

The Localization of Praxis-Oriented Research: Creating Service Design Applications

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Abstract--In this study, a mobile application development course was implemented from the perspective of technology, so that all of the inexperienced students who took the course were eventually able to independently develop a mobile application with their team to present their learning effects. The course structure was based on the service learning theory. The teacher led the students in performing field research and interacting with local residents, stores, and government agencies, so that the students could design a localized mobile application service based on the background and problems that they encountered. The core value of the study is to reach the goal of 'digital empowerment' of newer users, by training 'digital natives' who will most likely in the future design applications for 'digital immigrants'. According to the result, users were more willing to use the mobile applications proposed in the course based on the service learning theory, and they found learning more enjoyable. The focus of this study was on a coherent teaching method incorporating both practical and theoretical aspects, to assist students in learning to create localized mobile application services of higher adhesion for every user.

I. INTRODUCTION

The rapid advancement and growth of ICT has not only made daily life more convenient, but also gradually changed users' habits and models. The phenomenon and discussion about 'digital natives' and 'digital immigrants' [14] proven the importance of technology in modern lives. The 21st century is the century of digital technology and the immersion of technology in daily life is a on-going trend. Most people, especially younger generations, have lived following and accompanied by the rapid development of digital technology [9]. Their acceptance of digital technology is getting higher and higher. With various established digital information structures, more and more diversified and richer digital value-added services have been developed.

With the coming of 'digital century', in the field of learning, attention has been drawn to the combination of digital technology and education. For instance, Attewell [1] performed a four-year mobile learn project in three European countries, covering practices of learning systems, implementation, and trainings. This project provided teachers a new teaching tool. Motiwalla [13] as well voiced in for the high potential of applying digital technology in course teaching. He allowed his students to use mobile devices, such as wireless or hand-held devices, inside and outside the campus, in order to enhance the effect of learning. Also, he

proposed an experiment structure and an evaluation method, proving the high feasibility of applying mobile learning in education. From their insightful study, Ruchter et al. [16] suggested that the effects of the learning method with mobile technology nearly equals with the method of traditional in-class one-way teaching. With the help of mobile technology, newer education methods can largely improve learning motivation and also make students immerse themselves in learning. According to the studies mentioned above, this paper focuses on the application of mobile technology in the field of education.

Digital technology has not only rendered daily life more convenient, and contributed to the improvement of several social issues, including medical care problems. For instance, Wu et al. [17] modified the technology acceptance model (TAM) and expanded it to design a mobile medical healthcare system (MHS). The result showed that with the effect of mobile technology on medical diagnoses is positive. Also, as more and more information environment structures being implemented, cloud computing and ubiquitous computing have made mobile medical healthcare even more easy and applicable. Doukas et al. [6] developed a medical healthcare application on Android platform, with which under a stable Internet environment, that allows users to synchronize personal health condition and check on their basic health records through smart devices. Bourouis et al. [2] combined smart phone devices with a physiologic sensor, and designed a remote monitoring system that makes sure the safety of lone elders. In dealing with daily issues for autistic children in school, Mintz et al. [12] designed an application that helps discovering problems they might encounter. The authors also try to find the causes and offer assistance with newer technology designs. In hopes of improving learning for challenged individuals, Brown et al. [4] developed an Android location-based service (LBS) mobile game and performed follow-up evaluations and tests.

The increasing popularity of social networks has increased the attention focused on the combination of location-based service (LBS) and social networks. A part of LBS studies focused on certain groups of people. For example, Ferris et al. [7] designed a value-added service for passengers who take buses in Seattle, in hopes of improving the mass transportation issues of the city. Also, increasing attention has also been focused on LBS applications in specific cities, institutions, or regions. Ratti [15] collected information and

data in Milan with the LBS design for future research regarding the city's planning and development. Karamshuk et al. [10] demonstrated how to find spots for new retail store with the help of LBS. According to the aforementioned and implementations, mobile value-added services combining mobile technology, social network, and LBS have been applied in various fields.

The digital generation's acceptance of technology, particularly that of younger groups, has been increasing. Although society is aging, elderly people can communicate with younger people by learning to use digital technology. This was the impetus for this study. Based on the concept of digital natives, this study was intended to assist students in understanding the roles digital technology play in various fields in modern society, through a university course. The core value of this course is to train 'digital natives' to think and design for 'digital immigrants', so that their applications and designs could actually 'empower' inexperienced users and let them enjoy the convenience of technology as well (as illustrated in Fig. 1). Specifically, this course was first designed for the graduate students who took the course. In addition to participating in in-class discussions, the students, guided by the teacher, also visited a research area. This course was intended to assist the students in creating a deeper link to the field through a series of design and thinking units, observation, question discovery, design and planning, method design. Therefore when the students develop actual mobile

services in the future, their design consideration can be broader and more complete from a macro-view, thus benefiting and empowering experienced and also new users of digital applications and technologies.

The following section presents the project results of the students who took the 18-week course. After the course was completed, we compared the applications developed by the students with other applications available on the market. Finally, this study was in the form of the course driving the research at the same time; therefore, the final section of this paper describes the learning effects of the students due to this course and discusses the value-added applications based on the latest mobile technology, as well as suggestions for future course design.

II. THE INTERACTIVE COURSE

In traditional teaching, learning typically occurs through teachers explaining and illustrating. However, this type of teaching is one-way; although students can raise their hand and ask questions to obtain further information, personal participation and involvement in the learning effects of this method is insufficient and students who never ask questions actively. Thus, this paper proposes a course based on the service learning theory, to improve the traditional one-way teaching model and offer students more complete understanding and experiences (Table I).

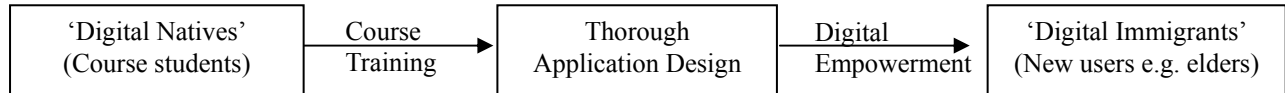


Fig. 1. Course Core Value

TABLE I. INTRODUCTION TO THE COURSE

Basic course information	Elective course name: Interactive Technology: Media, Perception, and Design Focus area: Culture-oriented living technology Provided by: Digital Content Master Program, NCCU Course duration: September, 2011 to January, 2012
Student Information	No. of students: 11 graduate students Academic background: - Human society: 1 student - College of Science: 4 students - Digital content: 6 students
Teaching Hours	Total: 227 hours - Teacher lecture: 60 hours - Field expert speech: 24 hours - Field survey: 20 hours (2 surveys) - Enterprise visit: 3 hours - Experiment/practice: 90 hours - Project design and presentation: 30 hours
System Development Technology	An application for smart phones with GPS functionality - Development environment and programming language: Macintosh, Objective-C - Hardware: iPad 2
Teaching Sharing Platform	Moodle with an open teaching practice platform (OCW/OEP)

The term “service learning” is extended from experimental learning. Early in 1984, when [11] proposed the learning cycle model, the basic spirit and structure of service learning had already been established. The concept of the learning cycle model is that through continuous observation, understanding, introspection, problem-solving, and experience generation, a continuous cyclic effect can be created in learning, achieving the goal of life-long learning. In addition to this fundamental theoretical structure, the service learning theory also emphasizes creation, deep social identification, and values. Reference [3] stated that the core concept of the service learning theory is not merely inducing higher learning motivation in students, but also facilitating communication and interaction between students and other social groups, so that they can learn more easily while considering whether what they have learned can resolve the observed problems. Thus, students’ sense of identification and connection with groups can be continuously improved. Specifically, this method can be used not only to teach students academically, but also to provide them with opportunities to participate in resolving problems. For example, practice in enterprises improves students’ perception of problem-solving. Furthermore, students are asked to enthusiastically participate in social group activities, such as becoming a teaching volunteer in a remote area. Thus, students can observe society more easily and help to make improvements. Finally, based on teachers’ in-class teaching and students’ social participation, students can consider whether what they have learned in class can be applied to resolve problems in society. This type of learning cycle model allows students to actively participate, introspect, and solve problems, and increases students’ sense of identification in society and creates common values.

The study by [8] is the first example of applying the service learning theory in an information technology (IT) development course provided by a university. In that course, the teacher asked the students to cooperate with a nonprofit organization or government institution, which provided the IT students with data and resources with which to observe large and small problems in society and propose corresponding solutions. Thus, the students not only learned the technology for IT development, but also participated in the process of resolving social problems, thereby developing their social identification and powers of observation. Based on these benefits, we implemented the service learning theory in a university course so that the students could learn the essence of the service learning theory and develop identification and values regarding society. The following paragraph contains a detailed introduction to the course. The introduction is divided into the core concept of the course and the course process planning.

The core concept of this course was to base the teaching structure on the service learning theory, beginning with research and following practice planning to enter the cultural field to explore problems and learn experiences, in order to discuss the relationship of interactive technology and digital

content with smart living, and use applications and theoretical analyses as the sensual interaction from a physical space to a virtual space, so that, eventually, the students could not only learn the academic theories and practice skills, but also improve their connection with space and areas and their social identification. Specifically, according to the service learning theory, students can first learn in classes to familiarize themselves with the learning goals, simulate problems, and discuss the theory. The teams were asked to make a field visit to the study region to observe possible problems and propose corresponding solutions based on new technology. Finally, the practice was performed in teams. Each team had to implement their project to realize their solution and feasible development technology teaching. Based on the policies of making the place to adopt the technology and making the technology to adopt the place, LBSs were integrated so that the course could offer an innovative teaching model. Table II summarizes the course process.

The backgrounds of the students who took the course were diverse. Among the 11 students, only the four from the College of Science had experience in information system development, but not for a mobile platform. Thus, all the students of this course were new to mobile platform development. Only one-fourth of the total course hours comprised one-way teaching. To increase field experience, the remaining hours comprised expert speeches, experiments and practices, and enterprise visits. All of the students were taken to the study area twice so that the teams could determine problems and plan solutions. Thus, the space connection between the students and the region was enhanced. The problems observed after the field surveys could be used as references immediately for system building and adjustment. The next section introduces and discusses the study area.

III. AN INTRODUCTION TO YILAN

Yilan is located in north east Taiwan, next to the capital of Taiwan, Taipei City. Yilan is surrounded by mountains on three sides. The Pacific Ocean is on the east side of Yilan. Yilan has a diverse natural landscape. In addition, since the HsuehShan Tunnel was completed in 2006, the convenient transportation has attracted increasing visitors. The driving time from Taipei was reduced from 2 hours to 50 minutes, increasing the motivation of Taipei City residents to visit Yilan. In the early 1940s, Yilan was a key area for the economic development of Taiwan. The lumber industry was flourishing and, because of the rich high-quality wood from Taiping Mountain, the annual wood-production of Yilan was the highest in Taiwan. As the country developed and the lumber industry transformed, Yilan gradually changed from a rural province to a large city focusing on tourism, based on its local resources. In addition, because Yilan directly borders Taipei, modern constructions and design services have increased in Yilan. For example, numerous delicate B&Bs

TABLE II. COURSE PROCESS

Digital technology media and creativity				
Introduction to the service learning theory				
Quantitative research analysis				
Fast prototype development				
Smart living perception analysis and planning				
Introduction to the basic structure for development				
First field survey				
Proposal writing				
Mobile service content planning and design				
Design, building, and experiment				
Foundation of system development applications				
Second field survey				
Application development				
System adjustment and building				
User testing				
Result presentation				
	9/14 – 10/19	10/26 – 11/12	11/26 – 12/17	12/31 – 1/14

have been constructed in Yilan to enhance tourist enjoyment and water parks have been designed to attract families to visit. The National Center for Traditional Arts has played a critical role in the preservation of the history of Yilan. Countless scenic areas and a rich history and culture are the reasons for which Yilan is highly attractive to tourists.

Thus, in this study, Yilan was selected as the research region. It was hoped that the implementation of technology can bring more modern feelings to Yilan's image and technology can facilitate communication between modern people and space, so that people can learn about the history and cultural values of the city more easily [5]. We also hoped that, through this study, the students would not only assist with the implementation of technology services but also become more familiar with Yilan.

IV. STUDENT PRESENTATION OF MOBILE TRAVEL APPLICATIONS

This section presents the applications developed by the students. The study region was Yilan and the target group was the mobile travel amateurs with smart phones. Based on these two points, we requested the students to develop a mobile travel application to assist tourists in learning about Yilan and love Yilan more by providing information regarding scenic spots and content design. Regarding system design, considering the students' development capability and the hardware and software environments, we chose the client-server structure as the core of the lessons. Figure 1 presents the system structure that was taught to the five teams of students. Mobile devices were defined as content carriers. Users had to be able to use the basic scenic-area search function without internet access, whereas connecting to the Internet should provide further information. This design was more a win-win design. This system structure allowed the development process to be simplified and more efficient. It also assisted in improving the richness of the content. The threshold of developing an application on a mobile device platform was lowered; however, the students who were familiar with the Internet development environment were

able to provide additional content by using the Internet.

However, the numbers of students of the teams and their development capabilities differed. Consequently, not all of the applications developed by the teams met the requirements of the system structure, as indicated by Fig. 2.

- Yilan Spring

- Idea for the content

Yilan boasts abundant natural resources, among them, hot springs and cold springs are the most popular in Taiwan. Thus, this application aimed to provide tourists with directions and indicators of prices and qualities. Specifically, this application first loads a business database of resorts and hotels, including reviews. Next, the application calculates the distances between the user and these places through the GPS function. Thus the user can immediately obtain information regarding high-quality hot springs in the vicinity. The information provided by this application includes photos, addresses, contact numbers, brief introductions, reviews, and promotional programs.

- Go Yilan

- Idea for the content

One of the major features of Yilan is its scenic areas. When developing a travel application, how to collect information on scenic areas is a major consideration. Thus, this application used the Gowalla social network as a source of scenic area information because Gowalla contains travel notes and check-ins. It was popular among backpackers and was therefore purchased by Facebook at the end of January, 2012. This application was developed by one person. Because of the limited development time, it was difficult for a single person to complete design, development, and content planning. Thus, during the course, the focus of this application was on the technical aspect of system development. The UI design was arranged as a follow-up task.

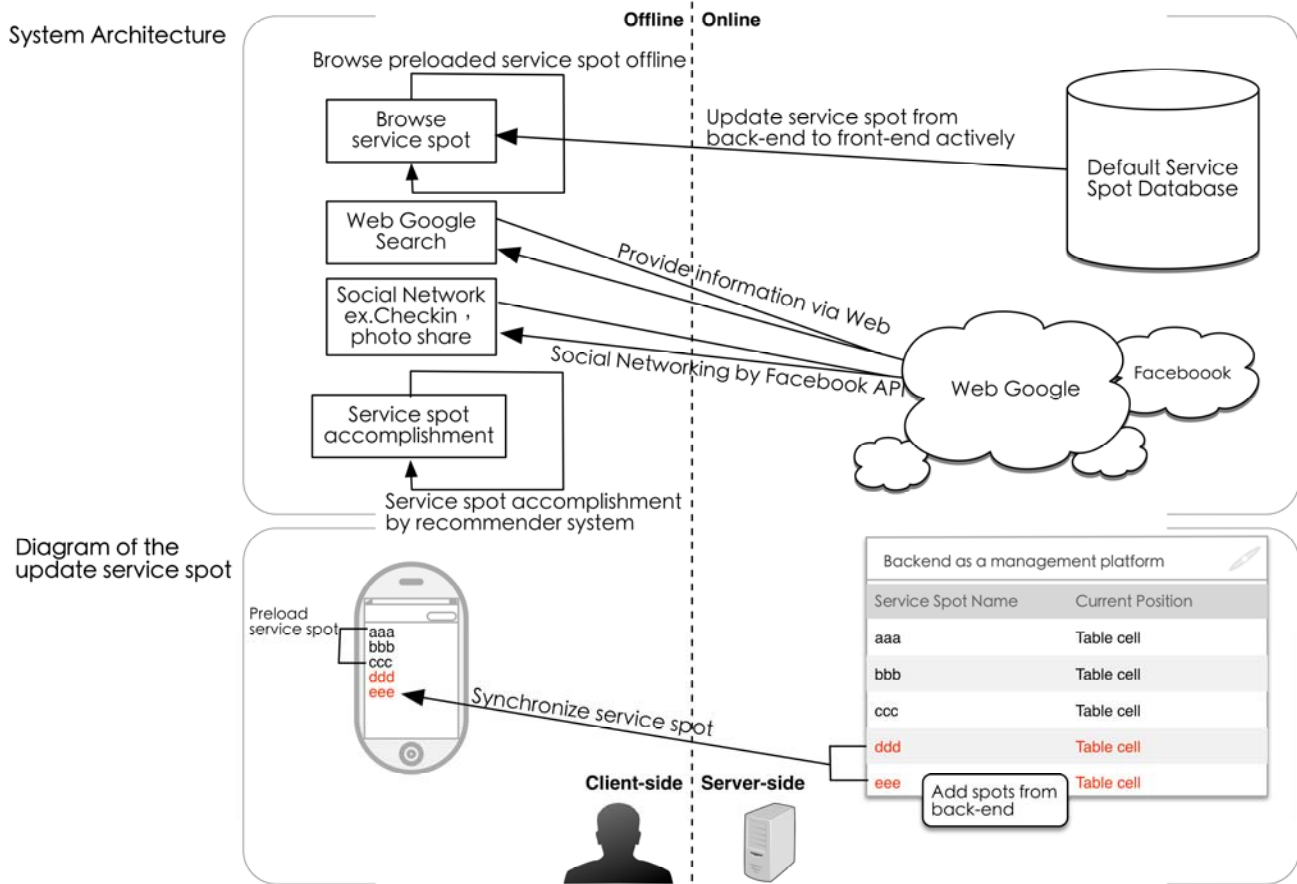


Fig. 2. System architecture for project management system

- War of Kamalan
 - Idea for the content

Yilan comprises numerous cultural and scenic areas of historical interest; however, the general public is typically uninterested in this topic. Thus, this application was designed based on the scenic areas of historical interest and the idea of passing challenges in games. Thus, users could not only retrieve historical and cultural information when visiting the historical sites in Yilan, but also be entertained by playing a challenging game. This application was also designed to calculate the distances between the user and historical sites by using the GPS function and provide information based on the calculated distances.
- Woodman Diary[5]
 - Idea for the content

Taiiping Mountain is located in Yilan. The lumbering industry here was one of the major economies in Taiwan. The forest resources on the mountain are rich. The lumbering operations of cutting wood, logging, delivery to wood storage pools, and making products of economic value is now rare. With government

assistance, eight lumbering pathways are currently preserved. Thus, this application was designed in hopes of attracting more young people to learn about the critical history of the Taiping Mountain lumbering industry by using a mobile device. In addition, this application was integrated with a social network, so that users could share related information with their friends to enrich their knowledge and make travel notes. Information dissemination could thereby be achieved.

- Yilan Good Design[5]
 - Idea for the content

This application stressed that we live in a sight-based world and people can easily be attracted by beautiful things. Thus, the application was developed with design elements along with the travel guides. In addition, interaction, entertainment, and information sharing features were created through inclusion of a game and integration with a social networking platform. The scenic area information was categorized into five types. In addition to offering scenic area information and photos, this application also provides

a map based on the social network for the purpose of bringing users better experiences in using this application.

V. SUMMARY AND FUTURE STUDIES

The aforementioned applications developed by the five student teams were designed for Yilan tourists. With the support of the course design and the service learning theory, the local features of the applications developed by the students were substantial. Although the contents of general tourist guide mobile applications are richer in comparison, certain local features are neglected. The advantages, and disadvantages of the applications developed by the students and the mobile travel applications available for various cities and counties in Taiwan are discussed as follows.

- Interface Design

The first aspect most users consider when downloading an application is the visual design. To attract more users in an online store, the design styles of most applications on the market are above a certain standard. The interfaces and operations of these applications are designed based on the theme they aim to present. The threshold for mobile development technology has lowered and numerous resources, such as packages and tools for mobile interface design, are available. Experienced developers can create more interactive elements in practices by using these resources. Inexperienced developers can still design a visually appealing interface for a system above a certain standard if they have sufficient time. Thus, from the aspect of interface design, the applications available on the market are more competitive with stronger advantages than the applications developed by the students. However, as previously mentioned, numerous open development packages and tools are available; with sufficient time, students can develop applications of more attractive appearance. Among the mobile travel applications developed by the students, the interface design of Yilan Good Design was the most appealing and above a certain standard.

- Content Provision

Travel applications developed by the government typically aim to facilitate local tourist industries and economies by using smart phones. The information and historical data of scenic areas owned by the government are typically richer and more complete. Thus, this type of application typically provides as much information as possible to users. Based on the information provided, users can locate desired information at any time. However, from the perspective of users, if rich resources are provided without a user-friendly interface, the user experience is poor. Users do not want only rich resources; they also want useful information in real time which they can use easily. This is particularly true for mobile travel amateurs. Thus, how to assist users in locating the precise

information they require while traveling is a critical factor for mobile applications. The content provided by the applications developed by the students might be much lower than the aforementioned applications; however through clear product positioning and scale definition, users can easily understand the user scenario of these applications when downloading them. Thus, the amount of information required to be provided can be reduced, and the services can be more focused. The Woodman Diary application is an apt example because it focuses on the lumbering industry culture of Taiping Mountain in Yilan. When users use this application, they can easily concentrate on the lumbering industry information without losing their focus.

- Information and Knowledge Dissemination

Because of the development of the Internet, people's life experiences and knowledge can be shared with friends easily through social networks. It is beneficial for the development of mobile platforms. However, how to transform information into more valuable knowledge before disseminating it is critical from the perspective of tourism promotion. One-time visits often play a critical role in sense of mystery and freshness. However, business opportunities and greater values lie in returning customers and revisits. If scenic area information can be delivered to users efficiently and transformed into knowledge, users can become more interested in the scenic area while learning more about the background and history of their travel destination. This is an efficient method of dissemination by transforming information into knowledge. Thus, this paper emphasizes that user experiences from the complementary relationship between content provision and interface design is the most crucial factor relating to information and knowledge dissemination. The focuses of the applications developed by the students were on some user scenarios of a specific theme. Thus, information and knowledge retrieval was more concentrated. Through integration with a social network, information and knowledge could be shared efficiently. The performances of the 10 aforementioned applications were superior to the applications developed by the students regarding information dissemination. However, the same might not be true regarding knowledge retrieval. Whether a product is clearly positioned and whether user experiences are good enough is critical. Providing more information does not necessarily mean generating more knowledge.

Finally, the applications developed by the students were developed within 18 weeks. The interface designs were rough and little information content was provided; however, clear product positions and user scenarios were the primary features of these applications, as well as the service learning theory. The students developed a strong sense of identification and values for specific places or space in

addition to working on system development. It was difficult to develop a perfect application within the limited course duration. However, prioritizing product positioning can lead to improved user experiences and scenarios. If there is sufficient of time for development, the problems of limited information content and unattractive interface design can be easily resolved.

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