

Research on Application of 4D Thinking in Inter-disciplinary Design Instructional Process

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Abstract

In recent years, in global trend of education, inter-disciplinary talent cultivation is always the objective of instruction. By this instructional process, it aims to develop “T” shape talents with social concern and inter-disciplinary innovation development in order to enhance students’ competence of employment and innovative business. Hence, this study focuses on curriculum to integrate 4D Thinking in inter-disciplinary cooperation and by action research and participant observation, it analyzes overall instructional process.

According to research analysis, inter-disciplinary design instructional process is classified into four stages: (1) pre-planning of curriculum: it should include the team of at least two teachers and by several times of instructional study, it establishes the integrated knowledge scope and drawing of curriculum map; (2) curriculum practice phase: 4D Thinking can be adjusted as “KM-4D-E” instructional model, including construction of theoretical knowledge and methodology, place observation experience, problem discovery and definition, design thinking and creative development, design practice manufacturing and proposal and evaluation; (3) proposal of curriculum outcome: it invites experts and place partners to introduce proposal and have mutual discussion and evaluation; (4) course review and reflection: it adopts teachers’ observation, TA journals and interview with students and arranges dialogue and discussion among place partners, teachers and students as reference to modify curriculum.

In addition, this study suggests that the same curriculum in the future should be at least based on one academic year. It should establish cross axle (scope) and vertical axle (depth) network of inter-disciplinary instruction by concentric circles and module concept which is adjusted and modified according to evolution of problems in order to respond to changeable future world. By instructional experience and process analysis result of this study, it aims to serve as reference for future inter-disciplinary instruction or related research.

Key words: 4D Design Thinking 、 Inter-disciplinary 、 Instructional Design

Introduction

In recent years, global agriculture and life style of villages are transforming. In 2009, government of Taiwan proposed the implementation of quality agriculture in order to reinforce international competitiveness of agriculture in Taiwan. LOHAS agriculture was one of the main programs. It aimed to reconstruct the characteristics of villages, community reconstruction, reactivation of villages and sustainable

development. Based on concept of experiential economy, it developed industry of agricultural villages to strengthen the functions of education, recreation, environmental protection, society, medicine, economy and cultural inheritance and to maintain excellent living environment of villages, construction of villages, attraction of villages and unique characteristics. Therefore, it shows the importance of the villages to create and promote the individual features. [1] [2]. Thus, curriculum planning and development of university education should be in the same direction. It introduces young students to the fields of villages and allows students of different backgrounds to participate in the rural fields to reconstruct the villages and create characteristics by brainstorming of the team.

In recent years, global education focuses on cultivation of inter-disciplinary talents and development of innovative curriculum model. By teams of teachers and students from different backgrounds, it conducts curriculum planning and execution of field practice in order to cultivate “T” shaped talents with social concern and inter-disciplinary innovative development through the instructional process and strengthen students’ competence of employment and innovative entrepreneurship. It can also solve the problems encountered by remote villages in order to cope with the problems of inter-disciplinary talent cultivation and field practice.

Therefore, in order to solve practical problems in fields of villages, it must integrate the concept of service design in the instruction. It is the core issue of this study. By observation and record of instructional process, it aims to analyze the phenomenon to apply 4D service design thinking [3] (UK Design Council, 2010) in inter-disciplinary design instruction and interaction between teachers, students and fields as reference for the following inter-disciplinary design instruction.

4D Thinking and instructional planning

General curriculum is planned by 4D Design Thinking (1D-Discover, 2D-Define, 3D-Development, 4D-Deliver, as figure 1). First, by concepts and theories related to soundscape and image, it constructs students’ competence of hearing and visual thinking and analysis and by theories and literature review of visual and hearing cognition, semiology and communication studies, it establishes research concept of soundscape analysis and meaning communication.

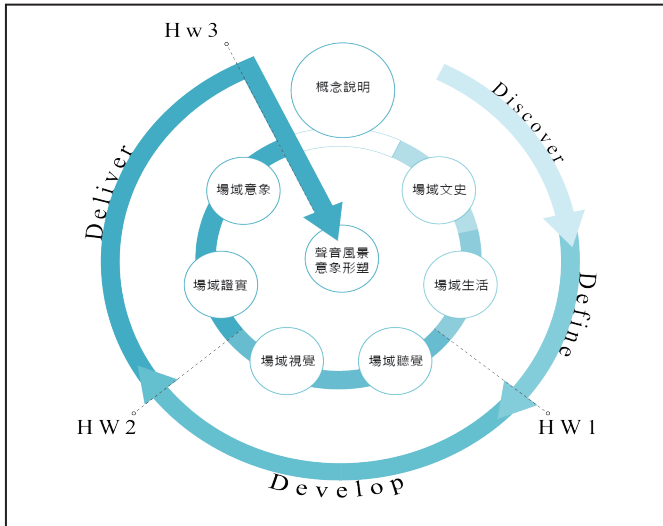


Figure 1. Course implementation process

Finally, through observation analysis and field participation experience, it practices emotional expression and design creation of fields with sound and images. Based on concept of hearing and soundscape and with the support of visual images, by field study and collection by related devices, it explores soundscape and visual images in the fields of Linnei Township of Yunlin Country (as figure 2) and extracts the specific images such as landmarks of the fields as the objectives of design development of the curriculum.

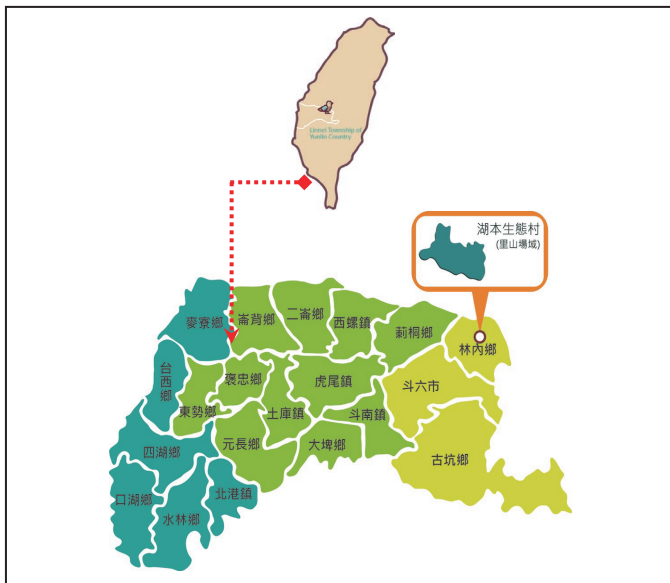


Figure 2. Course execution field

Instructional objective is based on human sensory perception experience, soundscape triangle theory proposed by R. Murray Schafer [4] [5], the Canadian composer and visual image construction of landscape in cities and countryside. By introduction of technology innovation, it intends to allow students to exchange with each other and design digital value added work with cultural thinking and playfulness. The practice is based on meaning transformation of sound and images in the fields. The goals are professional design development and competence cultivation of Develop-Deliver

of digital sound recording and sound software operation. It concerns about importance of exploration and thinking of overall environmental soundscape and finally it results in output of physical products.

Specific objectives are the following: recognizing soundscape concept and related theories, having basic competence of soundscape survey and analysis in villages, discussion competence of soundscape stories and themes of villages and design practice competence of soundscape collection and story transformation. Instructional model refers to different units. The planning is based on characteristics of learners of different backgrounds (information and communication technology and design).

Planning of field instructional curriculum

The schedule of the curriculum was constructed by 4D process of service design. The first six weeks referred to the stages of Discover and Define. This study conducted the first divergence and convergence. By the curriculum, it constructed basic concept of soundscape. Through field study in the field of Hu Ben, it recognized the owners' problems and demands. From Week 7 to 11, it was the stage of Develop. It conducted the second divergence. By introduction of case and holding of forums, students could begin developing the concepts of culture & creativity, recreation and production & sales and practice the model. Week 12 to 18 was the stage of Deliver. This study conducted the second convergence. Different groups successively completed the work of different dimensions and pondered on situations of use, visual appearance and mechanical installation. With several times of report, they modified and finally accomplished the work according to class teachers' and industrial instructors' suggestions (as Table 1).

Table 1. Course Executive Summary

Step	Week	Syllabus
1D-Discover & 2D-Define	W01	* Theoretical knowledge construction.
	W06	* Field study and problem discovery * Interdisciplinary workshops
3D-Develop	W07	* Case study
	W11	* Design Development and Proposal
4D-Diliver	W12	* Design adjustment and correction
	W18	* Prototype build * Final Prensation

Analysis of inter-disciplinary instructional process

Core objective of this curriculum is to cultivate students' inter-disciplinary and integrated thinking competence. By lectures, it instructs theories related to soundscape and visual images as the learning base of this field. It takes related cases as examples. Subsequently, by industrial instructors' collaborative instruction and forums of professional instructors with cultural and visual images, it teaches students to transform field image and construct concept in order to reinforce field practice competence. Finally, by cooperation of different groups, it implements project collaboration in order to solve the problems observed in the field and proposed by

field partners. In addition, through module exchange, teachers can introduce module borrowing and include modules of different fields and attributes to enhance competence training which is insufficient in original curriculum and accomplish the goal of inter-disciplinary instruction (as figure 3). The module refers to professional preparation course and inter-disciplinary and inter-school collaboration. Instructional methods adopted include lectures, case instruction, observation (Modernology), collaborative instruction, collaborative learning (heterogeneous clustering), etc.

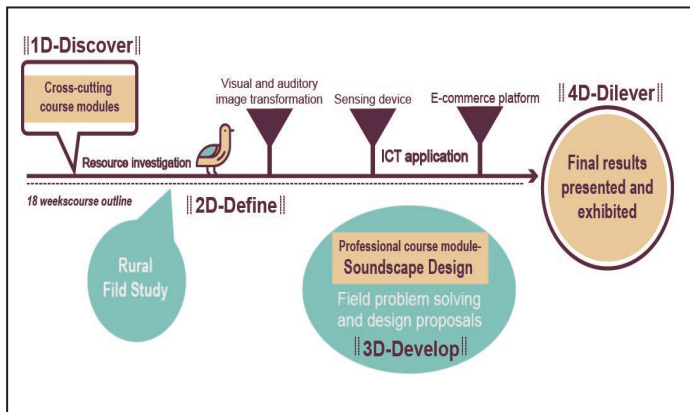


Figure 3. 4D Thinking in Inter-disciplinary Design Instructional Process

Instructional reflection and suggestion

By cooperation between academic circle and fields of villages, this study explores the problems, experiences and observes Hu Ben Village in Linnei Township of Yunlin and it proposes innovative ideas and solution regarding the problems encountered by field partners and their demands for future development. As to general curriculum planning, besides introduction of soundscape practice module, it also plans resource investigation and checking of inter-disciplinary course as the conditions. After introducing professional module, by inter-disciplinary teachers' sensor devices and network commerce, it allows students to construct inter-disciplinary concept of horizontal knowledge in learning. Through collaborative learning of heterogeneous clustering, they explore the problems and develop the solutions. Finally, they carry out the solutions. The overall curriculum is challenging for the students.

In addition, the course trains students' inter-disciplinary and integrated thinking, construction of professional basic concepts of multiple fields and competence of group learning and communication from different backgrounds. Nevertheless, the students all suggest that the time is insufficient. Therefore, in the future, this study will adjust the context of learning in module application of curriculum and reduce the scope of problem-solving in order to maintain curiosity, challenge and pleasure in learning process.

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