall design will not be dull and monotonous, bringing better visual experience to the elderly. Second, in terms of font design, the "interesting learning" app selects highly recognizable and concise fonts. The elderly can adjust the font size according to their own needs. At the same time, black fonts are used in a large area of light background, white fonts are used in a dark blue navigation bar, and orange fonts are used in the selected fonts, so as to form a sharp contrast and improve the legibility of the elderly. Thirdly, the icon design of the

"interesting learning" app strives to be simple and clear, so that the elderly can quickly understand the meaning of the icon. Fourth, in terms of panel design, the "interesting learning" app mainly selects the screen format to enhance readability, so that the elderly can quickly obtain information. In addition, pay attention to the design of the size, distribution and line spacing of each module element in the page, so as to make the space between touch targets large enough to reduce operational errors.

3.2.2. Easy to use interaction design

The interactive design of the "interesting learning' app is simple and easy to use, which reduces the operation steps of the elderly and enables them to achieve the operation purpose quickly and accurately. The innovation of the "interesting learning" app is that it takes voice interaction as the leading role, adds a voice assistant, and penetrates the voice assistant into each page. In the "recommendation" and "classification" modules, the elderly can click the voice assistant icon to say what they want to see, and then they can search the required short videos; In the "circle" module, the elderly click the voice assistant icon to say the friend they want to contact, and the dialog box of this friend will pop up; In the "I" module, the elderly click the voice assistant to say their own needs. For example, "changing the Avatar" can jump to the "Avatar settings" page in "account editing".

3.3. "Interesting Learning" APP usability tests

The usability test is an important part of design practice. Its purpose is to test the usability of the "interesting learning" app. It is mainly divided into expert usability tests and user tests.

3.3.1. Expert availability testing

Eight experts are invited to test the usability of the "interesting learning" app through the Delphi method.The expert test adopts the questionnaire survey method and uses the Likert seven-point scale to score the "ease of use", "efficiency", "affinity" and "interest" of the "interesting learning" app. The "other suggestions" adopt the semi-open questionnaire. It was sent to 8 experts by email for 4 rounds of testing. The results show that the final scores of the eight experts on the usability test of the "Bingzhu" app are shown in Table 4 with an average score of 6, indicating the overall usability of the "interesting learning" app "excellent".

	Accessibility	Efficiency	Likeability	Interest	Average score
Usability test scores of 8 experts	6	7	5	6	6

Table 4. "Bingzhu" APP usability test expert score.

3.3.2. User availability test

Six elderly people were invited to experience the beta version of the "interesting learning" app. The subjects were tried three times, each time for 45 minutes. The main contents of the test included: searching for learning content, developing learning, experiencing social functions, etc. Finally, the test results and suggestions are obtained through observation and in-depth interviews. The test results showed that the six elderly believed that the overall experience was excellent, the learning content was rich and the quality was high, which could meet their needs.

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The short video duration is appropriate, the operation mode is simple, the interface layout is clear and reasonable, and the voice assistant is convenient and fast. Collected problems and suggestions. Question 1: two elderly people think that the videos they have learned are difficult to find when they learn again when they forget to collect them; Question 2: one elderly person's Mandarin is not very standard, and there is a certain error in speech recognition. The solution to problem 1: according to the interview with users, the "attention" function in the "I" module is not necessary. Therefore, replacing "attention" with "learning footprint" makes it easier for the elderly to find the short video content they have learned. For the modified "I" module. Solution to problem 2: add fuzzy search to voice search, and strengthen the intelligence and compatibility of voice assistant.

4. Conclusions

This paper proposes a short video learning App Design for the elderly, which is mainly divided into two parts. First, investigate the elderly's acceptance of new short video learning methods, analyze the main factors that affect the elderly's acceptance of short video learning, and propose design strategies to improve the elderly's acceptance of short video learning according to the analysis results; Second, the design strategy is applied to the design practice of "interesting learning" app, and the design practice results are analyzed from three aspects: efficient function module design, reasonable and standardized interface design, and emphasis on usability testing. Based on obtaining accurate data as the basis of design practice, this paper focuses on how to design an easy-to-use short video learning app for the elderly, so as to improve their acceptance of short video learning.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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