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A Task-oriented English Education Platform Powered by ICT&AI

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***Abstract*—Lacking of pragmatic competence is a long existing issue for Chinese student, and the problem is even worse for those who live in rural regions, where both teachers and resource are rare. We are trying to break the regional disparity, provide better teaching resources for those in need by means of ICT and AI techniques that highly developed today. In this paper, we present the idea of how we designed and implemented this free English education platform to help kids especially those with financial difficulties to improve their pragmatic competence. In this platform, multiply access methods are provide at user side to adapt to different requirements; the unique server side is developed based on microservice architecture, which make the system easy to expand and maintain; a recommendation scheme and the social media system WeChat are employed as the main promotion methods; class is task-oriented designed to improve pragmatic competence of learner; online class, live video, and AI chatbot will be provided for different training purpose. This platform will integrate high-quality resource, and act as a hub that will connect eager learners and volunteer teachers, who can study and teach anywhere conveniently.**

Keywords- task-oriented; pragmatic competence; resource integration; microservise

I. INTRODUCTION

English has become the main foreign language taught in China for several decades. With the process of internationalization of our economy, mastering English has become a competitive skill in one's career. But there are still some problems in our school English teaching.

A. Lack of Pragmatic Competence

Pragmatics is concerned with how speakers and listeners conduct meaningful conversations through verbal and non-verbal language[1]. Language is a tool we used to communicate feelings, thoughts, knowledge, and culture; it closely relates to your life quality, career competency, and social status. For example, students from China and India are two of the main sources of international students in engineering majors of American universities. They both excel in academic fields, and show similar competence in their profession, but Indian students have outperformed Chinese students in the leadership positions in the major technology companies. As we know, executives of leading firms such as Google, Microsoft, Sandisk, and Adobe are all Indians[2]. Comparing the education backgrounds of Chinese and Indian, the pragmatic competence of English must played a very important role. English is the second official language of India, and is the working language in their schools, so they learn everything in English at school. They use English as a tool -- what a language should be. However, in China, English is taught as a subject; what Chinese students do is to master grammar and vocabulary. Although students learned to read, write, and speak, all they are aiming for is doing well in the subject and getting good grades instead of using English as a tool. Chinese students usually get good scores in TOEFL, but when they go abroad and want to communicate in English with others, they often find the English they have learned for dozen of years seems to be strange and impractical, which would be a very frustrating experience. Our goal for our platform is to make all classes task-oriented and focusing on improving the pragmatic competence.

B. Unbalance of education Resources

Though China experienced high-speed growth in both economy and education during the last few decades, but the unbalanced distribution of resources between different regions is still obvious. In some rural area, a lot of left-behind children are lacking of education resources because few qualified teachers are willing to teach there, hence, students in such areas endure a hard time studying subjects like English. As the Internet became ubiquitous, it offers these children a chance to connect to rest of the world and gain high-quality educational resources. But after all, a lot of online classes are not affordable for them. We are aiming to shrink the huge gap in education between urban-area and rural-area students through by providing high-quality and free course on our online education platform.

C. Evolution of Teaching and Learning Pattern

Classroom, text book, blackboard are familiar to us, and has been the prevalent scenario in school education for centuries. But, things have changed nowadays. Teachers and students use computers, tablet pc, online classrooms, and multimedia systems as teaching and learning tools, which make the process of teaching and learning more enjoyable, effective, and adaptable. Also, as the information and communication technology (ICT) evolves, many online study systems, like Khan Academy [3], work excellently in helping children study. With access to these ICT devices and platform, children can study from anywhere at any time; teachers can also carry out classes anywhere. Artificial Intelligence (AI) is an emerging trend in assist studying.

From the above analysis, we addressed the main issues in current English education, and intend to solve these problems by the aids of ICT and AI technologies currently

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available. We proposed a task-oriented online English education platform, which will unite volunteers from English speaking country to offer free studying materials and classes for students, especial for those who live in rural region, don't have enough study resources, and can't afford expensive additional training. Classes on our platform are task-oriented, addressing specific application scenarios of English, including culture, daily life, academic topics, arts and sports. We aim at improving the pragmatic competence to supplement school education andm helping user to master skill in specific communication task.

II. RELATED WORK

A. English teaching method

English is the most popular language and taught all over the world. Teaching methods evolve and innovate with time.

The most traditional method is Grammar Translate Method (GTM)[4], where teacher control the process and content of teaching. In this 'teacher deliver, students listen' pattern, students are passive and less motivated in acquiring skills to use language. Direct method[5] aims to create direct bond between word and its meaning, thought and expression with the use of audio-visual aids, so students can think directly with English.

Knowledge of language usage is different from knowledge of the language itself, It can't be learned only from books as stated in [6], "traditional textbooks cannot be counted on as profitable materials since they often contain insufficient specific input or insufficient interpretation of language use". On the contrary, consciousness-raising tasks, productive-skills tasks or role-playing activities are different resources for performing communicative acts[7]. In[8], interactive approach which emphasis on the process of communication are used to teach general English, there are a variety of interactive methods that have special effectiveness, such as roleplaying, brainstorming, discussion, case study, debate.

These English teaching methods are the foundations of our platform, and task-oriented interaction method is the core method used in designing the content of classes.

B. E-learning

Smart phone, personal computer, and internet are broadly used in people's daily lives. They brought a great challenge to the traditional "textbook and blackboard" teaching. There are a lot of web-based platform used in education, and Khan Academy is the most famous one among all[3]. On these platforms, huge amount of online videos on different subjects was provided. Another successful platform is VIPKIDS for English teaching. Comparing these two platforms, Khan Academy courses are more pre-filmed videos, students can learn whenever they want, but it requires students to be more self-motivated and resolved to stick to their studying, whereas VIPKIDS's live streaming pattern offers students with individual study service and direct interactions with teachers. However, the courses on VIPKIDS are expensive and the effect is not guaranteed for every single student-teacher pair.

Our platform is developed based on the WeChat, which is responsible to resolve and present content. It enables user to access the platform easily without the trouble to download a new APP. Also, through the outstanding ecosystem of WeChat, multiple access points are available for easy dissemination of our application.

C. Language Learning with AI

The official birth of AI as a new science is generally recognized as in 1956[9]. But it's not until in the 21st century that the increasing computational power revived the application of AI in many fields. AI used in learning language may include the recognition of speech, handwriting, gestures, faces, and facial expressions etc.. Intelligent Tutoring Systems is a computer-based support using AI for educational activities [10]. Language students [11] flips the roles of tutor and student, allowing the user to focus on the basic concepts of the target language and allows the user to learn by teaching. There are some researches and systems, such as MAP Reading Fluency Testing[12]、ESL Robot 'Tutor'[13], that can give advice on language learning, answer grammar questions, correct students' grammatical and spelling errors, answer general knowledge questions and even tell jokes and solve riddles. The foundation of these systems is natural language understanding. AI chatbots rely on training dataset that would ensure higher success rates and less confusions for the conversational agents.

Chatbot is absolute an economic solution to improve communication competence of students. We are intend to use it as the interactive chat assistant to train speaking ability in purposely designed task and context.

III. SYSTEM DESIGN

Our system aims to provide an integrated platform for people to teach and study English conveniently, so the convenience, simplicity, and adaptability are the main objective when considering the architecture design. Users should get access to our platform through web browser and mobile app at their convenience; functions are provided to maintain users' history so they can keep track of certain classes; recommendation mechanisms are set to increase user engagement.

WeChat[14] is the biggest and most influential social network in China, with over 889 million active users., it is not just a social media system now, but provides a high level software interface, and since WeChat App have some advantages in development, configuration, and dissemination, it become a booming trend to use WeChat app to access and service resources.

A. System Architecture

There are 4 layers of our platform, user layer, access layer, service layer, and resource layer. In user layer, as shown in Fig.1, WeChat client on mobiles or browsers on PC can be used to access service platform, administrator configure service and resource with management client.

Access layer provides connection to public internet access and WeChat high level service interface; service layer provide independent services that meet user's need; and resource layer contains the all kind of data inside or outside the organizations. By this architecture, we separate service and resource to provide more security and flexibility; front-end applications are independent, and share the same back-end service, which make the system more extensible and maintainable.

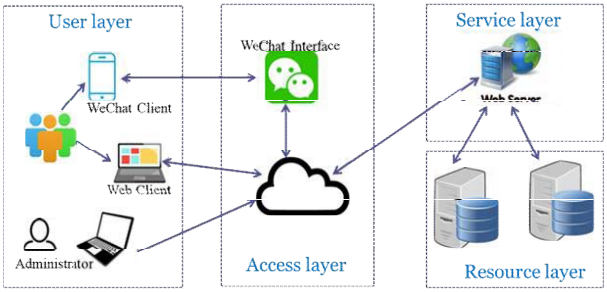


Figure 1. System Architecutre

B. 3.2 System Functions

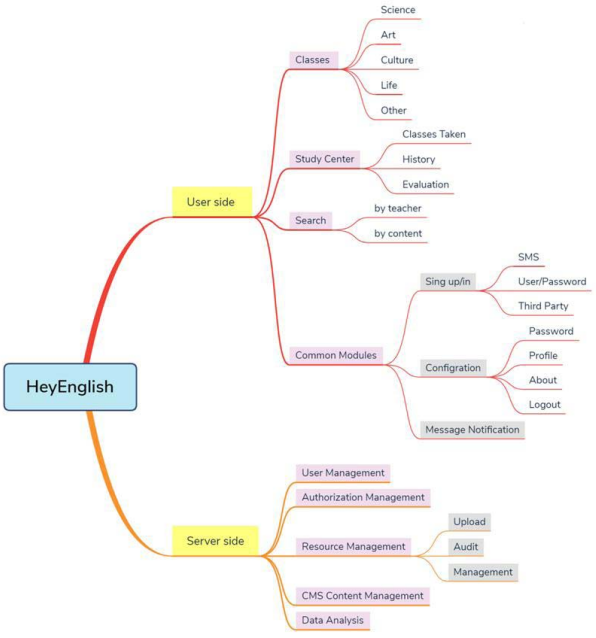


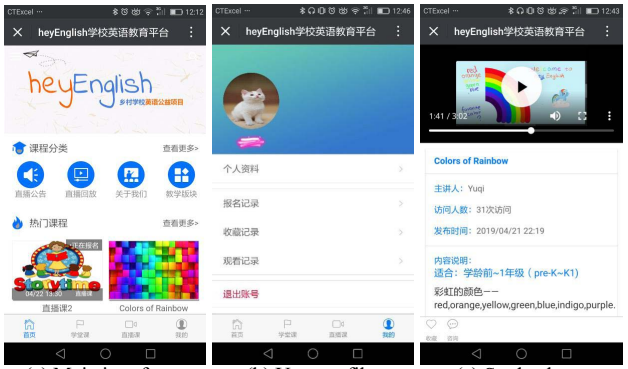
Figure 2. System Functions

The system functions are grouped into user side functions and server side functions, as shown in Fig.2. Class presentation and study center are the core functions on user side. Though these functions, user can easily find proper lessons, track favorite lessons, take part in a class, and evaluate the class. On server side, the core functions are resource management and data analysis. Class resources are checked, edit and uploaded online by authorized user. User data and study record are analyzed dynamically, and help system to recommend class to user and to determine the class setting strategy.

C. System implementation

Our system is built on WeChat application interface. WeChat App has a JavaScript engine, it is responsible to implement JavaScript code of our user-side program, and APIs in program were also translated to WeChat native interface to realize corresponding function. So our user-side presentation was resolved by WeChat, and we don't need to develop different App for different OS platform. Our service side is deployed on Alicloud; Java and MySQL are used to develop software.

The main interface is shown in Fig.3(a), it presents the main functions, newly uploaded and popular class videos. Fig.3(b) shows the user profile, which is useful for user to keep track of his class, and it also record information that will be used in our recommendation system. Fig.3(c) is the class video playing interface, user can comment and rate this video after studying, and these feedback information from user will play an important role in class recommendation. Fig.4 shows the serve side management interface, administrator can configure the system and manage class resources with it conveniently.



(a) Main interface (b) User profile (c) Study class

Figure 3. User Side Presentation

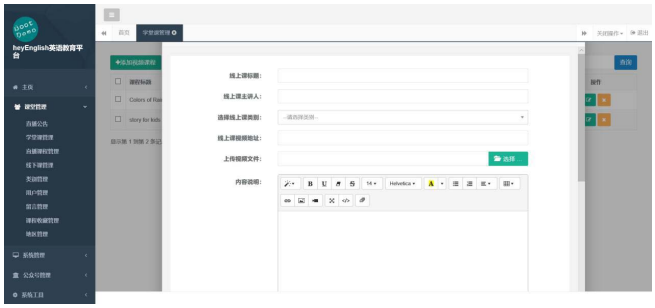


Figure 4. Service Side Management

IV. KEY TECHNIQUES IN OUR PLATFORM

An online teaching and learning platform is a systematic project, it includes many technologies to cooperate together

to reach its goal, the techniques used is not only about IT techniques, but also about teaching techniques and user services.

A. Microsevice technology In System Implementation

Microservices is a specialization of an implementation approach for service-oriented architectures (SOA) used to build flexible and independently deployable software systems[15]. Considering the future expansion of functions and the convenience of development and maintenance, microsevices architecture was employed to meet our requirements. Our server-side management system was BootDo framework, which is a Java development platform based on SpringBoot[16]. Currently, our microservice modules include account service, class service and studying service, as shown in Fig.5, and encapsulated all functions mentioned in section 3.2. Every service module runs as an independent Java thread on independent virtual machine, and communicate with inter process communication. Node.js is used to integrate all the back-end services and provide a unique outlet of service for front-end application. Services will be expanded further as more functions added to this platform, like payment service, live class service, test service etc..

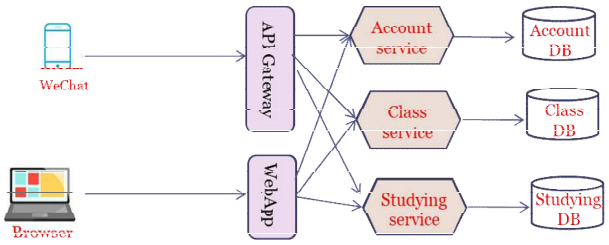


Figure 5. Microsevice of the platform

B. Class Recommendation and Promotion in User Service

When user sign up in our system, we would ask for some optional information like age, grade, hobbies, preferred class etc.. Whenever user sign in the system and study some class videos, their study record and rating to the videos would be recorded. This data can help them to readdress these classes conveniently, and we can also learn their preference through this data and use it for future recommendation. We use KNN algorithm implementing a simple content-based class recommendation. For each class video uploaded, it has some descriptions, which is served as feature of this class. Then we will search the study history of the user and find N most similar classes this user had studied, calculate the preference value of the new class according to the rating that user gave to these N class. If the preference value exceeds a given threshold, the new class will be recommended to the user.

Promotion is always the main issue for a project to be successful, and that is why we use WeChat app as a front-end. As a sub-application within the ecosystem of WeChat, our application can make use of its huge user group, strong dissemination capability and many promotion functions, like 'precision pushing' , to spread in potential users. Also it can be linked to subscription and service account and create multiple touch point across WeChat platform to get more users involved.

C. 4.3 Task-design in Class Presentation

Task-oriented English teaching is a student-centered method teaching students how to communicate in a specific task. It focuses more on pragmatics rather than on grammar and vocabulary, but, in fact, this method is also efficient in helping students understand grammar and memorize words in the context of practical English usage. Tasks could be visiting a doctor, academic discussion, job interviews, etc. A big task can be subdivided into small task units. For instance, we will give a task-design example of seeing a doctor, and then we use a bonefish diagram to analyze each task. As shown in Fig.6, task initiates from right and end in left, each step is a phase in performing the task. When a patient (P) goes to see a doctor (D), the common process is consist of 5 steps for doctor to get a conclusion, that is: (1)asking symptoms, (2) inquiring symptoms or disease history, (3) doing examination, (4) giving diagnosis, (5) making prescription.

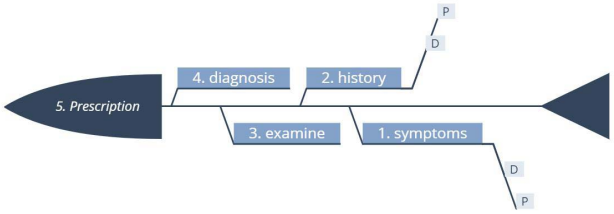


Figure 6. Task Design

The following is an example conversation, and D(i) denote the conversation conducted by doctor in the ith step in Fig.6:

D(1): Hi, what's wrong?

P(1): I feel unwell and keep vomiting all the time.

D(2): How long have you felt like this?

P(2): Nearly two days. It started just before going to bed the day before yesterday.

D(3): Let me examine you. I will press on your stomach to see if it hurts and then listen to your heart.

P(3): Ok. It doesn't hurt when you press my stomach. I just feel tired.

D(3): Ok. Did you eat anything different from usual before you started to feel this way?

P(3): Yes my boyfriend cooked dinner for me. He isn't a very good cook and the food tasked a bit strange.

D(4): You've got food poisoning. It is not very serious and you should be better in another day.

P(4): Oh dear, what should I do.

D(5): You need to drink lots of water and get plenty of rest.

P(5): Ok, thank you doctor.

D(5): You're welcome. If you are not better in 48 hours come and see me again.

This task design covers the process of a conversation, teaches students how to handle a certain application scenario.

D. *Chatbot in communication training*

AI is a feasible solution in assisting English studying [17]. *Heyee* is the name of our chatbot program used for communication training. Chatbot response to the input of user, and generate proper answer based on deep learning algorithm. We use seq2seq[18] as basic framework, which consists of two recurrent neural networks (RNNs)- an encoder and a decoder, as shown in Fig.7. The encoder reads the input sequence; capture the essence of the input sequence. Decoder takes context representation from the encoder and generates an answer. *Heyee* now is trained on the Cornell movie dialog corpus[19], but it not so effective when user 's inputs are random, more training works are going to be done further to improve its performance.

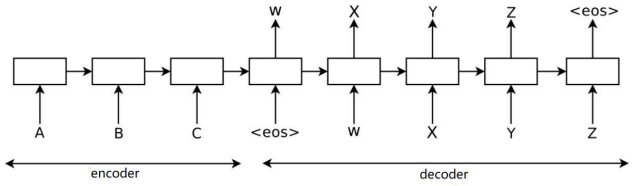


Figure 7. Base framework of *Heyee* chatbot

V. CONCLUSION

Our English education platform relies on the current highly developed information and artificial intelligent technologies, which help us to integrate education resources, build convenient user network, track teaching and learning performance, and provide better education opportunities for rural kids. Compared to current online teaching and learning systems, this platform has many advantages, which we will summarize in two aspects as follows. On technical aspects, first, it adopts multiple access patterns, users can use browsers and WeChat as the access entrance to the platform without the disturbance to install an extra App, and so it is user friendly; second, as a WeChat application, it will inherit and employ the huge user group and will be spread easily due to of WeChat; third, it is developed based on microservice architecture, which makes developing, maintenance, and function expanding easy; fourth, state-of-the-art AI techniques are used for pragmatic English teaching and learning to decrease the cost of operation; user recommendation system is designed to improve user experience and stickiness. On the educational aspect, task-oriented design centering on the pragmatics is used, so users can learn how to solve specific problems and tasks in real life.

In all, the platform is intentionally designed in system architecture, course content and user service, it provides a novel online English teaching and learning solution. In further studies, AI assistant will be our focus, which will cut the cost of operation of the platform and make it more available for rural students; some more promotion and incentive functions will be added to the platform to make it more professional and adaptable.

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