A Study On The Blended Learning Model and Evaluation System of Design Science

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Abstract

Design Science is a new subject in China, and its learning mode is still at a groping stage by both teachers and students. Blended learning is a learning method which combines aspects of online and face-to-face instruction. It can be used in the learning mode of Design Science to improve learning efficiency and effect. This paper explores the feasibility and concrete content used to construct the blended learning mode of design, and establishes an evaluation system, which is helpful for the standardization and innovation of the learning mode of design science.

Key words: Design Science, Blended Learning, Learning Model, Evaluation System

With continuous development of design in higher education in China, the primary problem of design has changed from "how to realized the discipline of design" to " how to do well the education of design". Since the beginning of the 21st century, blended learning has become the learning pattern adopted universally by all subjects. In this essay, blended learning patter and evaluation system of designed are constructed theoretically according to the course features of design, with the aim to offer reference comments for solutions to the problem of "how to do well the education of design".

I. Research design

The following two problems are discussed first in this essay:

First, whether is blended learning pattern suitable for design?

In recent years, design has become a most controversial new subject which develops the fastest in higher education in China. In 2011, China State Council adjusted the undergraduate specialty structure of regular institutions of higher learning and art became the new thirteenth discipline field, among which design is one of the five first level disciplines of art.

It could be seen thus that design has two features. On one hand, design is rather "new". Till 2018, it has been only 7 years since design became a first level discipline. "New" represents beautiful development prospect; meanwhile, it also suggests that subject education of design is still in the initial stage. Therefore, "new" design requires standardized learning pattern as blended learning. On the other hand, design is an interdiscipline. How to deal with the relations between design, art and science is a key problem of how to develop design education. YoramReich mentioned in Design Science that "science is nothing but designing." [1]KeesDorst thoughts "Design research, as a field, tends to base itself on fundamental insights from many other academic fields." [2] Though design in higher education in China belongs to the discipline of art, it is also a new interdiscipline of science, engineering and art. Considering these characteristics of design as well as good results of blended learning pattern in other subjects, it is justified to construct blended learning pattern in design.

Second, On which thoughts shall blended learning pattern of design be constructed?

Blended learning pattern is a learner-centered teaching pattern which realizes optimal learning objects by integrating organically class teaching and modern network teaching. [3] Generally speaking, "the learner" refers to the student, "technique" is learning means. Meanwhile, "teacher" and "course" play more important roles in constructing blended learning pattern than "student" and "technique". Take "course" as an example. "One of the main factors involved in running a BL course is a consideration of the 'appropriateness' of each medium of course delivery and the related matching of the delivery type to the learning activity."[4] “Teacher” is the “Designer” who construct blended learning pattern. “Designers can often offer a richer, more evocative vision of the consequences.”[5]

So, this essay constructs and designs blended learning pattern from the teacher's perspective considering the characteristics of the course, the students' conditions and the technological means.

II. Blended learning pattern and evaluation system of design

To design learning pattern and evaluation system is the teacher's obligation. It comprises the following elements: "context - students, institution, courses, and competences; objectives and skills; contents; methodology - activities, resources, space, and assessment." [6] Based on different teaching objectives of the courses of design, this subject is divided mainly into three classes, as shown in Fig.1.

TABLE I
Three main courses of design

	Course type	Main teaching objectives
1	Basic theory course	Popularize professional knowledge, teach design methods and cultivate design habits.
2	Foundation practice	Cultivate the students' application of their knowledge, hands-on activity, interaction and cooperation as well as capacities of solving problems.
3	Comprehensive design	Cultivate the students to use professional knowledge and skills to solve practical problems as well as their ability of writing and oral expression.

1. Basic theory course

The general form of the basic theory course of design is to

teach according to topics.

(1) Learning patterns and means

According to the characteristic of "topic lecturing" of basic theory course, blended learning pattern of "online-offline-online-online/offline" is constructed, which is divided into four stages: students preparing before class ——teacher lecturing in class——students learning after class —— teacher answering doubts after class (exam would be taken in the last class). As shown in Fig.2.

TABLE II
Design of blended learning pattern of basic theory course

Stage	Style	Means	Tools
Students preparing before class	Online	Online learning resources	massive open online courses
Teacher lecturing in class	Offline	Modern teaching tools	PPT, multi-media classroom
Students learning after class	Online	Online learning resources/online media tools	E-learning platform
Teacher answering doubts after class (exam)	Online/ offline	Online media tools/answering doubts	WeChat, QQ, etc.

Stage I: The students look up materials online under the guidance of the teacher before class to know of preliminarily relevant knowledge. The teacher could send the topic contents of the course through WeChat group, QQ group. The students could look up relevant materials through web page, library, massive open online courses and other online learning resources.

Stage II: The teachers lecture the topic knowledge in class and assign problems to think over. The teacher could use PPT, multi-media classroom and other modern teaching tools while the students could use laptop.

Stage III: The students finish the assignments online. They could look up relevant materials through web page, library database, massive open online courses and other online learning resources and send the answers to the teacher through e-learning platform, e-mail, WeChat or QQ.

Stage IV: The teacher answers the students' doubts after class online or offline. Online answering could adopt WeChat and QQ, while offline could be at fixed place at fixed time.

(2) Evaluation methods, contents and ways

Evaluation of basic theory course adopts bi-direction and two-line methods. The so-called "bi-direction" includes "teacher-student", in which the teacher assesses the students' performance respectively in different stages as well as "student-teacher", in which the students assess the teacher's teaching effects after the course ends. So-called "two line" means that the evaluation level is divided into online evaluation and offline evaluation according to the characteristics of online and offline blended learning pattern.

Evaluation of basic theory course is to evaluate multiple contents of the course. So called "multiple" means that in "teacher-student" evaluation, compared with the common evaluation system of "30% homework +70% final exam", the evaluation system of "10% pre-class learning +20% in class learning +10% after-class learning +60% final exam" is made according to the characteristics of blended learning pattern. In "student-teacher" evaluation, the evaluation system of "20% course content design +50% design of blended learning pattern +20% in class teaching +10% after-class answering doubts" is made.

Evaluation methods of basic theory course could be divided into online and offline. Online evaluation takes the teaching management system (teacher-student) and teaching evaluation platform (student-teacher) of colleges and universities as the main method, while offline evaluation takes comment (teacher-student) and survey and interview (student-teacher) as the main method. As shown in Fig. 3.

TABLE III
Design of evaluation system of blended learning pattern of basic theory course

Method	Content	Weight	Means
Teacher-student	Pre-class learning	10%	Teacher commenting
	In-class learning	20%	Teacher commenting
	After-class learning	10%	Teacher commenting
	Final exam	60%	Teaching management system
Student-teacher	Design of course content	20%	Teaching evaluation platform
	Design of blended learning pattern	50%	Teaching evaluation platform, survey and interview
	Classroom teaching	20%	Teaching evaluation platform
	After class answering doubts	10%	Teaching evaluation platform

2. Foundation practice

Foundation course includes not only theory teaching, but also practical teaching, which adopts mainly project teaching method.

(1) Learning mode and means

According to the characteristics of "project teaching" of foundation practice of design, blended learning pattern of "online/offline - online -online/offline" is constructed, which is divided into three stages: preparing design program - implementing design program - displaying design results. As shown in Fig. 4.

TABLE IV
Design of blended learning pattern of foundation practice

Stage	Style	Means	Tool
Preparing design program	Online/ offline	Offline meeting/ online media tool	WeChat, QQ, etc.
Implementing design program	Offline	Online learning resources	Library database, etc.
Displaying design results	Online/ offline	Modern presentation tools	PPT, etc.

At the beginning of the practice, the teacher shall divide the students into groups and assign topics of the practice projects to each group. The students could prepare the design program under the guidance of the teacher. During this period, the teacher could organize the student to hold meetings for discussion online or offline, using WeChat, QQ and other online media tools.

In the stage of implementing the design program, the teacher could keep contact with the students through media tools so as to grasp the progress. The students could take advantages of various online learning resources, such as web page, library database, etc.

In the final stage of the practice, the students could display their design results online or offline using PPT, website and other modern presentation tools. They could complete their study of foundation practice after being confirmed by the teacher.

(2) Evaluation methods, contents and ways

The evaluation methods of foundation practice is similar to that of basic theory course, adopting bi-direction and two-line methods.

In terms of evaluation contents of foundation practice, in "teacher-student" evaluation, "20% design program +20% design process +60% design works" is made, which corresponds to three practice stages. In "student-teacher" evaluation, the evaluation system of "60% design guidance +40% design of blended learning pattern" is made.

The evaluation methods of foundation practice is divided into online and offline, as shown in Fig. 5.

TABLE V
Design of evaluation system of blended learning pattern of foundation practice

Methods	Contents	Weight	Means
Teacher-student	Design program	20%	Teacher commenting
	Design process	20%	Teacher commenting
	Design works	60%	Teaching management system
Student-teacher	Design guidance	60%	Teaching evaluation platform
	Design of blended learning pattern	40%	Teaching evaluation platform, survey and interview

3. Comprehensive design

Comprehensive design of design generally refers to graduation design (including graduation thesis). Comprehensive design is the final node of undergraduate course teaching. The students could enter comprehensive design only after they have completed the basic theory courses and the foundation practice. In this period, the students shall complete their projects independently under the guidance of the teacher. It is generally divided into three stages, i.e., "thesis proposal-design-defense".

(1) Learning mode and means

In comprehensive design, blended learning mode of "online/offline learning - offline/online design - online/offline presentation" is constructed, which corresponds to three stages, as shown in Fig.6.

TABLE VI
Design of blended learning pattern of comprehensive design

Stage	Methods	Means	Tools
Thesis proposal	Online/ offline	Offline meeting/online media tool	WeChat, QQ, etc.
Design	Online/ offline	Offline meeting/online media tool, online learning resources	Library database, WeChat, QQ, etc.
Defense	Online/ offline	Modern presentation tools	PPT, etc.

In opening stage, the students shall select professional and practical topics under the guidance of the teacher. The teacher and the students shall discuss the topics online and offline, among which online discussion mainly takes advantage of WeChat and QQ.

In design stage, the students shall create the works and write the theses under the guidance of the teacher with the help of the library data base and other online learning resources. Meanwhile, meetings shall be held or online media tools shall be used to be supervised by the teacher. They could defense their works and thesis after being confirmed by the teacher.

In defense stage, the students shall present their graduation designs and theses online or offline, using PPT, video, network and other modern presentation tools. The students could graduate after passing their defense.

(2) Evaluation methods, contents and ways

Evaluation of comprehensive design could adopts bi-directional and two-line methods.

In terms of the evaluation contents of comprehensive design, in "teacher-student" evaluation, the evaluation system of "10% opening report +10% opening defense +30% graduation design +30% graduation thesis +20% graduation defense" is made; while in "student-teacher" evaluation, the evaluation system of "60% design guidance +40% design of blended learning pattern" is made.

Evaluation ways of comprehensive design are divided into online and offline, as shown in Fig. 7.

TABLE VII
Design of evaluation system of blended learning pattern in comprehensive design

Method	Content	Weights	Means
Teacher-student	Opening report	10%	Teacher commenting, Teaching management system
	Oral defense of opening report	10%	Teacher commenting, Teaching Management system
	Graduation design	30%	Teacher commenting, Teaching management system
	Graduation thesis	30%	Teacher commenting, Teaching management system

	Graduation thesis defense	20%	Teacher commenting, Teaching management system
Student-teacher	Design guideline	60%	Teaching evaluation platform
	Design of blended learning pattern	40%	Teaching evaluation platform, survey and interview

III. Conclusion

According to the subject characteristics of design, this essay analyzes different teaching objectives of design, divides it into basic theory course, foundation practice and comprehensive design and studies theoretically how to construct blended learning pattern and evaluation system in different subjects. This study has provided theoretical reference to design education, which is helpful to standardization and innovation of learning patterns of design.

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