Research on User Experience of Mobile Learning System Based on WeChat

Lei Peng*

Division of Human Resources, Guangdong University of Finance and Economics, Guangzhou, Guangdong, China.

* Corresponding author. Email: penglei@gdufe.edu.cn Manuscript submitted July 10, 2020; accepted October 18, 2020. doi: 10.17706/jsw.16.2.55-66

Abstract: Based on the theory of user experience design, this paper analyzed the key factors of mobile learning system user experience based on WeChat, and with the development practice of "mobile micro-classroom system" it also analyzed the roles that technology of Responsive Mobile Webpage, OAuth authentication technology, WeChat template message technology, and WeChat JS-SDK technology played in improving the user experience of a mobile learning system. Questionnaires method have been used to analyze the applying effect of the system. In conclusion, the users were satisfied with their experience in mobile learning, and insights in the development of mobile learning systems are also summarized.

Key words: Mobile learning system, WeChat, user experience

1. Introduction

As a social application for smartphones with an extremely high installation rate, WeChat has a large user group, particularly among students. Due to the broad accessibility provided by WeChat API for mobile applications from various industries, learning via WeChat platform in the field of education has become commonplace. It is known from the literature that the existing research on mobile learning includes the design and development of mobile learning platforms based on WeChat, the creation of a mobile learning environment based on WeChat, and experimental research of curriculum learning supported by WeChat platform.

An excellent educational App requires strong market competitiveness and development prospects. Apart from the user volume, the more important thing is to increase user retention to achieve product objectives by optimizing the user experience. Wagner [1] thought that "in the mobile learning environment, the better the (user) experiences are, the more behavior of learning occurs," thus, the user experience design of mobile learning applications has received much attention from researchers. The issues surrounding the user experience of mobile learning applications have been extensively discussed by scholars worldwide, mainly in three fields:

- Based on user experience theory, using different technologies to improve user experience. Shen [2] explored the role of a mobile learning application that achieved emotion perception by using multiple modal effective detection techniques in improving the user experience; Lee [3] analyzed the role of enhanced mobile learning systems based on voice recognition in improving the learning experience of English learners.
- Designing evaluation systems to measure the user experience of the mobile learning application. Xueming Zhao [4] built a fuzzy comprehensive evaluation model based on the fuzzy evaluation theory and the analytic hierarchy process to evaluate the usability and user experience of mobile

learning APPs; Hassen [5] also presented a framework to evaluate the usability and user experience of mobile learning APPs.

3) Summarizing the theoretical frameworks which are used to guide the development of mobile learning applications that focused on usability and user experience. On the basis of a large number of mobile learning application development cases, AMIR [6] summarized a framework named Mlux which was used to guide the design and development of mobile learning applications that focused on user experience; Zhiwang Yuan[7] designed and completed a mobile learning system based on Android mobile browser by integrating the user experience idea into the process of mobile learning system development and summarizing its design pattern.

Many issues have been discussed; however, the user experience of the mobile learning system based on WeChat has not yet been given enough attention and explored in-depth.

This paper focuses on the theory of user experience and the characteristics of mobile applications, to analyze the user experience factors of mobile learning systems based on WeChat and discusses how to improve the user experience of mobile learning applications on a technical level.

2. Analysis of the Factors of User Experience

There is no consensus definition of what user experience is in academia at present. In many cases, the most well-known definition is from the ISO 9241-210 Standard: "People's perceptions, impressions and responses to products, systems or services that are used or expected to be used" [8], which could be understood as some psychological sensations arising while the users are involved in a human-computer interaction. Sharing the same situation with the user experience, there is no unified view about which factors make up the user experience. Shen [9] believed that the factors affected the user experience included three aspects: the content, which means the quality of the offered learning material, the teaching process, which means letting learning integrate into daily life, and the learners themselves. From the point of view of website design, Garrett [10] believed that the user experience should be divided into five levels: the performance, the framework, the structure, the scope, and the strategy, in which there were three factors should also be considered through information architecture, interactive design, and visual design. Rubinoff [11] put forward the Four-Factor Theory, which contained sensory impression, usability, function, and content. Overall, "factors in user experience are not explicitly determined according to any one of the theories mentioned. In specific researches, it is actual issues that choose theories" [12]. Thus, the Three-Factor Theory of Garrett is adopted in this paper as it closely relates to the research objectives of this paper. Here are some definitions of these three factors:

- Information architecture refers to the structure of an application system, organizing, designing, and placing of content based on user needs analysis of the entire application system (navigation system, label system, indexing and retrieval system). It focuses on designing organization classification and navigation structure, which lets users browse the content of the application efficiently and effectively.
- 2) Interactive design refers to a mechanism of interaction between the designer and the product (or business), primarily the user's ability to operate the functions they need in the process of using the system, and how comfortable and challenging it is.
- 3) Visual design refers to bringing out a reasonable combination and distribution with various factors in the UI, in order to arouse a good impression from the user of the product which includes the interface design, icon design, color design, and others.

3. Analysis of User Experience Factors in Mobile Learning System Based on WeChat

Journal of Software

An essential difference in user experience between the mobile application and PC application is that the mobile application has a changeable using situation (for instance, massive difference of hardware and system properties of accessed devices, the restriction of network access, and changing locations of usage), thus, it is necessary to consider how the mobile situational factors would influence the user experience during our research. When it comes to the factors of user experience of a mobile learning system based on WeChat (hereinafter referred to as "WeChat Mobile Learning System"), the first step would be to analyze the implementation principles of this mobile learning system. From a technical point of view, the WeChat Mobile Learning System is essentially a set of dynamic webpages based on the Open Interface Specification of "WeChat public platform (mp.weixin.com)," as shown in Fig 1 which is the technical architecture analysis of this system.



WeChat public platform (mp.weixin.com)

third-party mobile learning platform

Fig. 1. Diagram of WeChat mobile learning system.

All viewable WeChat messages and instructions sent by users are forwarded from the "WeChat public platform (mp.weixin.com)," and the pre-configured mobile learning platform interface URL and TOKEN are the destination of the information forwarding. When the user sends a message via WeChat, it is first received by the "WeChat public platform (mp.weixin.com)", then packaged as XML and sent to a third-party mobile learning platform which is designated by the configuration interface, this kind of mobile learning platform is a dynamic web system based on HTML5, and its business logic layer is responsible for processing the received XML message. The design of the mobile learning platform is directly related to user experience. At the beginning of implementation of blended teaching mode based on Blackboard platform (system), those teachers who participate in should allow students to be acquainted with structure and functions of various parts of network-based learning platform about curriculum. After that, make students to set curriculum learning guidance under the module of guidance learning and guiding contents of each chapter from the blackboard platform. Teachers start teaching after preparation. On one hand, teachers carry out teaching as a practitioner and on the other hand, they are observing the service condition of network learning platform as observer. When completing teaching, relevant introspection record should be written by teachers to self-examine their teaching conditions and application strategy, method, and effect of network learning platform. Meanwhile, as the author of this paper, I have observed the teaching conditions and interviewed teachers and students as well as analyzed the materials used in the network learning platform.

3.1. Information Architecture

The information architecture of a mobile learning system should have function modules of learning content management, learning process management, learning evaluation management, and user management. [13], and its navigation system and layout design could refer to some mature commercial

applications. As a mobile application, the particularity of information architecture of the WeChat Mobile Learning System is to accommodate the varying usage situations specifically, so the result of design and development of the information architecture should be able to make corresponding adjustments to the different usage situations and the modules and contents of the system.

3.2. Interactive Design

Moore [14] divided the interaction of distance education into three categories: learners and content, learners and teachers, learners and learners, on the basis of which the fourth category called learners and interface was added by Hillman [15] and others. The "interaction" in "interaction design" in this paper mainly refers to the interaction between learners and mobile interfaces. When using WeChat Mobile Learning System, users first need to follow and enter the WeChat official account, then enter the mobile learning system through the menu or link provided by this official account. Therefore, the interactive design of the mobile learning system is divided into two levels in this paper. The first level is the interaction between the user and the WeChat interface. The second level is the interaction between the user and the mobile learning system, which an adaptive information input interface such as form, button, the drop-down box, which needs to be designed according to the variety of accessed mobile devices and the variability of usage situations. The interactive form between the user and content in the mobile learning system is mainly to watch videos, view courseware, and evaluate the learning. After these interactions, the mobile learning system can process these interaction behaviors, then push personalized WeChat messages to the first level of the WeChat interface. This pushing interaction depends on the message template mechanism of the "WeChat public platform(mp.weixin.com)," and the specific implementation process that is introduced below.

3.3. Visual Design

WeChat Mobile Learning System uses the WeChat official account, which is assigned by the system as the portal. The interface of the WeChat official account is determined by the WeChat application and which cannot be customized freely. Moreover, the carrier in which the user experiences the mobile learning through this portal is an HTML5 dynamic web system followed WeChat interface specification. The developer designs the interface of this carrier and shows the characteristics of a teaching site. The specific design factors may include the overall layout, text system, interface color, and image icon.

According to the analysis above, the user experience research of the WeChat Mobile Learning System is to design and develop a system that includes the three factors of user experience as the evaluation dimension and the characteristics of mobile application user experience in the category of WeChat platform (under the portal constraint and with the prepared technical support of the "WeChat public platform(mp.weixin.com)"). This research tried to integrate the user experience design idea into the lifecycle of the system development, combining with a developing practice of a mobile learning application named "mobile micro-classroom system" which is based on API of "WeChat public platform(mp.weixin.com)", and elaborate the key technology which may achieve a good user in three dimensions of information architecture, visual interface design and interactive design.

4. Key Technology of User Experience in Mobile Micro-classroom System

4.1. Responsive web Design Technology to Enhance the Visual Effects of the Interface

The appearance and coherence of the interface of mobile applications could directly affect the user experience. A good vision is the beginning of nice user experience. Providing a compatibility design for different types of mobile terminals is the most basic requirement for an interface since the mobile terminal screen resolutions are different from each other. The system must be relatively flexible in the layout to

provide adaptive adjustments to different screen sizes for horizontal or vertical screens.

Since the WeChat client can solve most of the hardware compatibility issues, the WeChat mobile learning system could be developed in a "mixed mode," with which the developer only needs to develop a third-party platform, which is an HTML5 mobile terminal; this would help to implement the system quickly. The HTML5 webpage of the "mobile micro-classroom system" is based on responsive web design and its philosophy is "that the design and development of the page should respond and adjust to user behavior and device environment (system platform, screen size, screen orientation, etc.), making a website compatible with multiple terminals instead of designing a specific version for each terminal "[16]. There are a number of mature frameworks for responsive web development, such as Frozen UI, SUI Mobile, jQuery Mobile, etc., to help developers quickly build up responsive mobile applications. The characteristic feature of these frameworks is that the responsive architecture has been achieved, and unified elements of UI have been met. The mobile micro-classroom system uses the jQuery Mobile framework and was tested on the mainstream models with iOS and Android platforms. There were no defects found with regards to system compatibility.

4.2. OAuth Authentication Technology and Message Template Technology to Optimize the Interactive Experience

4.2.1. OAuth authentication technology to simplify user login and certification process

"Make the clicks as few as possible when a user is navigating to the most important content and functions," is a basic requirement for interactive technology [17]. Before the OAuth (Open Authorization) technology is applied to the teaching system, the user must click on different control widgets and input information for such as registering or logging in multiple times. Since a user has multiple information systems to use and each of them has a separate account and password, he/she has to not only register and log in separately but also remember different accounts and passwords; this would dampen the interactive experience.

By using the OAuth website authorization, the interactive authentication experience of the mobile learning system would be completely changed to obtain the user's authorization information. OAuth is a kind of user authentication authorization standard that accompanies the emergence of the open platform, which is characterized by obtaining the user's authorization information without requiring users to input user name and password in a third-party application, and made authentication and authorization process simple and safer. The "OAuth Web Authorization Certification" launched by "WeChat public platform(mp.weixin.com)" is a specific application of OAuth, which users can directly use the existing WeChat account to access to the mobile learning system through the OAuth authorization. This would avoid wasting much effort in account management like using traditional online teaching platforms; it allows users to focus more on the course itself.

The main steps which the "mobile micro-classroom system" takes for obtaining the user's WeChat authorization information by the authorization authentication of the webpage are shown in Fig. 2. When the system needs to access the user's account resources: 1) the system requests for the Request Token which is not authorized by the user from the "WeChat public platform(mp.weixin.com)" through the OAuth mechanism; 2) the "WeChat public platform(mp.weixin.com)" will ask the user whether to authorize the account service to the system; 3) after the user agrees; 4) the system will be able to access the user's account service in the "WeChat public platform(mp.weixin.com)" by using the OpenID login system of the user's WeChat account. Registering a new account or providing the password to the system are both not required during the process.

The process above is transparent to the user, and the only operation to take for confirming occurs in step

3. Fig 3 shows the interface when the user login system and OAuth are requesting the user's authorization. For developers, however, the process is complex, and Fig. 4 describes the logical process of implementing OAuth authorization access in code design.

The mobile learning system using OAuth authorization technology simplifies the process of logging in and authentication, and makes the user access to the system smooth and quick, and carries out one-key logging in for the users, and greatly reduces the extra consumption of account management.

4.2.2. WeChat template message to personalized user learning notification

The traditional online learning systems require users logging in to the personal backend to provide feedback, but the reality is that users are not logging in to receive feedback in time. The mass message function of WeChat can offer messages to the users actively, but these messages are not personalized as feedback such as different students' homework completion, test scores, etc., and of which the offering frequency is strictly limited by the "WeChat public platform(mp.weixin.com)."

WeChat Template Message ensures that users are not harassed when developers think that it is necessary to send reminders or notifications to users. One or more template(s) offered by a library of the "WeChat public platform(mp.weixin.com)" site is allowed to be selected, then reminders or notifications based on the ID(s) of the selected template(s) will be pushed to the user [18]. This approach is appropriate for pushing various personalized messages to users.



Fig. 2. WeChat oauth authorization process.



Fig. 3. WeChat oauth authorization screen.



Fig. 4. OAuth authorized accessing process.

To use the template message, first to log in the "WeChat public platform(mp.weixin.com)" backend to select the appropriate template(s) to add to the "my template library." As shown in Fig. 5, three templates named job reminders, check-in reminders, and result notices are added during the development process.



Fig. 5. Template library of "mobile micro-classroom system".

Then to write the corresponding service logic program in the mobile learning system to send messages which are personalized according to the pre-set events (such as new homework publishing, homework pending, etc.) to users regularly, users are able to receive and check them in the WeChat client instead of having to enter the system, as shown in Fig. 6 and Fig. 7:



Fig. 6. A Homework reminder push screen.



Fig. 7. A report notification push screen.

According to different scenes, the mobile learning system provides appropriate learning feedback to users precisely in time and improves the interactive experience about the system, helps users to take the initiative to manage the learning process and self-regulation, enhances the user stickiness of the system.

4.3. WeChat JS-SDK Technology to Achieve Situational Awareness in Information Architecture

As mentioned earlier, the effect and influence of mobile situational factors on user experience must be considered in research on user experience design of mobile applications. Schilit [19] pointed out that situational awareness to make computer devices aware of the real situation in the current environment through sensors and its related technologies. The WeChat mobile learning system uses WeChat JS-SDK to perceive situations that the users are in and present different information architectures according to different situations. WeChat JS-SDK is a development toolkit provided by the "WeChat public platform(mp.weixin.com)," which includes the portal of image, audio, equipment information, and geographical location, and the "mobile micro-classroom system" uses two portals of JS-SDK to achieve the adaption of information architecture.

4.3.1. Identify the user's location to recommend appropriate learning resources.

In a mobile learning system that is characterized by LBS (Location-Based Service), it is necessary to provide some feedback based on the user's location, which can be detected by the geographical location portal. "Mobile micro-classroom system" uses the geographical location portal to detect the user's geographical location and determines whether the user is in a particular study site (such as an off-campus practicing base), and then notices the user browse the recommended teaching content according to the real situation, as shown in Fig. 8.



Fig. 8. Recommendation based on geographical location.



Fig. 9. Notification based on network status.

4.3.2. Provide learning resources via different media according to user's network status.

Mobile learning resources are generally divided into multi-media pages (graphics and texts) and full-media pages (graphics, texts and videos), since the full-media pages contains videos which consumes more network data, "mobile micro-classroom system" first detects that the user's current network type is 4G or Wi-Fi through the JS-SDK network status portal, then provides a full-media or a multi-media page to the user according to different network type, as shown in Fig 9.

WeChat JS-SDK technology displays the learning contents of the "mobile micro-classroom system" not limited to a simple page, but can be dynamically adjusted and matched according to the real mobile application using situation, so that more intelligent characteristics are included. And the information architecture of the system is more flexible that helps to optimize the user experience.

5. Analysis of Teaching Effect of an Application System

To evaluate the applying effect of the user experience design technology of the "mobile micro-classroom system", the satisfaction data about the system are obtained from target users by a customized questionnaire. The design of this questionnaire for "mobile micro-classroom system" drew on the "Mobile Learning Software Quality Assurance Framework" proposed by Jian Fu [20], which divided the evaluation framework into three levels of usability, accessibility and fondness based on the international user experience 5E Model and Cellular Model.

After the system development was completed and went online, all the students who had used the system for a course learning took part in the questionnaire. The survey sampled 55 students who majored in Radio and Television Directing from the same class. The author has confirmed that all the students who participated in the course were already familiar with the system from analyzing data to logging in, content click-through rates, and system logs. The questionnaire was seamlessly integrated inside the system, and sent to the students and was informed to fill via mass message function on WeChat. There were 55 questionnaires released and 55 collected, with an effective collection rate of 100%. The statistical results of this survey are shown in Fig. 10.

As shown in Table 1, question 1 and 2 were designed to evaluate the usability of the system. According to the result, 98.1% of users thought that interface deformation and text or picture dislocation had never happened; 96.3 % thought that screen flow or even deadlock had never happened while using the system. It tells that the adaptability to different mobile terminals of the system is functional and reliance on hardware

Journal of Software

and software environment is low while compatibility is reliable. In order to do further analysis of the compatibility of the system interfaces of different operating systems, users were grouped according to question 0 (39 Android users 39 with 16 iOS users), then question 1 was reanalysed with the result shown in Fig 10. There was no apparent difference between users with different operating systems about the system interface compatibility since the satisfaction was all above 90%.

Questions	Option statistics		
	Definitely agree	Agree	Disagree
0. The operating system you use is: $(A \land Android \land B \land IOS C \land$	_	_	_
others)			
1. Interface deformation and text or picture dislocation had	46.3%	51.9%	1.9%
never happened during use			
2. Screen flow or even dead lock had never happened during	74.1%	22.2%	3.7%
use			
3. There is no need for additional learning to use the various	57.4%	35.2%	7.4%
functions of the system during use			
4. There is no problems about the account or password	70.4%	29.6%	0.0%
during use			
5. I appreciated the switching to multi-media page	18.5%	59.3%	22.2%
automatically when without Wi-Fi			
6. Personalized learning information pushed by the system	29.6%	55.6%	14.8%
was perfectly meet my learning needs			
7. It is convenient to receive recommendation of the relevant	31.5%	63.0%	5.6%
content in different locations automatically			

Table 1. Statistic Results of "Mobile Micro-classroom System" User Experience Questionnaire Survey



Fig. 10. Satisfaction comparison between android and IOS users.

Questions 3 and 4 were designed to evaluate the accessibility of the system, which refers to an indicator of whether the setting of system interactive control widgets is consistent with the user's habits. 96% of users thought that there was no need for additional learning to use the various functions of the system. All users did not encounter any problems when using the OAuth authentication, with the account, which showed the effectiveness of the OAuth authentication.

Questions 5, 6, and 7 were designed to evaluate the fondness of the system. The WeChat JS-SDK

technology was used to achieve the situational awareness in information architecture to some extent, which was found to be experienced well according to the result. It was shown that 85.2% users thought that the personalized learning information which was pushed by the system perfectly matched with their learning needs, which showed that the personalized reminder function was achieved by using the WeChat template message technology, enhanced the fondness of the system. It showed that 94.4% users appreciated the function of recommending the relevant content in different locations automatically. Adding, 77.8% users appreciated the design of switching the multi-media page and full-media page in different network environments automatically, but still there were some users who did not. We attributed the positive feedback to two reasons: first, the video delivered a wealth of learning information which was easier to attract the attention of users in a fragmented learning environment; secondly, with the decrease of network data charges and the increase of internet speed, some students did not care about the consumption of mobile data much as before. Users tended to use the full-media because of these two reasons. They also inspired us to add media preferences options into the system in subsequent refinement, which will allow users to choose whether to let the system switch to different media modes according to the network environment.

6. Conclusion

With the development of mobile development technology, the concept of user experience in mobile applications is gaining more and more attention in the commercial market in recent years. The education-oriented Apps also inherit such an idea that it is the goal of the practitioners in the field of mobile learning to provide good mobile learning resources and improve the learners' user experience. Based on the theory of User Experience Design, this paper analyzed the factors influencing user experience in mobile learning system based on WeChat and the development practice of "mobile micro-classroom system." It also investigated the roles that cross-platform technology (such as Responsive Mobile Webpage, OAuth authentication technology, WeChat template message technology, and WeChat JS-SDK technology) played in improving the user experience in Mobile Learning System. The feedback of the target users from 55 questionnaires showed that the satisfaction was high. The significance of this research lies in the fact that by focusing on mobile learning, it proved and supported the mobile learning theories and the corresponding application system and provided a reference for future research of developing mobile learning systems.

Conflict of Interest

The authors declare no conflict of interest".

References

- [1] Wagner, E D. (2005). Enabling mobile learning. *Educause Review*, 40(3), 40-53.
- [2] Xie, L, B., & Shen, R. (2014). Enhancing user experience in mobile learning by affective interaction. *Proceedings of the 2014 International Conference on Intelligent Environments* (pp. 297-301).
- [3] Lee, S. M. (2016). User experience of a mobile speaking application with automatic speech recognition for EFL learning. *British Journal of Educational Technology*, *47*(*4*), 778-786.
- [4] Zhao, X. M., Jun, S., & Zhang, Z. X. (2017). Mobile learning APP evaluation research based on user experience. *Heilongjiang Technology Information*, 186-189.
- [5] Hassen, A M. (2016). A comprehensive framework for design and evaluation of M-learning applications. Qatar: Qatar University.
- [6] Amir, D. (2016). From usability to user experience in mobile learning applications. Finland: Aalto

University.

- [7] Yuan, Z. W. (2012). Mobile learning system design and development based on ideas of user experience. Normal University of Tianjin.
- [8] ISO.9241-210:2010. Ergonomics of human-system interaction-part 210: Human-centered design for interactive systems. International Organization for Standardization (ISO). Switzerland.
- [9] Shen, R. (2012). Constructing a user experience Based environment: Problems and solutions. Germany: Fernuniversität in Hagen.
- [10] Garrett, J. J., (2008). Factors of user experience: User-centred web design, China Machine Press.
- [11] Rubinoff, R. How to quantify the user experience [OL]. Retrieved from: http://www.sitepoint.com/print/quantify-user-experience
- [12] Ding, Y., Guo, F., Hu, M. C., & Sun, F. L. (2014). Global research review of user experience. *Industry Engineering and Management*, 92-97+114.
- [13] Fu, Z. W., & He, C. B. (2015). Research of WeChat third-party platform applying in mobile learning. *Information Technology Education*, *9*, 77-80.
- [14] Moore, M. G. (1989). Three types of interaction. The American Journal of Distance Education, 3(2), 1-6.
- [15] Hillman, D. C. A., & Willis, D. J. (1994). Learner-interface interaction in distance education: an extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education*, 8(2), 30-42.
- [16] Kayla, K. (2011). Responsive Web Design: what it is and how to use it [OL]. Retrieved from: https://www.smashingmagazine.com/2011/01/guidelines-for-responsive-web-design/
- [17] Yu, Y. L. (2014). Mobile learning system research based on user experience. Southwest University.
- [18] "WeChat public platform(mp.weixin.com)". Template message interface[OL]. Retrieved from: http://mp.weixin.qq.com/wiki/17/304c1885ea66dbedf7dc170
- [19] Schilit, B., & Adams, N. (1994). Context-Aware computing applications. Proceedings of the Workshop on Mobile Computing Systems and Applications. 16(2), 85-90.
- [20] Fu, J., & Xie, X. X. (2011). Qualified framework research on mobile learning application based on user experience. *China Distance Education*, 34-38.

Copyright © 2021 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<u>CC BY 4.0</u>)



Lei Peng is the research associate at Guangdong University of Finance and Economics. She got her bachelor's degree on information technology in education at South China Normal University from 2000 to 2004 at Guangzhou, China. Later she continues her study at the same university for a master's degree from 2004 to 2007.

After graduation from South China Normal University, she joins the Guangdong University of Finance and Economics in 2007 at Guangzhou, China. She has published many papers, book chapters including: 1). Research and Investigation on Practical Teaching Competency in

Application-oriented University, Education, 2017.12, ISSN1671-5624; 2). An Investigation on the Pedagogical Reform of information technology Education Course in Independent Institutes from the Perspective of Current Social Competitive Pressure---Take Guangzhou University of Finance and Economics as an Example, 2013.10, China Information Technology Education, ISBN:1674-2117; 3). A practical study on creative student training at the era of internet plus, 2017,11, Software Guide, ISBN:1672-7800.