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Android-based Interactive English Reading App Design

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Abstract: *Teacher-oriented, insufficient teaching interaction and lack of long-term effective mechanism for cultivating thinking ability are common in English reading teaching, leading to poor teaching effect. The article summarizes the previous research based on the goal of strengthening the interaction between teaching and cultivating students' thinking ability, and designs an interactive English reading learning APP through the deep integration of information technology and English reading teaching, which to a certain extent promotes students to carry out independent, interactive and collaborative learning and realizes efficient, deep and extended English reading teaching.*

Key words: *English reading; Interaction; APP; Design*

Introduction

English reading is an important indicator to measure the comprehensive English skills of college students, which largely determines the comprehensive level of learners in daily use and comprehensive tests. Its status in English teaching is self-evident. Over the years, the reform of English reading teaching has made the cultivation of critical thinking skills with the goal of analysis, evaluation and creation an important teaching goal. For example, teaching resources, teaching theories, and teaching interaction methods have been tried, such as: adopting teaching materials that enhance students' comprehensive application skills and cultivate their critical thinking skills at the same time; adopting teaching theories that enrich the cultivation of critical thinking skills, such as metacognitive monitoring strategies and schema theory; implementing teaching methods and strategies that improve classroom interaction and cultivate critical thinking skills, such as cooperative group learning, problem-based learning, and collaborative learning strategies (Zhang, 2014). However, due to the influence of individual classroom interaction and environment, the phenomenon that teachers teach from the text and students focus on the text and take the test is still common, and the lack of effective teaching interaction means to cultivate thinking ability still restricts the deepening reform of reading teaching. The development and application of interactive English reading APP provides new ideas to solve the above problems, and its purpose is to help solve the existing problems of teacher-oriented English reading teaching, insufficient teaching interaction, lack of long-term effective mechanism to cultivate thinking ability, and difficulty in mobilizing learners' interest, resulting in poor teaching effect, so as to effectively promote students to carry out independent, interactive and collaborative learning, and its unique advantage is that it provides its unique advantage is that it creates a more ideal personalized teaching environment for English reading and realizes efficient, deep and extended English reading teaching.

English Reading App Design Theory and Principles

Constructivism believes that learning is a process in which learners actively construct internal mental representations, and learners acquire knowledge by constructing meaning in certain contexts with the help of others in the learning process and using necessary learning materials. Context", "help from others" and "meaning construction" are three important factors for learners to acquire knowledge. The interactive English reading APP is developed based on the above theory, and its purpose is to create an interactive reading learning context, where learners continue to explore and collaborate and communicate according to different learning purposes, so as to enhance the interaction between teaching and learning, improve the ability to think and argue, and complete the reconstruction of knowledge. Its essence is to promote learners' independent learning, cooperative learning, and inquiry learning through the interaction between people and people and people and the environment to realize the process of teaching and learning (Zhen et al., 2021). Research shows that: interaction is a psychological need in the learning process and also a kind of self-actualization, and learners should give interaction in time when they have questions or need to communicate with others; interactive learning environment can construct learners' cognitive process, and learners realize the cognitive process of knowledge in learning interaction; social interaction among learners and between learners and teachers is an important aspect of knowledge construction. APP is a personalized learning space that requires not only the support of a certain interactive learning environment (people and learning resources), but also interpersonal relationships between students and teachers (people and people) (Chen & Liu, 2015).

AAP design follows five principles: (1) Interactive: to achieve seamless interaction between people and people, people and systems, and people and resources, to facilitate learners' independent learning, cooperative learning, and inquiry learning, and to develop students' thinking skills. (2) Well mobile: break through time and space restrictions, learners can learn anytime and anywhere through mobile devices, creating good conditions for teaching. (3) Personalized: learners can choose learning forms and contents flexibly according to their development needs and actual ability levels, which improves teaching effectiveness and relevance. (4) Wide range of topics: The integration of many topics and different genres, with the organic combination of audio, video, images and text, on the basis of practicality and interest, not only reflects the various forms of reading learning, and at the same time take into account the needs of assessment. (5) Dynamic: The platform design should be dynamic and flexible, so that teachers can update the resources at any time according to their needs, and students can share their learning resources and experiences.

Design and Development of English Reading App

According to the concept of English reading teaching, combined with the cognitive characteristics and learning needs of learners, using questionnaires, in-depth interviews and other methods to grasp the detailed needs of teachers and students, through the analysis of relevant learning software on the market, visit senior English reading teaching experts to understand the latest developments, the formulation of the four aspects and four principles for the design of the surrounding functional module, database, interactive experience, system interface, the design is based on four principles: (1) Functional modules are independent and loosely coupled. (2) Emphasize the generation and dynamism of learning resources. (3) Advocate the interactive experience of multiple participation, timely sharing and instant evaluation; (4) APP interface is simple and clear, easy to

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operate, comfortable and flexible.

Requirements Analysis and Functional Design

This English reading APP, through the deep integration of information technology and teaching, effectively extends teaching from inside to outside the classroom as an aid to English reading teaching, not only as a mobile classroom, but also as a supplement to learning outside the classroom. In the process of using the App, the teacher should take the lead and the students should be the main body, emphasizing that students are the key participants in the teaching process. App learning is mainly oriented to discussion and exchange, demonstration and sharing, with formative evaluation as the main evaluation system, and the learning mode is mainly independent learning and collaborative learning, so the APP must meet the need for real-time communication between teachers and students, with real-time demonstration and sharing, evaluation and other interactive functions. During the teaching process, teachers must regularly carry out thematic English reading teaching activities, organize various group communication learning activities and push rich reading resources; they can effectively monitor students' usage, always pay attention to students' progress and give appropriate guidance to help students complete their learning tasks. Students should take the initiative to cooperate with teachers and actively complete learning tasks; they should be able to use fragments of time to study outside of class; they should be able to show their learning results, share their learning experiences and communicate online.

Based on the above demand analysis, the English reading APP should be suitable for both supplementary teaching and extra-curricular learning environments, with the purpose of strengthening the interaction between teaching and learning, cultivating students' thinking and discernment skills, enhancing students' satisfaction in the application process, and creating a harmonious and pleasant learning environment. Therefore, the APP is divided into four functional modules: system management, theme teaching, training test, and information statistics, as shown in Figure 1.

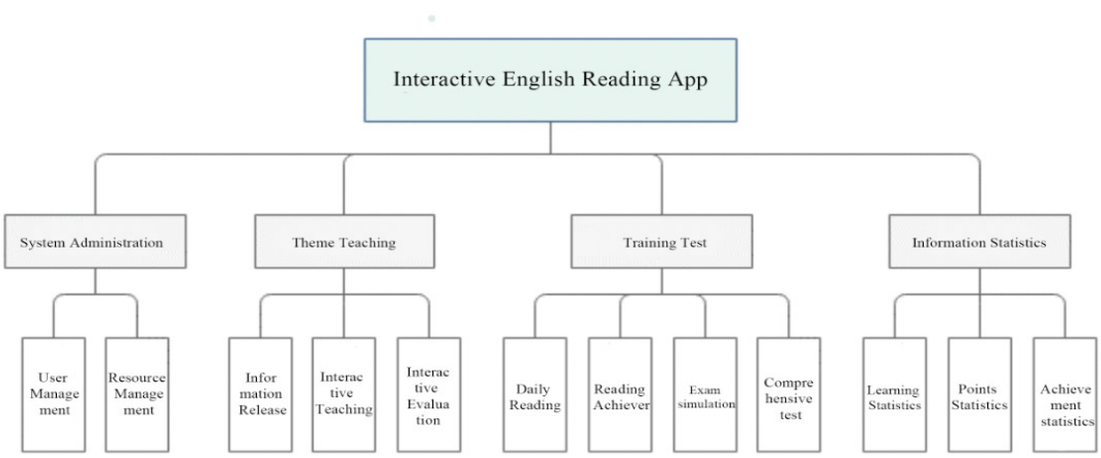

Figure 1. Interactive English Reading App Functional Structure Diagram

System Administration: APP system management is operated by the administrator (teacher), including two parts: user management and resource management. The user management module includes user registra-

tion, user login, permission assignment, etc. The administrator can assign different usage rights according to the user's identity (teachers and students) and know in real time when the user logs in, when he/she leaves, whether he/she completes the learning tasks, etc. Data management includes data entry, uploading and downloading, data evaluation, etc. Teachers and students can enter, edit, query, download and evaluate the learning materials according to their respective rights, and it is worth mentioning that the evaluation of the materials allows teachers to understand the value of the materials in time and make appropriate adjustments.

Theme Teaching: Theme-based teaching includes three parts: information release, interactive teaching, and interactive evaluation. Information release is used to release information about teaching activities, teaching design and teaching requirements before class, so that students can have a certain understanding of the teaching to be carried out. Interactive teaching is the core of APP, including micro-lesson teaching, collaborative learning and result sharing. Firstly, by watching micro-lessons corresponding to teaching objectives, such as interpreting chapter structure, analyzing question characteristics and explaining problem solving skills, etc., and answering 1-3 related questions during or after watching the video. Then collaborative learning is conducted using similar articles and question types. Each group member thinks independently and then discusses collaboratively to determine the group's final answer and jointly complete the reading concept map, and finally complete the sharing by uploading the concept map. The interactive evaluation session includes self-assessment, mutual evaluation by teachers and students, group reporting, and evaluation by the group, which cultivates learners' analytical thinking, reasoning thinking, and evaluation thinking (Zhang, 2021).

Training Test: The training test includes four parts: Daily Reading, Reading Achiever, Exam Simulation, and Comprehensive Test. Various English reading materials such as news, sports, poems and anecdotes are updated daily, and learners can use fragmented time to read them. Readers can complete reading training in the form of contextual breakthroughs, task-based breakthroughs and cooperative breakthroughs to stimulate learners' interest in learning, cultivate learners' sense of cooperative inquiry and improve learners' independent learning ability. The test simulations include TEM-4, TEM-8, CET-4 and CET-6 past years' reading questions for learners to simulate the test, which is the same as the actual test, requiring learners to complete it within a specified time, and the test is automatically assessed by the system after completion. Comprehensive tests are synchronized with the teaching progress, including unit tests, midterm tests and final tests, realizing paperless examination evaluation and facilitating the generation of files such as teaching quality analysis reports and comprehensive quality evaluation reports.

Information Statistics: The information statistics include three parts: learning statistics, points statistics, and achievement statistics. Learning statistics are mainly used to count learners' online learning time, learning records, learning progress and other information to facilitate timely grasp of learners' current status. Points statistics are used to count the points of learners' answers, points of teachers' and classmates' favorable comments, and points of the top performers to help understand the initiative and enthusiasm of students' learning. Achievement statistics include records and statistics of regular grades, unit tests, midterm and final grades, and finally the system generates information on credit hours, comprehensive grades and evaluations to facilitate the understanding of learners' comprehensive level.

Resource Library Design

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The rapid development of information technology has facilitated the search and use of original English learning materials, and learners can quickly access English books, magazines and English newspapers through the Internet. What kind of resources can effectively improve learning? These questions must be taken into account when building the database. The project team identified the main sources of resources after investigation and research: industry procurement, textbook refinement, network collection, and independent development. On the one hand, it is to adapt to various forms of rich reading learning, and on the other hand, it takes into account the needs of reading teaching. By optimizing the resource configuration, it is divided into four knowledge areas: intensive reading resources, general reading resources, daily resources, and examination resources, which are configured into each functional template according to the usage requirements to achieve data interoperability and resource sharing. As shown in Figure 2.

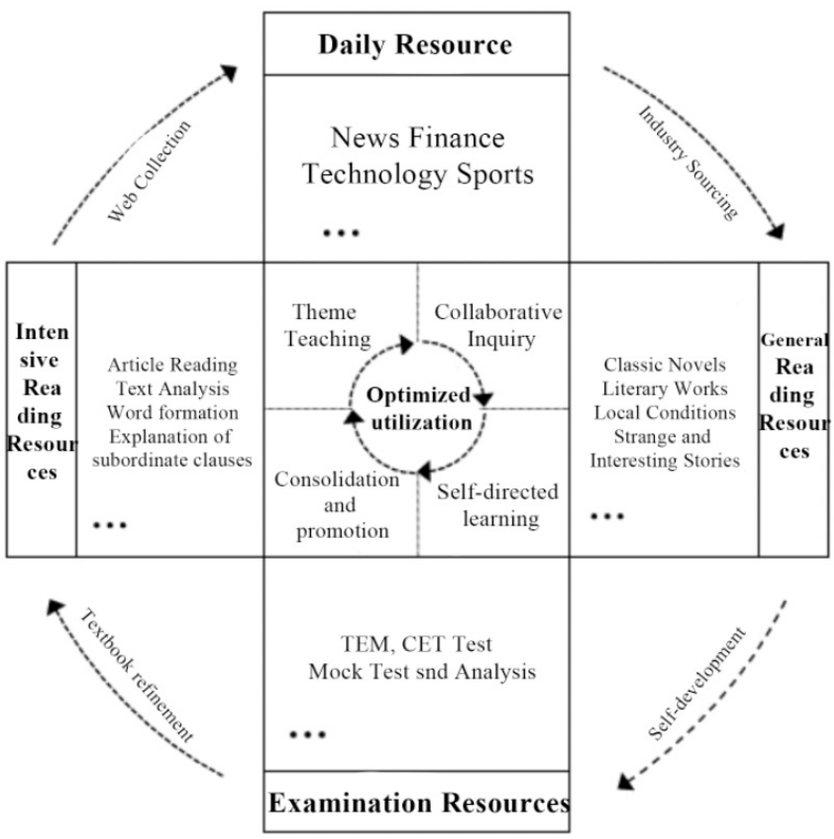

Figure 2. Interactive English Reading App Resource Library

Interaction Design

Wagner (Wagner & Ellen, 2017) defines interaction as the behavior of both parties, which can be either individual-individual or individual-group interaction. Marc (Liaw & Huang, 2018) believes that human communication and interaction is crucial in the learning process. Mingxuan Chen believes that learners construct and improve the knowledge system by sharing others' experiences, expressing personal insights, and deepening theoretical learning through continuous interaction activities (Chen & Yang, 2017). Based on the above theory, APP interaction behavior will be carried out around the teacher, students and APP, and the interaction subject and object are "human and human" and "human and APP" respectively. In practice, teachers can

understand student dynamics through APP, implement accurate teaching and scientific management, and students give feedback to teachers through APP, which helps teachers improve teaching and management, and promote the quality level of reading teaching by continuously optimizing the teaching process and improving learning effectiveness (Douglas, 2001). As shown in Figure 3.

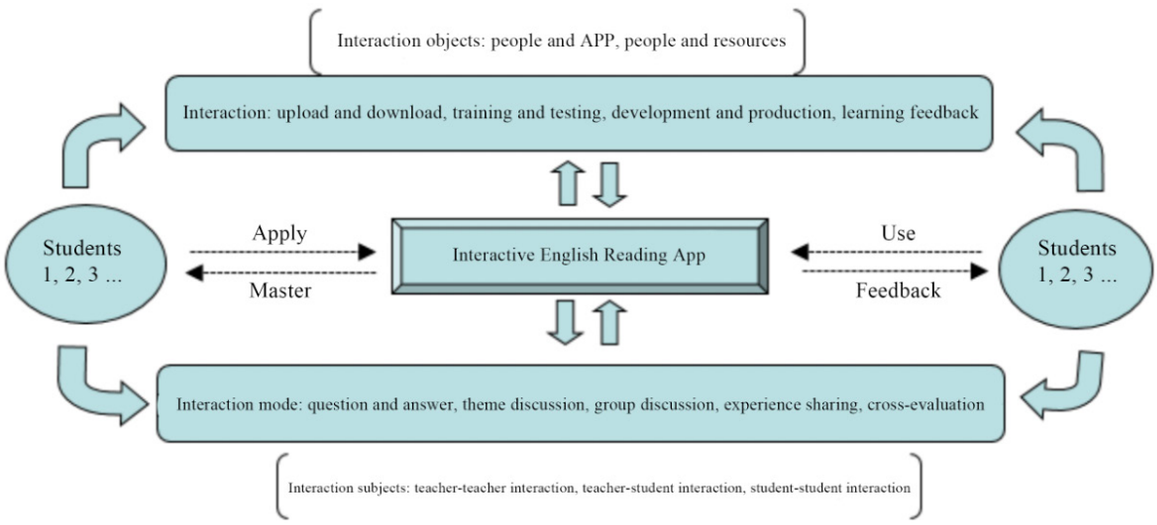

Figure 3: APP Interaction Design Schematic

Interaction Subject: Teacher-teacher interaction: interaction between teacher teams, including forms of sharing teaching tips, discussing teaching methods, recommending beautiful articles, and evaluating lessons. Teacher-student interaction: question-and-answer, teacher-student mutual evaluation, organizing theme teaching, guiding collaborative learning, carrying out group discussion, etc. Student-student interaction: collaborative cooperation, group discussion, cross-evaluation, forwarding, sharing, liking, and other forms.

Interaction Object: People and APP: Teachers carry out thematic teaching activities through APP, test students' reading level, students log in APP to study, train, test, APP statistics on students' information, generate report feedback and other behaviors all belong to the interaction between people and platform. People and resources: independent research and development of resources, uploading and downloading resources, resource evaluation and other behaviors are all interactions between people and resources.

Interaction Behavior: Whether it is "human-to-human" interaction or "human-to-app" interaction, the interaction behavior affects the teaching quality and learning effect to a certain extent, and the requirements of interaction behavior are different for various application links. In the design of interactive behavior, we pay more attention to student-student interaction, student-teacher interaction, interaction between human and resources, mainly including question and answer, group discussion, experience sharing, cross-evaluation, uploading and downloading, training and testing, development and production, etc. These behaviors not only play the leading role of teachers to guide, inspire and monitor the teaching process, but also reflect the initiative, enthusiasm and creativity of students as the main body in the learning process.

Facilitating Interaction Strategies: In order to mobilize students' initiative and enthusiasm to participate in the interaction, we have established a suitable motivation method, using the interactive feature of APP, and inte-

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grating evaluation throughout the theme teaching, providing learners with timely information about teachers' and peers' evaluation, effectively helping them to establish a "self-referential" standard for learning; stimulating students' learning initiative through the combination of teachers' evaluation and students' The combination of teacher assessment and student self-assessment and mutual assessment stimulates students' learning initiatives and promotes their individual growth. The scores of this interactive assessment are also included in the statistics of the usual grades, and become an important source of students' usual grades.

Table 1. APP Interaction Design Schematic

First indicators	Secondary indicators	Rating basis	Quantification scores
System evaluation	Progress evaluation	Complete the theme teaching tasks assigned by the teacher	10 points
	Practice Grading	Complete the corresponding exercise questions (no more than 10 questions)	0-10 points
Self-assessment and mutual evaluation	Self-evaluation	Rate your performance in completing the teaching tasks of the theme	0-10 points
	Teacher Evaluation	Teacher grading of students' performance in completing tasks	0-10 points
	Peer Evaluation	Cross-rating between peers on each other's performance	0-10 points
Exchange and Discussion	Active Speaking	Speaking at the thematic teaching exchange session	10 points
	Breakout groups	Group discussion and brainstorming	10 points
	Share thoughts	Share study tips, problem solving and reading skills	10 points
Results Sharing	Concept map sharing	Upload the concept map for reading	10 points
	Likes, Comments	Share the results of the likes and comments 1 point / piece (article)	10 points

Interface Design

App interface design must take into account the limitations of the screen size of mobile devices and the number and presentation of learning resources, and strive to simplify the interface and functions to the greatest extent possible, reduce redundant information and cumbersome operations when using, and achieve the purpose of simplicity and ease of use. In the process of interface design, the following points should usually be achieved.

The interface design should be simple, easy to use, friendly and intuitive, reasonably remove useless functions, hide uncommon functions, streamline the operation interface and reduce complex operations. The color scheme should be as fresh and comfortable as possible, avoiding too lively and highly saturated colors.

Reasonable layout of learning resources structure, highlighting key learning content. In order to reduce the cognitive load of students, the APP page should be reasonably laid out to strengthen the recognition of the

APP interface, so that the navigation is clear, the learning path is clear and the key content is prominent.

Reasonably set the function buttons in the App, and associate the navigation buttons with a harmonious and unified design. In order to ensure the comfort and fluency of learners' operation, complex operation processes should be avoided, redundant steps and interfering items should be reduced, and a harmonious and unified interface corresponding to most learners' operation habits should be created (Wang & Xiao, 2021).

Incorporate personalized design elements, such as providing more personalized reading interface adjustment settings, including page turning mode, page turning effect, time display, gesture settings, etc. to meet different learners' needs to further improve user experience and enhance customer stickiness.

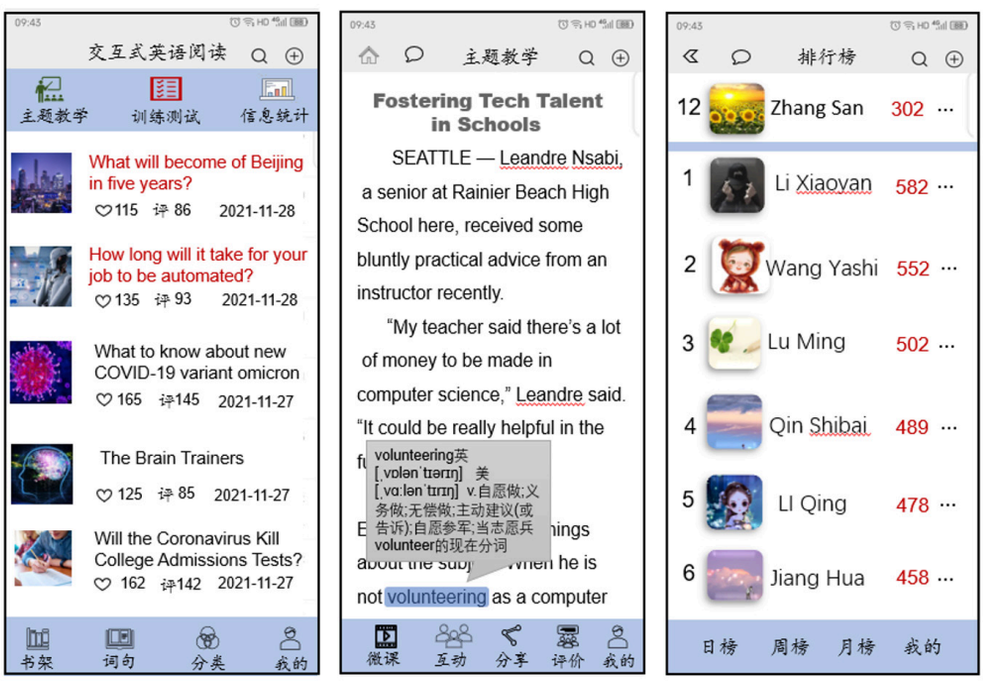

Figure 3. APP Interaction Design Schematic

The Key Technology of APP Implementation

Android system has high open source advantage, which provides developers with high degree of development own, therefore, the interactive English reading APP will choose to develop based on Android platform in the first stage, and further consider secondary development based on IOS platform when conditions are mature. The reading APP consists of Android client and server side, using gradle build tool Spring-Android framework to develop the Android client program, using Tomcat, Spring, SpringBoot, SpringData, Maven, Hibernate architecture to develop the server side program We use Tomcat, Spring, SpringBoot, SpringData, Maven, Hibernate architecture to develop server-side applications. The server side uses Tomcat as the web server to receive HTTP requests from the Android client, Spring, SpringBoot and SprintData as the underlying framework building technology to manage the dependencies between each module on the server side in a hierarchical manner and decouple the implementation of each module. The Hibernate framework technology is the bottom layer of the system, providing standard and unified data operation interface and database trans-

action management for each module in the upper layer. The system uses the standard JSON format for data exchange between the Android client and the server (Xian, Kuang, & Chu, 2019).

Conclusion

The article designs an interactive English reading learning APP to enhance students' thinking skills in English reading learning through active, interactive, and collaborative learning among students, while promoting the development of students' awareness of independent and cooperative learning. The theme-based teaching activities achieve efficient, accurate and extended English reading teaching, which to a certain extent alleviates the teacher-oriented, insufficient teaching interaction and lack of long-term effective mechanisms for developing thinking skills in reading teaching, leading to poor teaching results. In the future, we still need to make continuous improvement and refinement of APP, and study in depth the teaching methods, learning objects, teaching effects and assessment means under the support of the system, so as to better guide the practical application and give full play to the advantages and values of APP.

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