The APP Design for Assisting Health Statistics Teaching

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Abstract. In view of the trend that the number of smartphones and the frequency of use of student groups are increasing year by year, this paper proposes the design concept of health statistics-assisted teaching APP. With the online learning of health statistics, online testing, and final review as the main functions of APP, we introduce the forms of points, medal, ranking and other forms which are popular among young people to enhance the students' interest in the use of APP. At the same time, according to the characteristics of health statistics for focusing on application, the application case base of health statistics method is designed to show students the whole process application from data collection, analysis, selection method, calculation and interpretation of calculation results, which can solve the puzzles of students in theoretical study through practical cases and strengthen students' practical application ability. The design and development of health statistics-assisted teaching APP is of great significance to improve the teaching activities of health statistics and improve the teaching effect.

1. Introduction

The rapid spread of mobile devices such as smartphones and tablets has created technical conditions for intelligent teaching changes. Mobile classrooms, large open online courses (MOOCs), education APPs, and mobile teaching management have become the first wave of mobile Internet transformation education [1]. As a form of auxiliary teaching system, various mobile education apps are gradually integrated into teaching activities. Health statistics is the main course of preventive medicine. The important basic disciplines of modern medicine have the characteristics of many knowledge points, abstract mathematical methods, close connection, and strong applicability. Students are more difficult to learn. Therefore, the concept of "Internet +" is introduced in the health statistics, design and development of the teaching aid system for health statistics, with the wisdom teaching tools to create a closed loop of learning, improve the learning effect of students, do emotional curriculum design, and let the wisdom classroom live. It is of great significance to improve the teaching activities of health statistics and improve the teaching effect.

2. Mobile Education App Overview

2.1 Mobile Education App Concept and Development

Mobile Education App has emerged along with the development of mobile education in China. Since 2002, people have begun to use mobile network technology to promote the development of education and teaching activities. Since 2010, the form of education with mobile client App as the carrier has begun to appear. Currently, mobile education App can be divided into the following categories: e-reading, early childhood cognitive enlightenment, foreign language training, vocational education exams, teaching aids, etc. [2]. The health statistics teaching aid system studied in this paper belongs to
the teaching aid category. Based on the intelligent question bank system, the mobile phone app is the main form of expression, and it is used for the undergraduate health statistics teaching in medical colleges.

2.2 The Significance of Developing Health Statistics-assisted Teaching App

Health Statistics Assisted Teaching App is in line with the development trend of modern teaching. In this era of mobile Internet, teaching concepts and models are changing, knowledge information is developing rapidly, and students' access to knowledge is no longer limited to learning in the classroom. The concept of teaching is shifting to “student as the main body”. The development of the Health Statistics App helps students change from traditional passive learning to active learning, with the transformation of teaching reform and educational concepts \(^3\). At the same time, the mobile education app can satisfy the user's requirements. University students are the main user groups. Through the education app, students can make full use of piecemeal time to learn and receive more abundant learning resources, which makes learning more personalized, convenient, and interesting.

2.3 The Feasibility of Developing Health Statistics-assisted Teaching App

The development of the Health Statistics App has high feasibility. According to CNNIC's 41st Statistical Report on Internet Development in China, as of December 2017, the number of Internet users in China reached 772 million, and the Internet penetration rate was 55.8%. Among the netizens' professional structure, the highest proportion of them are students, and students accept a high degree in mobile education App-assisted Teaching; nowadays, wireless campus construction has gradually gained attention, many colleges and universities have gradually realized the coverage of campus wireless network, and also provide conditions for students to use mobile education App\(^4\).

3. Design Goals and Principles of the Health Statistics-assisted Teaching App

The Health Statistics Assisted Teaching App aims to promote a student-centered learning model, which provides teaching resources for students, advocates students to control the learning process autonomously, fully mobilizes the enthusiasm of students, and reflects the convenience of mobile education App.

In the functional design of the App, the following principles should be adhered: ① Systematic learning content modularization\(^5\): The traditional course of health statistics is a chapter of this system, but App mobile learning needs to consider using the piecemeal time, and the overall course is in same circumstances. Therefore "fragmented", as a knowledge point corresponds to a module, which is convenient for students to complete in a short time and improve flexibility. ② Personalized learning\(^6\): Considering that there are certain differences in the student base for learning with an App, the App requires to provide abundant teaching resources, which covers different difficulty types. In addition, it is necessary to provide personal learning plans, learning progress and other functions, so that students could better control the progress of self-study. ③ Improve the user’s sticky\(^6\): App's functional services demand to pay attention to the user's experience, otherwise it is easy to be "abandoned" by users, in terms of interface design, operation, etc. as simple and comfortable as possible, it need to allow users to set their own likes, such as font size, font colors, backgrounds etc. Simultaneously, by way of improving the enthusiasm of students, the introduction of points, medals, rankings and other forms that young people like to enjoy, daily learning and good homework scores should be earned points. Moreover, points could be used to redeem teacher courses, release rewards questions, redemption of small gifts, etc. These could be promote the use of software. ④ Closely combined with the characteristics of the discipline: Due to the characteristics of the discipline, health statistics often use some mathematical symbols that are uncommon in the mobile phone input method. Therefore, the health statistics app design should provide corresponding common symbols, which is convenient for users to answer questions on the smart mobile phone.
4. Functional Design of Teaching Aids for Health Statistics APP

The health statistics app designed in this paper is divided into student and teacher two parts. And the health statistics app adopts modular design. The student side function part includes online learning, online testing, final review, actual case inquiry, learning community and personal center. The teacher part includes four modules which are online learning statistics, test results statistics, teaching case queries and system management[7].

Figure 1. Functional structure diagram of the teaching aid system for health statistics APP

4.1 Student Part

4.1.1 Online Learning
4.1.1.1 Synchronization Course
According to the teaching progress of the teacher-side control, the current chapters are learned online in various forms such as text, pictures, PPT, audio, video, etc., in addition the progress of the study is recorded. Among them, the video material is generally a recorded classroom video, and the information includes the lecturer, the chapter knowledge points and the like. All learning materials are classified according to their knowledge points and chapters, so that users can perform query reading.

Synchronous course learning could set up check-in links, and daily check-in gives fixed points; and if the online learning time exceeds a certain time on the day, then a certain amount of points will be given; so that if you study continuously for many days, you can give more points rewards.

4.1.1.2 Master's Lecture Hall
Collect relevant PPT, audio and video courseware from well-known professors and scholars of health statistics at home and abroad, such as Peking Union Medical College and Peking University School of Medicine, and promote the dissemination of high-quality teaching resources to students all over the country. Moreover for the high quality courseware, users need to redeem through points.

For universities with mature conditions, which could organize a live broadcast of a famous lecture. All students and teachers who have permission to watch the lectures in real-time through the mobile app and ask questions online. Master’s lecture hall function can give full play to high-quality teaching resources to bring about action and improve teaching results.

4.1.1.3 Knowledge Point Review
Due to the strong continuity of knowledge before and after about health statistics, it is often encountered that the former knowledge points cannot be remembered, which causes difficulties in subsequent learning. Therefore, the system provides a knowledge point review function. Student users can search for a certain knowledge point for problems encountered in daily learning. The system provides the learning content of the corresponding chapter of the knowledge point and provides links to related knowledge points. It is equipped with health statistics knowledge maps, mind maps and other content to assist students in understanding the corresponding knowledge.

4.1.1.4 Online Assignment
The system provides the function of submitting jobs online, which can help teachers to correct assignments and improve teaching efficiency. Student users can use this function to check the homework content of the teacher, and submit the assignment online by answering questions online, uploading exercise texts or pictures. For submitting assignments on time or in the first few places, the system will give a certain point reward.

Meanwhile, for past assignments, students can view the teacher's scores and corrections for the assignments online, and also query the standard answers would be issued by the teachers, strengthen training and review for the wrong part, and check for missing gaps. For students with a higher assignment score, the system can give a certain point reward.

4.1.1.5 Online Q&A
The knowledge of health statistics is abstract and hard to learn, for the reason that students can ask questions to the classroom teachers about the difficult problems encountered in daily study, homework, practice, and exams.

4.1.2 Online Test

4.1.2.1 Synchronous Test
Based on the teaching progress of the teacher-side function, when the health statistics course is completed, the exercises are automatically generated for the knowledge points of the class. Students can conduct their own synchronization test according to their own time schedule. After the answer is
submitted, the system will automatically make a change and give the correct answer. For students who participate in the simultaneous test in time, the system will give a certain point reward.

4.1.2.2 Unit Test
According to the teaching progress controlled by the teacher part, the system will automatically generate the unit test questions in this chapter when the entire chapter is finished. The students independently conduct unit tests. After the questions are submitted, the system automatically makes the judgment and gives the correct answer. For students who participate in unit testing in timely, the system will give certain points rewards.

4.1.2.3 Error Analyses
The system will automatically save the students' mistakes in the various tests [7, 8], automatically retrieve the relevant knowledge points corresponding to the wrong questions, and explain in detail. After the students learn, student users can continue to generate the knowledge points to consolidate the exercises. The system provides a variety of forms such as browsing in order, browsing by chapter, browsing by knowledge point, and searching by keyword. For students who have detailed questions in time, the system will give certain points rewards.

4.1.3 Final Review

4.1.3.1 Knowledge Point Statistics
After the completion of the whole semester teaching, according to the requirements of the examination syllabus, combined with the students' online learning, testing and other information, the APP counts all the knowledge points that students need to master, and uses the built-in algorithms and weights to automatically calculate the mastery of each knowledge point, and helps them review unexplored knowledge points emphatically. At the same time, it can score the overall mastery of student health statistics. Students can also check the mastery degree scores of other students in the same class or major. The learning motivation of the students who are ranked lower will be stimulated.

4.1.3.2 Simulation Exam
After all the chapters have been completed, the system automatically generates a simulation period final exam paper, which can be selected to generate simple, medium, difficult, high difficulty and other different levels of questions. It helps students improve themselves gradually, step by step. It is important to note that the system should be able to record all the questions selected in the test, and reserve a certain number of questions that can meet the needs of the formal exam, to avoid the questions that have already been used in the practice during the formal exam. In particular, high-scoring questions such as short-answer questions and calculation questions should be reserved to prevent students from being opportunistic by traversing the question bank.

4.1.4 Practical Case Inquiry
Health statistics is an applied discipline, and it is an essential tool and skill for the industry in health management, public health, and medical and health big data analysis. The system establishes an application case base of health statistics method by collecting examples of statistical methods in journal articles, dissertations, and research reports. These resources can enhance students' understanding of the application scope and calculation formula of statistical methods. The application case base shows students the whole process application of data collection, analysis, selection method, calculation and interpretation of calculation results, which can solve the puzzles of students in theoretical study through practical cases and strengthen students' practical application ability.

This function can also form a software product alone, which can be used for inquiry and learning by young researchers, health management personnel, public health service personnel, etc., and has extremely high practical value.
4.1.5 Learning Community

4.1.5.1 Study Group
In the learning group part, students can see the information of registered users in the class, the major, the school, the region, etc. (Users can set the visible and visible range in the personal center), and voluntarily join or initiate the study group. In the same study group, each member can conduct social activities such as learning experience, problem discussion, knowledge point exchange, etc., and post study notes for other students to refer to. This encourages users to supervise each other and persist in learning.

4.1.5.2 Problem Release
In the problem release part, students can post questions they have encountered in their studies to the App, wait for other users to answer. And users can answer questions themselves. The question can be set to reward points which can be obtained after the answer is adopted. In addition, the release part also provides a search function that allows users to search for existing questions and their answers. At the same time, the system will also set the ranking list according to the number of questions answered by the user and the adopted situation, and give points reward.

4.1.5.3 Knowledge Contest
The knowledge contest is divided into knowledge ranking and friends’ pk. Users can participate in the knowledge qualifying which is divided into different seasons by semester. In each season, the user answers the random questions in the system question bank, ranks according to the number of consecutively answered questions. If the answer is wrong, the user can’t continue. The system sets different segment positions according to the number of consecutive answers. According to the segment from low to high, the difficulty level of random questions is set to be easy to difficult.

The friends PK provides the opportunity to compete with other users (randomly assigning or inviting friends). There are ten questions in each competition. Each question has a specified time to answer. Users who answer more questions win.

In addition, different forms of knowledge contests are regularly launched. Users participate in competitions and receive corresponding points or season medals.

4.1.5.4 Medal Wall
In order to increase the student’s stickiness to the system and interest in the spontaneous learning, the system has set up various types and levels of medal rewards. In the process of using other modules, students obtain medals through various ways such as accumulating time, obtaining high scores, continuous use, and high activity.

The Medal Wall will show all the medals that the individual has obtained, and will show the schedule of the medals that have not been obtained. At the same time, students can check the medal status of the same class, the same department, the same school, the same area and friends, the system will sort them.

4.1.5.5 Points Store
Students can use the points earned in other modules to redeem virtual or material rewards, such as excellent courseware, master class tickets, coupons, traffic packages, etc. They can also check their point consumption.

4.1.6 Personal Centre

4.1.6.1 User Registration
After the student users enter the app for the first time, they must first register, fill in the necessary basic information, and set up the school, major, class and other information. Class and other
information needs to be reviewed by the teacher. Or teachers assign users directly. It can also be connected with the school student status management information system to obtain the corresponding information.

4.1.6.2 User Management
Student users can modify personal information, modify and reset passwords, set up theme modules, fonts, and monitor new versions. Students can edit their individual study plans. The system automatically pushes information according to the customized learning plan and reminds them regularly.

In addition, in user management, students can set their own information to be all visible, friends visible only or invisible, and to be public or not in classes, departments, schools, and regions. They can decide for themselves whether they agree to add friend [8]. Some of the student's information, including name, class, etc., have to be set to be visible to the teacher.

4.1.6.3 Point Management
Student users can view their current points, inquire for the detailed list of point acquisition, and sort and count the total number of points obtained by various ways, set the point consumption password and so on.

4.2 Teacher Part

4.2.1 Online Learning Statistics

4.2.1.1 Teaching Progress Control
According to the syllabus and actual teaching needs, the teacher selects the current teaching progress of each class. They can manually update after each course, or automatically set the update frequency, such as 2 lessons per week, automatically updating the teaching progress.

4.2.1.2 Uploading Courseware
Upload various types of courseware, including documents, forms, pictures, ppt, audio, video and many other forms. At the same time, the uploaded content can be modified.

4.2.1.3 Student Progress Statistics
The system automatically counts the progress of each student in the class and the online learning time, and forms a visualization chart, which can be used for student learning behaviour analysis.

4.2.1.4 Assignment Correction
Teachers can post assignments to students online, view assignments submitted by students, correct assignments, fill in comments and work scores, etc.

4.2.1.5 Online Q&A
Teachers can browse the questions raised by the students in this class and fill in the feedback information.

4.2.2 Test Result Statistics

4.2.2.1 Student Test Progress
The system can automatically count the completion of each student's synchronization test and unit test, and give early warning tips for students who have not completed the time.

4.2.2.2 Test Result Analyses
The system can automatically count the scores of the students in the class, the distribution of grades, the number of students in each grade segment, the correct rate of different topics and knowledge points. And it provides teachers with teaching reference through early warning of low correct rate topics and knowledge points.

4.2.3 Teaching Case Inquiry
Teachers can inquire about courseware, lesson plans, etc. shared by other teachers.

4.2.4 System Management
Through this function, teachers can manage their account information, maintain class and student information, and manage the scope of courseware uploaded by themselves.

5. Conclusion
The research and development of the auxiliary system of health statistics is in line with the development trend of information-based teaching activities. It is more interesting than the traditional teaching model of health statistics. It helps to stimulate the enthusiasm of users who are mainly composed of students, and improve students' ability to learn independently. However, there are still some problems in the system, such as the lack of App quality evaluation system (including evaluation of knowledge content, user friendliness, etc.), lack of intellectual property awareness [3]. Further improvement is needed in the future development of the App. At the same time, the software's functionality can be further extended to remote teacher training and distance learning to further promote the dissemination of quality resources.

References
[1] Zhang Qing, Hu Zhihua. Mobile Internet and Higher Education Revolution [J]. Theory Monthly.(03):58-63.(2016)
[2] Zhang Hongyan. Research on the Construction of Mobile Learning Resources for the "Multimedia Technology" Course APP in Colleges and Universities under the Principle of Primary Teaching [J]. Theory and Practice of Education.(24):50-51.(2014)
[3] Liu Dan, Hu Weixing, Li Yubin, etc. Research and Development Status and Application Problems of Mobile Education APP [J]. e-Education Research.(08):47-52.(2016)
[4] Li Hong, Tian Jing, Zhang Renli, etc. Application Construction of the "Cloud Class" APP Teaching Mode in Nursing Education[J]. Chongqing Medicine.47(10):1425-1427.(2018)
[5] Lu Hongying, Dai Xiguo, Huang Yujian. Design and Implementation of the "University Computer Foundation" Course APP Based on Android Platform[J]. Chinese off-Campus Education (Theory).(3):163-164.(2015)
[6] Yan Li, Liang Yue. Development of Education APP of Education Press [J]. Modern Educational Technology.(01):61-67.(2017)
[7] Cao Jinmei. Design and Application of the "University Computer Foundation" Course APP Based on Android Platform[J]. Computer Knowledge and Technology.13(23):60-61.(2017)
[8] Zhang Hao, Shi Jianxiong, Zhang Yi. Connotative Development of Graduate Education in the Background of Informatization——APP and Postgraduate Courses [J]. Heilongjiang Researches on Higher Education.(07):52-55.(2014)