Blog Interface Producing Mechanism in Learning Management System

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Abstract—**Presently the latest internet rage is the blog; the blog's interface is highly readable which makes it very attractive to users. By synthesizing the synergies of e-Learning systems with blogs, so that e-Learning content can be presented in a blog style, such that the attractiveness of e-Learning would be enhanced to prospective e-learners, is the primary focus of this study. Combining the above stated principles and purposes, this paper aims to draw on synergistic interactions between a critical literature review and trials of various interface designs, to discuss whether it is desirable that the blog interface be incorporated into LMS (Learning Management System).**

Index Terms—**Blog's interface, e-Learning, LMS**

I. INTRODUCTION

The features of distance learning are that it has no limits of time and location in learning and that learning can be done anytime. These prompted educational institutions and enterprises increasingly to integrate distance learning into the traditional education of physical environment. The prevalence of distance learning allowed Learning Management System (LMS) to develop rapidly and its functions to become stronger. However, plenty of LMS users will consider whether these functions satisfy their needs or provide them with good interactions or not in choosing them.

Mayer proposed the cognitive theory of multimedia learning in 2003, and in the theory memory store included sensory memory, working memory and long term memory. The main task of multimedia learning is to process working memory which is used in temporarily holding logged-in messages and manipulating knowledge. Visual image and auditory image enter into working memory by the form of these two senses respectively. The right half frame of working memory represents the construction of knowledge within which forms pictorial mental model, verbal mental model and the linkage of these two models.

Long term memory represents learners' knowledge warehouse which can store large amount of knowledge; nevertheless, the stored knowledge can be used to further perform active thinking after they are moved to working memory to be integrated with verbal and pictorial mental models. Currently LMS can not only allow teachers to upload teaching materials but also provide multiple functions and large amount of information. Excess functions and information cause cognitive load easily, and the design of "chapter" cannot lead learners to think actively. Therefore, the purpose of this study was to investigate how to make learners absorb knowledge easily and perform active learning and bring about discussion conveniently.

Now, Blog is a frequently-used discussion system on the internet and its interface is easy for users to read and join in discussion, and hence a flood of teachers use Blog to teach. However, Blog cannot provide the function of LMS and therefore it cannot improve learning performance greatly after all. This study planned to combine LMS functions with the interface design of Blog to present the digital learning contents by the approach of Blog and provide the necessary functions of LMS on the Blog and expected to attract learners to join in discussion and improve their learning performance.

II. LITERATURE REVIEW AND RELATED THEORIES

This study investigated all operation functions of the design elements of LMS and selected the interface functions suitable for Blog applying the principle of interface design, and expected that these can improve learning performance. The following literature review was conducted focusing on the elements of "design element of digital learning platform", "cognitive theory of multimedia learning", "Blog interface" and "evaluation approach".

A. Design Element of Digital Learning Platform

LMS is one of the basic digital learning tools, and its main function is to provide systematical core management and it focuses on planning and managing the training process including the establishment and management of learners' basic data, the planning and tracking of the training process, and delivering the course to users. Chen (2000) summarized that LMS should contain the following basic functions including:

1. Providing a process which can construct knowledge
2. Providing an environment which can form learning communities
3. Providing an environment that is easy to use for students
4. Providing an environment which allows dynamic exploration of knowledge to be performed
5. Providing an environment that users can be aware of other users' operation activities
6. Providing an environment allows groups to perform cooperative learning
7. Providing an environment that learning process can be recorded [1].

Besides, the international organization LTSC of IEEE also regulated the functions that a general digital learning system should have as the following figure showed, including 4 components and 2 databases.
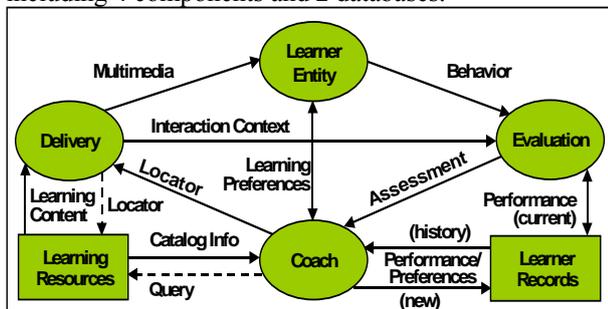

Figure 1: Components and Databases of LMS defined by LTSC.

The LTSC identifies four processes: Learner Entity, Evaluation, Coach, and Delivery process; two stores: Learner Records and Learning Resources; and ten information flows among the components: Behavioral Observations, Assessment Information, Performance and Preference Information, Query, Catalog Info, Locator, Learning Content, Multimedia, Interaction Context, and Learning Preferences.

From the above definitions we knew that a qualified LSM should contain the following basic functions including:

1. Learners' records related to their learning process such as learning process and test score
2. Building tools of pre-assessment and evaluation to understand learners' learning performance
3. Supporting computers to perform automatic guided teaching and self-study teaching
4. Able to integrate with other assisting teaching tools such as video conference and electronic white board

With these basic functions, teachers can produce digital teaching materials and utilize LMS to perform teaching on students.

With the evolvement of Web, the application scope of eLearning is no longer limited to traditional classroom learning, and eLearning includes: blended learning and distance teaching in schools, employees' training in enterprises, and individuals' life-long learning. The digital learning which is formed based on the concepts and application of Web 2.0 is called eLearning 2.0. Its characteristics included the following:

1. Learner centered: Learners can control their own learning; they can choose subjects they like, learning media, data format and learning method.
2. Immersive learning: It is similar to virtual reality and it means learning by doing.
3. Connected Learning: Students can connect with the world through computers and learn by the connection with others, and learning happens based on conversation and interaction.

The above features enable LMS to attract learners and perform interactions; nevertheless, it is easy to cause learners' cognitive load by excess functions. Therefore, this study aimed to investigate how to keep the above basic functions of LMS, promote interactions, avoid providing learners with too much information and improve learning performance.

B. Cognitive Theory of Multimedia Learning

Mayer has based the majority of his multimedia work on an integration of Sweller's cognitive load theory [2], Pavio's dual-coding theory, and Baddeley's working memory model (1992) [3] [4].

Mayer based his cognitive theory of multimedia learning on the following model.
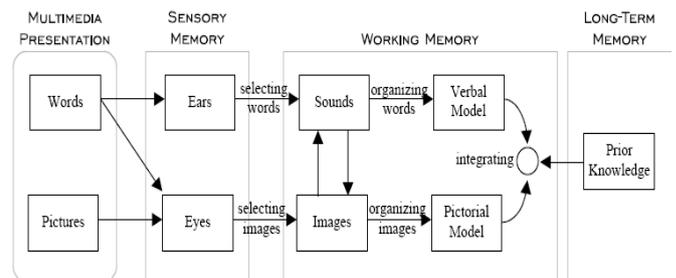
Figure 2: Cognitive Model of Multimedia Learning [5].

This multimedia learning flow chart was based on 3 hypotheses [5]: (1) dual-channel hypothesis: people use separate channels to process visual/image and auditory/verbal information [3] [4]; (2) limited capacity hypothesis: there are only fragments of information can be processed actively at one time at one channel [6]; (3) active processing hypothesis: meaningful learning happens only when learners focus on cognitive processes.

Based on the cognitive theory of multimedia learning, Mayer proposed 9 main principles in the design of multimedia teaching material after conducting his empirical studies:

(1) MULTIMEDIA PRINCIPLE

Mayer (2001) regarded that learners' learning performance would be better when they learned by words and pictures than only by words, and when words and pictures were presented together, they could construct verbal and pictorial models and the linkage of those two models [5].

(2) SPATIAL CONTIGUITY PRINCIPLE

From the hypothesis of active learning in the cognitive theory of multimedia learning, we knew that learners not only store information in the memory but also try to actively organize words and pictures to understand the teaching materials. However, computer monitors or books can only present limited information and hence how to allocate space and decide how many words and pictures to be presented are challenging subjects. Mayer (2001) indicated that students' learning performance would be better when words were presented closely to pictures. In other words, when corresponding words and pictures were placed closely to each other, learners would include the information into working memory simultaneously [5].

(3) TEMPORAL CONTIGUITY PRINCIPLE

Time and space are important resources, and therefore we have to decide where to place words and pictures. As corresponding descriptions and animations are presented at the same time, it is more possible for learners to memorize both in working memory simultaneously.

(4) COHERENCE PRINCIPLE

Coherence refers to the structural relationship among elements of teaching materials, and when interesting but unrelated words and pictures are presented together in the multimedia, students' learning performance is worse; when unnecessary words are deleted their learning performance is better.

(5) MODALITY PRINCIPLE

Modality principle means that students can obtain better learning performance from the animation matching with verbal words than from those with visual words. That means that students have better learning performance of words by presenting verbal words than by presenting visual words in multimedia.

(6) REDUNDANCY PRINCIPLE

Redundancy principle refers to that students' learning performance will be better when the animation is matched with verbal words than with visual words.

(7) INDIVIDUAL DIFFERENCES PRINCIPLE

Individual differences principle means that design effect has a greater effect on low-knowledge learners than on high-knowledge learners and has a greater effect on high-spatial learners than on low-spatial learners because high-knowledge learners can use their prior knowledge to compensate the lack of guidance in the presentation such as forming appropriate mental images from words and high-spatial learners have the cognitive ability to integrate visual and verbal symbols from the presentation of effective multimedia.

(8) SEGMENTATION PRINCIPLE

Segmentation principle means that when multimedia teaching materials are segmented into several pieces learners are able to select words and pictures from every piece and have time and ability to organize and integrate these selected words and pictures and move on to the next piece; on the contrary, when the multimedia teaching material is played continuously, learners are able to select words and pictures from the 1st piece, but when they are busy with organizing and integrating selected words and pictures, they are required to select words and pictures from the continuously-presented information, and this will cause over-load in dual channels and lower their learning performance.

(9) SIGNALING PRINCIPLE

Signaling principle refers to that when students learn multimedia teaching materials and if there are signals assisting them to process the materials, their understanding will be better than those without the signals.

The above principles enable LMS designers to avoid learners' obtaining deviated information caused by excess or dispersed information and these principles were the major ones in designing the interface of this study.

C. Blog Interface

Originated from the concept "Weblog" proposed by John in 1997, Blog is diary-type webpage organized by time sequence and its contents can be shared with others anytime. Scholars indicated that the characteristics of Blog interface included:

1. Time mark and date headline: The contents on Blog are established by time sequence and this sets up the context of Blog. New contents are built based on old ones and so this gives reading clues for browsers.
2. Article Sorting: Blog contents are placed in certain area according to different categories such as time and type and this forms the basis of knowledge management.
3. Static link: It provides fixed links and allows every article to be linked and hence these can be quoted and linked by and from different blogs. Therefore, the contents on blogs can be public and shared.
4. Leaving message or commenting: There is a message board for browsers to interact with the contents immediately on every Blog page.
5. Quotation: Quotation function enhances interactions among Blog.
6. RSS subscription: Using XML standard allows subscribers to obtain the updated Blog pages automatically through certain reading software and extend the social network.
7. Others: Full text search and calendar etc.

Because Blog has the above features and functions, it can provide some special applications in teaching. For teachers' professional development, they can use Blog to record their teaching, research data, resources, and

thoughts; they can also perform knowledge management, accumulate past teaching experiences or research paper or thoughts, track their own thinking and perspectives at different period, reflect on their own teaching, and all these allow their professional knowledge to grow constantly; in addition, using the functions such as leaving message or commenting and quoting allow them to form a community with other experts of the same field, and knowledge can be exchanged and supplemented through sharing and interaction.

For students, Blog can be a platform of independent learning and collaborative learning. Through the writing process of Blog, students can conduct deep reflection on what they have learned and learn to build knowledge. All records of learning process can establish students' electronic learning files, and these are the significant contents to review their learning for students or teachers. Students also can interact and exchange with teachers, classmates, or even other persons who have the same interests to learn together. Blog can also be a basis for students' self-evaluation or their mutual evaluation.

Besides, the characteristics of Blog meet the features of space and time in Mayer's cognitive theory of multimedia learning. And the presentation of both words and pictures also conforms to the dual-coding theory. Therefore, the purpose of this study was to use the design principle of Blog interface, combine the cognitive theory of multimedia learning and finally design a LMS.

D. Evaluation Method

Bostrom (1990) proposed a complete theoretical framework for the education and training of information system. He regarded that 3 factors affecting the learning performance of information system were Target System [7], Individual Differences and Training Method. The interwork of these 3 factors caused different effects on learning performance.
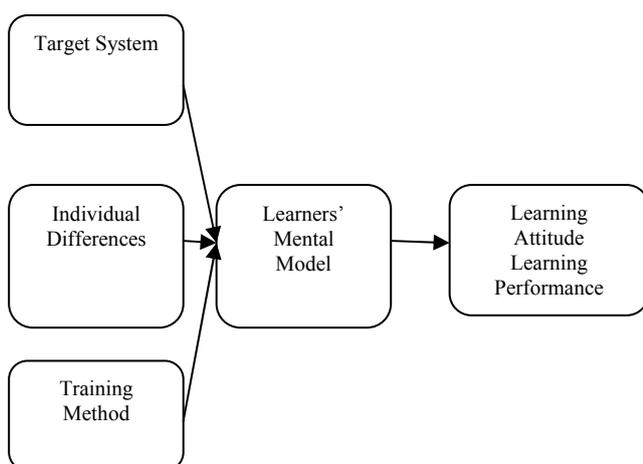

Figure 3: Factors affecting the learning performance of information system

(1) Target System

Target system means the information system used by the users during training period. Bostorm et al. (1990) considered that the design of the target system (such as the easiness of human-machine interface) was the critical factor affecting learners' usage of the system. Therefore they particularly emphasized the effect of human-machine interface because the interface was the target system for users. A bad interface design would cause users' rejection [7].The theoretical framework of Bostrom et al. (1990) pointed out the effects of the using frequency of the system, perceived usefulness and perceived easiness on learning performance [7].

(2) Training Method

Bostrom (1990) divided training method into two dimensions - Conceptual Model and Method Employed [7]. The former mainly described the presentation method of a target system or training software, and the latter emphasized on the method used in training period referring to learning method used in the training process. For instance, learners learn to use software through some realistic cases or conduct learning through certain training materials of reading software.

(3) Individual Differences

Individual differences will affect users' mental model of the system. Plenty of researches indicated that users' learning performance on information system was closely related to whether their mental model of the system was correct or not. Individual differences included users' learning style, personal characteristics, cognitive style, and problem solving ability, etc.

(4) Training Outcome

Training outcomes included attitude toward target system and learning performance; the evaluation of learning performance included using efficiency of system, correctness and completeness of the finished job, and problem solving ability etc (Staggers and Norcio, 1993) [8].

(5) Mental Model

Users' mental model included their ability to explain and understand the structure and function of the system, etc. For understanding the target system, the mental model can be produced by various mapping methods as the following:

1. Mapping via usage: Learners can acquire mental model through their usage of target system.
2. Mapping via analogy: During the mapping process, learners' mental model is produced via their prior experiences in using other similar systems.
3. Mapping via training: Learners can also produce mental model via training.

III. METHODOLOGY

This study kept the functions of LMS and redesigned the interface, and changed it into Blog interface that users are familiar with. On the changed interface, this researcher kept the functions of Blog and removed some inappropriate functions according to their features; for instance, functions that involved with privacy, their

features of discussion and static links were removed. The functions were described in detail as the following:

TABLE 1.
THE FUNCTIONS OF LMS AND BLOG INTERFACE.

Student Function	Description	Blog Function
Bulletin Board	Inquiring the information of test, assignment, questionnaire, login log and announcement	(1) Time mark and date headline (2) Static link (3) Article sorting (4) Leaving message or commenting (5) Quotation (6) RSS
My Course	Providing data such as course regulations and outlines	(1) Time mark and date headline (2) Static link (3) Article sorting (4) Quotation (5) RSS
My Good Friends	Setting the links of their good friends, browsing their information on their webpage, leaving messages etc.	(1) Time mark and date headline (2) Static link (3) Article sorting (4) Quotation (5) RSS
My Learning	Providing course list, on-line course, discussion room booking, and learning resources etc.	(1) Time mark and date headline (2) Static link (3) Article sorting (4) Quotation (5) RSS
Learning Interaction	Providing progress and guidance of course, downloading file of teaching material, group discussion, on-line test etc.	(1) Time mark and date headline (2) Static link (3) Article sorting (4) Leaving message or commenting (5) Quotation (6) RSS
Services of Academic Affairs	Providing information related to academic affairs such as: my questionnaire, course selection information, payment details, grade ranking, test information, application etc.	(1) Time mark and date headline (2) Static link (3) Article sorting (4) Quotation (5) RSS
Individual Services	Providing aids of personal learning such as electronic wallet, calendar, e-mail mailbox, short message service, internet hard disc, individualized setting etc.	(1) Time mark and date headline (2) RSS

Besides, this study adjusted the features of the interface and functions according to the cognitive theory of multimedia learning as the following table:

TABLE 2.
THE COGNITIVE THEORY WITH FUNCTIONS OF LMS AND BLOG INTERFACE.

Student Function	Cognitive Theory of Multimedia Learning
Bulletin Board	(1) Multimedia Principle (2) Spatial Contiguity Principle (3) Temporal Contiguity Principle (4) Coherence Principle (5) Modality Principle (6) Redundancy Principle (7) Individual Differences Principle (8) Segmentation Principle (9) Signaling Principle
My Course	(1) Multimedia Principle (2) Spatial Contiguity Principle (3) Temporal Contiguity Principle (4) Coherence Principle (5) Modality Principle (6) Redundancy Principle (7) Individual Differences Principle (8) Segmentation Principle (9) Signaling Principle
My Good Friends	(1) Spatial Contiguity Principle (2) Temporal Contiguity Principle
My Learning	(1) Spatial Contiguity Principle (2) Temporal Contiguity Principle
Learning Interaction	(1) Multimedia Principle (2) Spatial Contiguity Principle (3) Temporal Contiguity Principle (4) Coherence Principle (5) Modality Principle (6) Redundancy Principle (7) Individual Differences Principle (8) Segmentation Principle (9) Signaling Principle
Services of Academic Affairs	(1) Spatial Contiguity Principle (2) Temporal Contiguity Principle
Individual Services	(1) Spatial Contiguity Principle (2) Temporal Contiguity Principle

A. System Structure

This system utilized LMS system Moodle to design Blog interface. Through the integration of the basic functions provided by LMS and Blog interface, this study expected to improve the interaction of learners and LMS and their learning performance. The structure of the system of this study showed as the following figure:
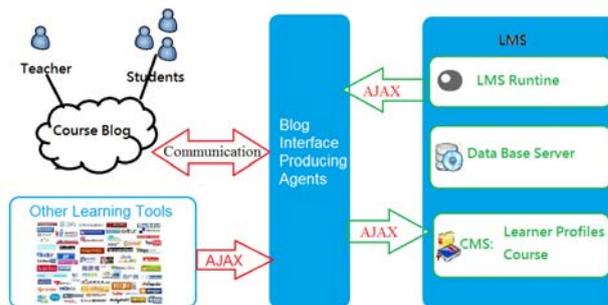
Figure 4: Framework of Blog Interface Producing Mechanism

B. Subject and Tool

The subjects of this study were students in two classes of "Computer Basic Skills" of the Bachelor program of Chinese Culture University, and 51 students were in one class and 50 students were in the other. The research tool of this study was a LMS system developed by the researcher–Interactive Course Assisting Net, abbreviated as Moodle. Currently it is the major learning platform used in the University in Taiwan. As for the function and positioning of a LMS, Moodle platform was equipped

with a standard and complete series of management functions of on-line teaching and learning.

This study kept some functions of Moodle and provided Blog interface and functions and expected that the interface of Moodle could satisfy learners' needs more in order to improve their learning performance and quality.

Figure 5: Blog Interface of LMS

C. Hypothesis

An internet-based learning environment is a medium spreading learning content; if it has the prerequisites of a general system design, abundant and appropriate contents, and complete functions and tools, then learners will be willing to use it (Venkatesh, and Davis, 1996) when it is presented by a user-friendly interface and has no obstacles for learners to use [9]. And therefore it will enhance learners' learning willingness and affect their satisfaction (Amoroso & Cheney, 1991) [10]; in other words, if the quality and reliability of information technology is higher, then learning efficiency will be better [11]. Hence, a good design of user interface is one of the elements to exert its using efficiency and improve learning performance [12]. As a result, this study proposed the following hypotheses:

H1: System quality has a positive effect on learning satisfaction.

H2: System quality has a positive effect on learning performance.

In an internet-based learning environment, learners' characteristics will affect their own learning performance, and hence it is a subject worth investigating [13]. Because learning activities mostly are conducted through the internet in on-line teaching and learners may have different learning performance due to their virtual environment, multimedia teaching material, personal ability to use technology and learning style in an internet-based learning environment. Therefore, different learning styles always lead to different performances [7]. As a consequence, this study proposed the following hypotheses:

H3: Learning style has a positive effect on learning performance.

H4: Learning style has a positive effect on learning satisfaction.

Learning performance is an index to measure a learner's performance and is one of the major items of the evaluation of teaching quality; learning performance will be affected by the factors such as learning style, curriculum design and teaching [14].Learning satisfaction is one of the major items to measure learning performance. There are abundant factors that will affect students' learning satisfaction, and teacher, curriculum and learning environment may affect it in addition to their personal factors. Lots of researches indicated that learning satisfaction was related to learning performance [15]. Therefore, this study proposed the following hypothesis:

H5: Learning satisfaction has a positive effect on learning performance.

IV. RESULTS

A. Descriptive Statistic Analysis

The major purpose of the descriptive statistic analysis was to analyze the distribution of background data of the samples in order to gain a preliminary understanding about the distribution of the samples and their basic characteristics. The researcher issued 101 questionnaires and there were 90 valid and 11 invalid ones; the valid response rate was 89.11%.

It was discovered from learners' background data that there were more males (80.1%) than females. Users' experiences showed that most of them learned on Moodle for less than 3 hours (46.7%), and among them most learners learned for 2 to 3 hours per week on average.

B. Reliability Analysis

According to reliability α theory proposed by Cronbach (1951), the results of this study showed that Cronbach's α of dimension "system quality" was 0.816; Cronbach's α of "learning style" was 0.841; Cronbach's α of "learning satisfaction" was 0.823; Cronbach's α of "learning performance" was 0.811. The Cronbach's α values of all dimensions were above 0.7 [16], and this indicated that the internal consistency existed in the items of all dimensions.

C. Path Analysis

This study used path analysis in order to understand the relationship strength among system quality, learning style, learning satisfaction and learning performance of learners and obtained the interplay and its extent among all dimension variables from the path coefficients of each dimension. The results of path analysis showed as followed.

Hypothesis	Standardized Regression Coefficient (β)	Explained Variance (R²)
H1: System quality has a positive effect on learning satisfaction.	.395(***)	.601
H2: System quality has a positive effect on learning performance.	.392(***)	.711
H3: Learning style has a positive effect on learning performance.	.415(***)	.712
H4: Learning style has a positive effect on learning satisfaction.	.341(***)	.766
H5: Learning satisfaction has a positive effect on learning performance.	.431(***)	.731

*p<0.05；**p<0.01；***p<0.001

1. The relationship of system quality and learning satisfaction of this study showed that system quality had a significant effect on learning satisfaction, and this meant that if related teaching staff improves system quality for learners then their learning satisfaction will be improved.

2. The empirical results of the relationship of system quality, learning satisfaction and learning attitude showed that both system quality and learning satisfaction had significantly positive and effects on learning attitude. It indicated that learners' learning attitude was formed based on their perceived system quality and learning satisfaction of Moodle Blog Interface, and when these are improved then learning attitude will be improved.

3. The empirical results of the relationship of learning satisfaction and learning performance indicated that learning satisfaction had a positive effect on learning performance. If we want to improve learners' learning performance, then we have to improve learning satisfaction in order to enhance their learning performance during the learning process.

V CONCLUSIONS

This study used a Moodle to conduct a practice and used it as the major base and kept original functions of LMS, and provided Blog interface and functions integrating characteristics of Blog to perform the teaching of wireless application. Through this particular LMS platform, students could interact with others and do all types of Blog activities and their learning performance could be improved through these activities rather than only being taught.

Based on the above results and analyses, this chapter made a comprehensive conclusion and proposed tangible suggestions for establishing new Learning Management platform in the future.

A. System Satisfaction

This study was the first one to apply LMS platform with Blog interface in the courses, and students' perceived easiness, perceived usefulness, system interactivity and assisting function, system reliability, and interface design about this platform were regarded as great helps for teaching. Even though they used this platform for the first time, they still found it easy to operate and their satisfaction in using it was improved greatly.

B. The Discussion of Learning Satisfaction and Learning Performance

This study constructed an effective evaluation model of learning satisfaction and learning performance based on the Technology Acceptance Model of Davis et al. (1989). Through the model, this study analyzed the key factors including learners' system quality, learning style, learning satisfaction and learning performance of this LMS with blog interface in order to understand their needs and further built up a complete learning platform of LMS with blog interface which could satisfy their needs.

The results indicated that the explained variance (R²) of system quality on learning satisfaction was 51.1%; the explained variance (R²) of system quality and learning style on learning performance was 70.1%; the explained variance (R²) of learning satisfaction on learning performance was 72.1%. These showed that the outcome variables were well explained by the causal ones, and this platform LMS with blog interface constructed by this study had a high explainability; the hypotheses proposed in this study were all valid and all the causal variables had direct and positive effects on the outcome ones. Among the causal variables affecting learning satisfaction, system quality had the greatest effect and its variation was 1.012 units. The order of the power of the effect was system quality, and then learning style. This meant that if we want to promote learners' learning satisfaction we can fist put effort into the system to help learners and then learning attitude and finally it's using easiness and user friendliness.

From the results we learned that learning satisfaction had the greatest effect among the causal variables affecting learning performance, and its variation was 0.78 units. The order of the power of the effect was learning satisfaction, system quality, learning style; therefore, if we want to promote learners' learning performance, we can first put effort into improving learning satisfaction and make them feel satisfied about the interface and teaching method etc. and then we can make them feel that this platform is able to enhance their learning effectiveness and improve their learning method.

Therefore, it could be obtained from the results the correlation of learning satisfaction and learning performance, and this study integrated information technology into teaching process and discovered that the characteristics of this LMS with blog interface could improve the correlation. Learning style can be further investigated in the future researches.

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