

Network Learning Platform Usability Evaluation Modeling

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Abstract

To improve the effectiveness of network learning platforms, this paper attempts to evaluate the usability of network learning platforms based on the perspective of users' experience and usability theory. With the support of the theory of usability, three dimensions to evaluate network learning platforms were given, and the relations between these three evaluation dimensions and usability were explained. Then, the three-level availability evaluation index system of network learning platform was established and discussed in detail. Finally, the theoretical model of the network learning platform usability evaluation system was proposed.

Keywords: network learning platform; evaluation model; usability theory; online education

(Submitted on September 15, 2019; Revised on September 30, 2019; Accepted on October 12, 2019)

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1. Introduction

With the rapid development of online education, online learning has become an indispensable learning method that has been accepted and adopted by more and more people. In recent years, with the development of Internet technology, the scale of online education has become larger, and the speed of development has increased by leaps and bounds. Learning methods based on online learning platforms have quickly become popular in universities and colleges. The rise of online learning has eased teachers' workloads and enabled students to learn anytime, anywhere.

However, these learning methods have also encountered some challenges, such as high dropout rates, unsatisfactory learning results, and low completion of courses. In order to determine the reasons for these challenges, many researchers have invested in online learning behavior analysis research. They have sought to solve the problems faced by online learning by analyzing learning behavior data in the online learning process and improve online learning and its outcomes.

With the rapid development of computer network technology, educational informatization has become the top priority of national education development. Carrying out network learning and network teaching has an important role in promoting educational informatization. As the strong support for the implementation of network teaching and network learning, an online learning platform's good or bad aspects have a direct impact on whether the implementation of network teaching and network learning is valid or not. Therefore, it is extremely important for online learning platforms to receive feedback in time. Feedbacking the stands or falls of network learning platforms involves evaluating if the availability is good or bad.

In this context, a network learning platform usability evaluation model is proposed in this paper from the perspective of user experience for colleges and universities to evaluate the usability of the network learning platform. With the support of usability theory, the network learning platform availability assume evaluation model is established. On this basis, a set of complete usability evaluation questionnaires is built. We propose a three-level network learning platform usability evaluation index system and discuss its properties in detail.

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2. Research Status

2.1. Usability Theory

In general, for certain users and environments, the usability of a product involves the effectiveness, the efficiency, and the users' subjective satisfaction. The usability model is shown in Figure 1.

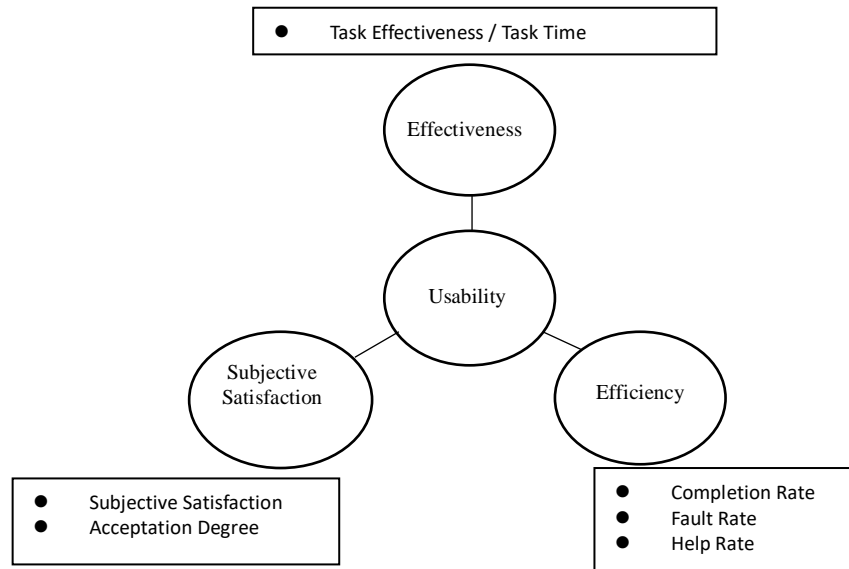


Figure 1. Usability model

The model has three dimensions: effectiveness, efficiency, and users' subjective satisfaction. There is a detailed interpretation of each dimension. The usability of education also depends on these three dimensions. Most IT products mainly focus on how to satisfy people's living needs and makes lives more convenient. However, different from IT products, educational products are not only easy to use and provide a good learning experience, but also ensure the best learning performance and maintain the persistence of learning.

2.2. Network Learning Platforms

For the study of online learning behavior assessment, some foreign scholars have been committed to evaluating the learning status of online learners, hoping to improve learners' learning performance through evaluation. Hummel collected information including learner's learning content, learning status, feedback, and self-evaluation, analyzed and evaluated the learner's learning behavior, and provided timely feedback [1]. Mandinach discussed the impact of online learning evaluation on online learning processes and teaching and discussed the development trends in learning evaluation [2]. Huh and Hirumi studied the ability of online learners to read through software to improve reader's online reading ability [3]. Morris used multiple regression analysis to assess the level of student participation and predict grades [4].

In addition, some scholars have put forward requirements for the content and form of online learning behavior evaluation. Outtaj and Ajhoun proposed to evaluate learners from multiple aspects and divide the learners into different roles. Different characters used different evaluation criteria [5]. Lei proposed a web data mining technique to analyze e-commerce websites and combined analysis models as evaluation methods [6].

Some scholars in our country have focused on the evaluation model of online learning behavior. For example, Peng proposed a multi-level model of learning behavior diversity and set up a learning platform capable of intelligent learning and learning behavior evaluation [7]. It has played an exemplary role in the study of domestic learning behavior analysis. Li constructed a mathematical model for the evaluation of online learning behaviors to discriminate the learner's style and performance on various types of learning behaviors [8]. Yan used the rational behavior theory (TRA) and technology acceptance model (TAM) to construct a network learning behavior model (MABNLB) with causal relationships of nine latent variables and used structural equations to conduct empirical analysis [9]. Wang constructed the selection and analysis model of network learning platforms from the prospective of usability [10]. From the prospective of ecology, Wang constructed an ecological characteristic evaluation model of network learning platforms [11].

In summary, scholars at home and abroad have paid attention to the study of online learning behavior evaluation and research results [12-13], but these studies still have deficiencies, mainly in the following areas:

- The research on online learning behavior evaluation focuses on the optimization of learning resources and the analysis of learners' learning styles. The ultimate goal is to recommend learning resources to learners, and they think that they only need to provide learning resources to learners. The misunderstanding of being able to learn well neglects the guidance and intervention of learners' online learning behaviors and ignores the reasonable evaluation of students' learning behaviors.
- There is little analysis of the relationship between learning behavior and learning effectiveness in the existing models. The evaluation results do not indicate the relationship between learning behavior and learning performance; they only focus on some explicit information.
- In the construction of the evaluation model, the feasibility of the learning behavior data verification model is not combined with the actual online learning platform.

3. Network Learning Platform Evaluation System Model

In this section, we propose a three-level network learning platform usability evaluation index system. Then, a questionnaire survey is used to analyze the reliability and validity of the index system. Finally, we give the final usability evaluation model.

We construct the model with the idea of operations research. Firstly, we discuss the usability evaluation dimensional division of network learning platform, then divide each dimension to several secondary evaluation indexes, and finally divide these secondary evaluation indexes into more detailed third-order indexes.

3.1. Three Dimensions of Network Learning Platform Evaluation System

There are two methods to construct a model: analogy and hypothesis. The former is based on the existing model to infer another model, and the latter is based on the hypothesis of the scientific knowledge and experience of the research object. This study combines the advantages of the two methods. According to the preliminary established evaluation index systems in literature research and the expert investigation method, we give three evaluation dimensions: teaching and learning support, resource support, and platform support, as shown in Figure 2.

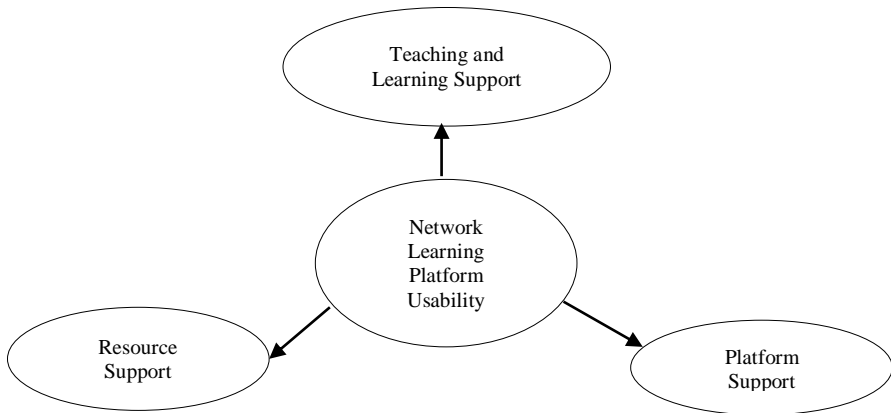


Figure 2. Network learning platform usability evaluation dimensional division

(1) Teaching and learning support

The focus of network learning platform is teaching and learning support. It includes two aspects: the support of teaching and the support of learning.

(2) Resource support

Resources involve strong support of platforms' teaching and learning. The rich material provides useful teaching and learning environments. Resource support includes three aspects: resource coverage, resource presentation, and resource service.

(3) Platform support

The teaching and learning activities in learning platforms and resource support all depend on the platform itself, including platform technology support such as safety, stability, flexibility, and compatibility. The clarity, comfort, and convenience of the platform may affect the subjective feelings of users. Finally, the usability of the platform can be reflected by the click rate, total visits, webpage downloading time, and so on.

3.2. The Relation Between Usability and Evaluation Dimension

We give the above three dimensions from the perspective of usability theory. The relation between usability and evaluation dimension is given in Figure 3.

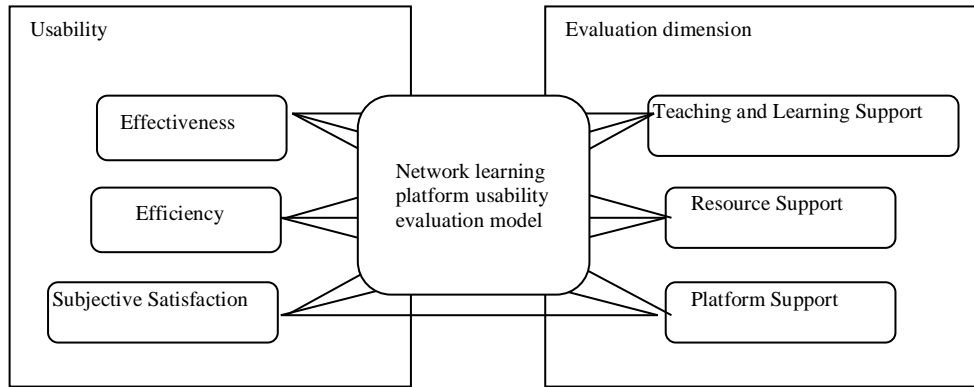


Figure 3. The relation between usability and evaluation dimension

For each evaluation dimension, we estimate its usability from the perspective of effectiveness, efficiency, and subjective satisfaction.

3.3. Three-Level Indicator System

From the above three dimensions—teaching and learning support, resource support, and platform support—we construct the evaluation index system in detail in terms of users (teachers and students), resources, and teaching and learning environment.

Teaching and learning support, resource support, and platform support are used as the first-level indicators of the network learning platform usability evaluation index system, and they are decomposed to obtain the second-order evaluation indicators and more detailed third-order evaluation indicators for network learning platform usability evaluation.

(1) First-level index system

The first-level index system of our network learning platform is given in Figure 4.

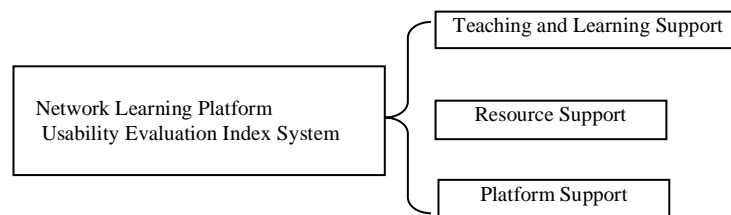


Figure 4. First-level indicators of network learning platform usability evaluation index system

(2) Second and third level index system

This paper adopts the existing online learning platform to classify the recorded learning behaviors and obtains the second-level evaluation criteria for online learning behavior evaluation.

For teaching and learning support, there are four third-level indicators: teaching support, learning support, teaching mode, and teacher-student interaction, as shown in Figure 5.

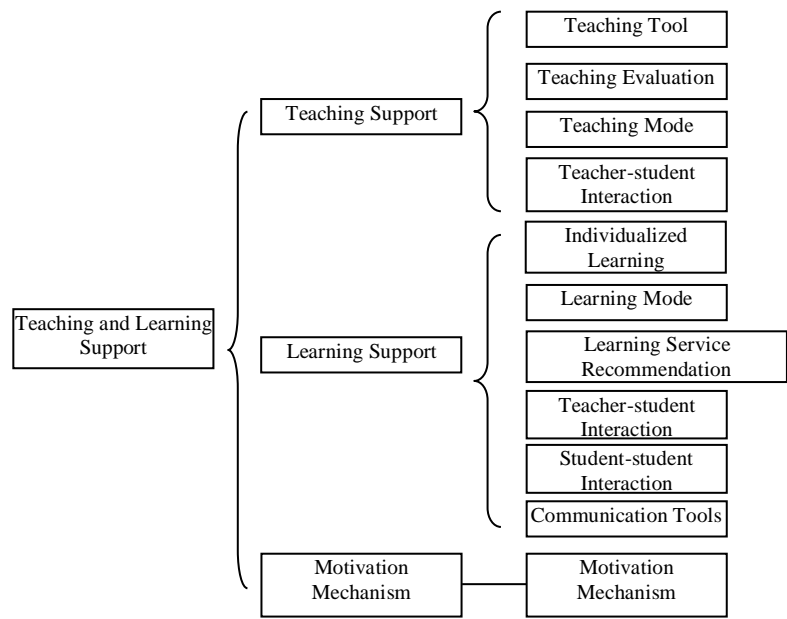


Figure 5. Second- and third-level indicators of teaching and learning support

For teaching support, we evaluate the usability of the network learning platform mainly from the prospective of a platform's teaching supporting function.

For teaching support, we have the following:

- Teaching tool: the effectiveness of the teaching tools provided by the platform. It mainly affects the subjective satisfaction and effectiveness of usability.
- Teaching evaluation: the use of multiple evaluation tools to access students' learning processes and results. It mainly affects the subjective satisfaction and effectiveness of usability.
- Teaching mode: the support of multiple teaching modes. It mainly affects the subjective satisfaction and effectiveness of usability.
- Teacher-student interaction: the effectiveness of teacher-student interactions and whether students' feedback can be received and solved by teachers. It mainly affects the subjective satisfaction and effectiveness of usability.

For learning support, we evaluate the usability of the network learning platform mainly from the prospective of a platform's learning supporting function.

For learning support, we have the following:

- Individualized learning: students' individualized setting of their learning time and self-controlled learning process. It mainly affects the subjective satisfaction and effectiveness of usability.
- Learning mode: the modes preferred by students.
- Learning service recommendation: the recommendation of relative learning materials according to students' interests. It mainly affects the subjective satisfaction and effectiveness of usability.
- Teacher-student interaction: the frequency and effectiveness of teacher-student interactions and whether students' feedback can be received and solved by teachers. It mainly affects the subjective satisfaction and effectiveness of usability.
- Student interaction: the effectiveness of student-student interactions and whether the interactions between students are meaningful. It mainly affects the effectiveness of usability.
- Communication tools: the tools that are used for communication.

Finally, for motivation mechanism, we focus on whether effective mechanisms are given to encourage students to learn more effectively.

For resource support, there are three third-level indicators: resource coverage, resource presentation, and resource service, as shown in Figure 6.

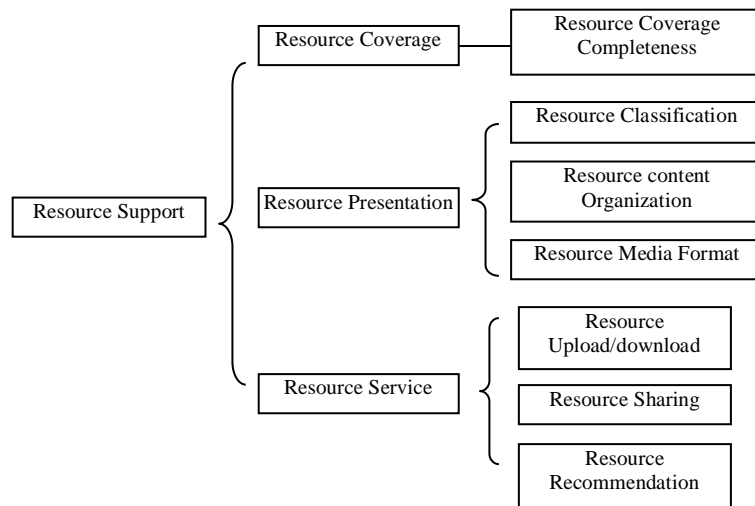


Figure 6. Second- and third-level indicators of resource support

For resource coverage, we evaluate the effectiveness of the network learning platform by the intensiveness of the learning resource coverage. It mainly affects the subjective satisfaction and effectiveness of usability.

For resource presentation, we evaluate the effectiveness of the network learning platform by the presentation forms of the learning resource.

- Resource classification: the reasonability of resource classification. It mainly affects the effectiveness of usability.
- Resource content organization: the reasonability of resource content organization. It mainly affects the subjective satisfaction and effectiveness of usability.
- Resource media format: the multiple resource media formats that can attract students. It mainly affects the subjective satisfaction of usability.

For resource service, we evaluate the effectiveness of the network learning platform by the evaluation of resource uploading and downloading and resource sharing.

- Resource uploading and downloading: the uploading and downloading of resources whenever the students want. It mainly affects the efficiency and effectiveness of usability.
- Resource sharing: the resources provided by the platform can be shared by students. It mainly affects the efficiency and effectiveness of usability.

For platform support, there are three third-level indicators: interface interaction, technology support, and actual operation, as shown in Figure 7.

For interface interaction, we evaluate the effectiveness of the network learning platform by the evaluation of platform interface design and the interaction between the platform and users.

- Consistent style: the interface style should be stable and consistent. It mainly affects the subjective satisfaction of usability.
- Beautiful interface: the interface should be beautiful and make users feel comfortable. It mainly affects the subjective satisfaction of usability.
- Friendly interface: the interface should be friendly and in accordance with users' habits. It mainly affects the subjective satisfaction of usability.
- Fluent operation: the fluency of users' operation. It mainly affects the subjective satisfaction of usability.
- Convenient operation: the convenience of users' operation. It mainly affects the subjective satisfaction of usability.
- Effective preventing user errors: the platform should guide students and prevent them from making errors. It mainly affects the effectiveness of usability.
- Searching and help: the platform should help students search what they need. It mainly affects the effectiveness of usability.
- Error correction: the platform should help students correct errors. It mainly affects the effectiveness of usability.

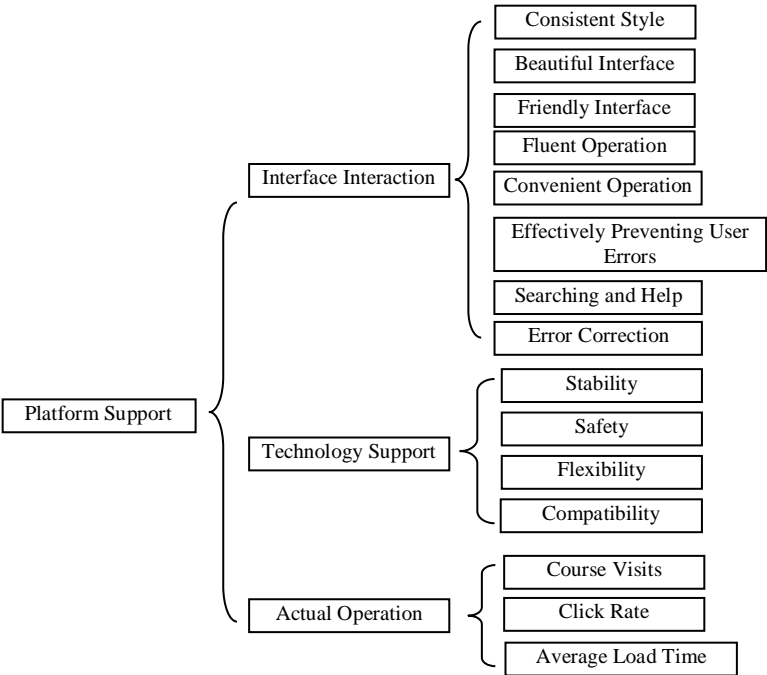


Figure 7. Second- and third-level indicators of platform support

Technology support is a major part of network learning platforms, and platform evaluation is important for accessing the effectiveness of usability. The stability, safety, flexibility, and compatibility of the platform could improve students' learning performance, the subjective satisfaction, and the effectiveness of usability.

- **Stability:** the platform should keep stability during operation. It mainly affects the subjective satisfaction and effectiveness of usability.
- **Safety:** the platform should provide safe service for users' data and related resources. It mainly affects the subjective satisfaction of usability.
- **Flexibility:** the platform should keep flexible to the changes of users' need. It mainly affects the subjective satisfaction and effectiveness of usability.
- **Compatibility:** the platform should keep stable operation in difference operating systems and web browsers.

For actual operation, we evaluate the operation condition of network learning platform and it concerns the usability of the platform.

- **Course visits:** the amount of independent IP that visit the platform in a certain amount of time. It mainly affects the subjective satisfaction of usability.
- **Click rate:** the amount of webpage click times in a certain amount of time. It mainly affects the subjective satisfaction of usability.
- **Average load time:** the average load time of a webpage. It mainly affects the efficiency and subjective satisfaction of usability.

3.4. Network Learning Platform Usability Evaluation Model

In summary, based on the above three dimensions and usability, the theoretical model for the network learning platform usability evaluation model is shown in Figure 8.

4. Conclusions

In this paper, we first summarized the research status of network learning platform evaluation at home and abroad through literature review and discussed the characteristics of network learning platforms. Then, we gave three dimensions to evaluate network learning platforms and explained the relations between these three evaluation dimensions and usability. On the above basis, we proposed the three level evaluation indicator system of network learning platforms and discussed them in detail. Finally, we gave the theoretical model of the network learning platform evaluation system.

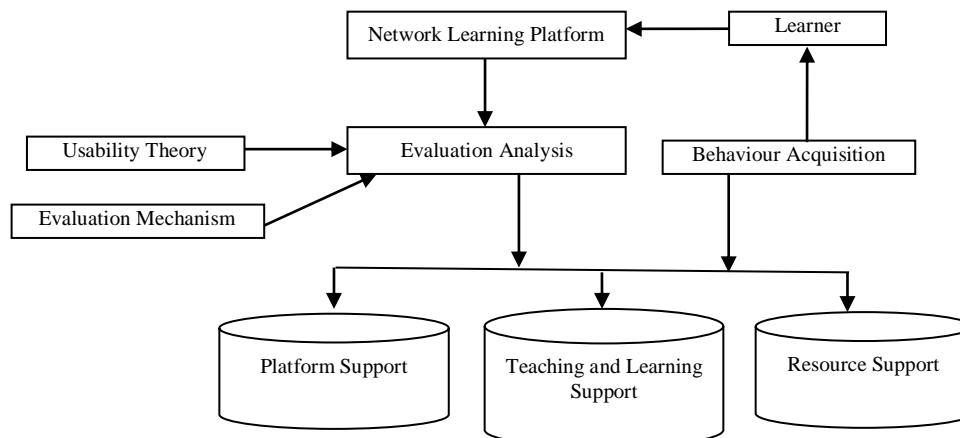


Figure 8. Network learning platform usability evaluation model

For future works, we will attempt to use the Delphi method and analytic hierarchy process to construct a set of relatively, including qualitative indexes and quantitative indexes of the network learning platform usability evaluation model, and then use computer technology programming to achieve the network learning platform usability evaluation system.

Acknowledgements

The research is supported by the National Nature Science Fund Project (No. 61562093), Key Project of Applied Basic Research Program of Yunnan Province (No. 2016FA024), Program for Innovative Research Team (in Science and Technology) in University of Yunnan Province, and Starting Fund for Doctoral Research of Yunnan Normal University (No. 2017ZB013).

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