

STUDY ON E-LEARNING MATERIAL DEVELOPMENT FOR VOCATIONAL HIGH SCHOOL

Wen-Jiuh Chiang*

Tien-Hung Lan*

Abstract

This study aimed to develop e-learning materials of the hospitality program for vocational schools through systematized instructional design. By literature review and interview, this study generalized instructional framework and strategy, and employed the ADDIE model in the development of e-course of the indigenous food. According to self-report of e-learning material accreditation of the Ministry of Education, this study conducted questionnaire survey on 30 students in the Department of Home Economics of a vocational school, as well as 10 experts, in order to determine the appropriateness of the design of the e-teaching materials. The findings suggested that, “description and framework of teaching material content”, “design of teaching materials”, “media and interface design”, and “users satisfaction” are positively regarded by students and experts. The results proved that the ADDIE instructional model used by this study can effectively develop e-learning materials of the hospitality program for vocational schools. The findings can serve as references for other teachers to develop e-learning materials.

Keywords: ADDIE model, hospitality program, vocational school, e-learning materials

* National Kaohsiung Normal University, Kaohsiung, Taiwan(R.O.C)

Introduction

Due to the prevalence of computers and internet, instructional model have changed dramatically. Students can learn without instructional resources, such as classrooms and textbooks. By e-learning model, teachers control the characteristics of online learning and create positive e-learning situations through more convenient internet and rich multimedia resources, in order to enhance students' learning effectiveness.

E-learning has created a new vision in education, and e-learning materials are the keys. In e-learning, the current design of e-teaching materials is mostly based on the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model.

This study used the ADDIE systematization design as the framework to construct the e-learning material of “traditional food of the indigenous people: the making of A-bai” of the hospitality program for vocational schools. By far-reaching internet and interesting multimedia, this study attempted to revive the making of the indigenous food in order to enhance cognition and skills of the students in the hospitality program regarding the food culture of the indigenous people. Educational authorities and teachers who have intention to promote the indigenous education in Taiwan can actively construct e-learning materials, while those who are interested in digital archiving of traditional skills can also make efforts on the e-education of traditional skills.

Literature Review

Instructional model of e-teaching materials

Instructional model of e-learning materials refers to the instructional orientation adopted by instructors in order to accomplish instructional goals. Instructors select instructional strategies instead of regular answers, according to different instructional goals, course content and learners' characteristics or capabilities (Hsu, 2011). Instructional models of e-learning materials can be divided into “lecture”, “demonstration”, “practice”, “simulation” and “game” (Chang, 2005):

Lecture: the instruction is based on narration; a good lecture is based on learners' needs, and is modified according to courses and instructional purposes. The instructional quality relies on instructors' expressive skills.

Demonstration: the instruction is based on hand-on operation. It is the instructional method upon visualization instead of narration, and it is particularly suitable for instruction of special procedures and skills.

Practice: in the instruction, quizzes are given, so that learners can be familiar with the learning content through continuous practices.

Simulation: it simulates the phenomenon or situations in daily life or works to facilitate learning. The learning process is triggered by a series of learners' decision-making or actions. By errors and feedback after operation, learners internalize and absorb learning content. This kind of learning is suitable for software programming and cultivation of soft skills and operational skills.

Game: instructional content is designed upon computer games in order to maintain learners' motives and attentions, and accomplish "education in entertainment".

Regarding the instruction of skills in e-learning, Chen (2007) proposed the principle of design of e-teaching materials, and emphasized the importance of demonstration. Assistants or videos can be used to demonstrate the skills, and key points can be displayed on the machine interface. The quizzes after class can help teachers to recognize the students' comprehension of the skills. Gu (2011) suggested that in the design of e-learning materials, demonstration of the skills by videos or multimedia can allow learners to watch and practice repeatedly and memorize the key points of skills. Thus, complete teaching materials can be provided for learners. Chen (2007) found that presentation allows learners to construct skill-related cognition base, and videos are the best teaching materials of skills. They not only function as demonstration, but also show the steps in detail. Therefore, learners can absorb the sequential standard motions and skills from videos. In technical fields, presentation of the teaching materials include videos (including sound), and the combination of presentation, videos and sound (Gu, 2011).

This study aimed to develop e-learning materials of indigenous food. The making of the indigenous food is motion-based instruction, and visualization in instruction is more important than narration. Thus, the instructional materials particularly emphasize the special procedures and motions. Therefore, this study adopted the instructional model of demonstration, and presented the e-learning materials by the combination of presentation, videos and sound.

Instructional model of ADDIE

ADDIE is the most popular and simple model in systematized instructional design. By following the standard procedure, the development of teaching materials can follow the preset schedule, and instructional quality can be controlled. Five major steps of ADDIE are shown below (Lin, 2008):

Analysis: demand analysis, learner analysis, goal analysis, teaching material analysis, analysis of software and hardware learning environment analysis are required to define users' needs, users' prior skills, users' characteristics and teaching materials.

Design: according to the attributes of teaching materials, design of instructional goals, instructional framework, instructional activity, and instructional strategy are accomplished. The plan of instructional design should be finished as the important criterion for the next step.

Development: based on the plan of instructional design developed at the previous stage, the script is created. According to the instructional strategies planned, the multimedia of e-learning and teaching materials related to courses are selected. Moreover, the media to be adopted should be accomplished. It is the stage to develop multimedia elements.

Implement: it integrates the modules and teaching materials of e-learning. There should be tests before the online operation. After the confirmation, the courses are installed on the e-learning platform. The operation of the learning function is tested to avoid instructional errors. The instructional goals and content in each class are implemented according to the activities designed.

Evaluation: the instructional design should be evaluated in order to guarantee the propriety. According to learners' use and comments, and even learning effectiveness and satisfaction evaluation, this stage determines whether the instructional content matches the instructional goals, or whether the overall presentation satisfies the needs of instructional units. Suggestions are provided to instructional units (Hsu, 2011).

This study followed the above steps of the ADDIE model to produce e-learning materials. By the systematic instructional design process, high-quality e-learning materials of indigenous food were produced for the hospitality program of vocational schools.

Quality evaluation of e-learning materials

According to the "Accreditation review procedures and applications of e-learning materials and courses of the Ministry of Education" announced by the Ministry of Education in July 2011, the purpose of accreditation is to implement accreditation systems of e-learning, and guarantee the quality of e-learning. The accreditation system aims to enhance the public's identification with e-learning, encourage students' participation in e-learning, and promote lifelong learning (Ministry of Education, 2011).

The regulations of accreditation of e-learning materials include "content and framework of teaching materials", "design of teaching materials", "supportive design" and "media and interface design". Items of each regulation are divided into "obligatory" and "selective". For the regulations of accreditation, there are 29 indicators. Among the four regulations, 19 indicators are obligatory, accounting for 66% of total indicators; 10 indicators are selective, accounting for 34%. The obligatory items of "instructional content and framework" are the most (7), followed by "design of teaching materials", with 6 obligatory items. In "media and interface design", there are 6 indicators, including 5 obligatory indicators (Hsu, 2011). Thus, "instructional content and framework", "design of teaching materials" and "media and interface design" are the key indicators in the production of e-learning materials. In order to guarantee the quality of e-learning materials, it is important to control the obligatory indicators of the three regulations (Lai, 2010).

Therefore, this study followed the accreditation regulations of the Ministry of Education to produce the e-learning materials in order to ensure quality.

Study on the indigenous food

Food culture of the indigenous people involves festivals, such as the Harvest Festival. The most representative food is A-bai (Lin, 2001), which is prepared for sharing among the tribesmen in many indigenous festivities of the Amis, Puyuma, Rukai, Bunun and Paiwan tribes. A-bai is wrapped by shell flower leaves on the outside. Millet and boar meat are wrapped by nicandra physalodes leaves inside. It is then steamed before serving. The making of A-bai varies across tribes, and it plays an important role in the food culture of the indigenous people. Therefore, this study treated the most representative food A-bai in the indigenous food culture as the theme.

Food preparation of the indigenous people is different from the instruction of other subjects, and it cannot be introduced simply by reading the references and watching the films. Teachers must have basic knowledge of food preparation of the indigenous people or resort to the assistance of more professional units for supplementary material or guidelines. In order to enhance the professional content of e-learning material of A-bai preparation, this study invited elders of Puyuma in Chulu of Taitung County to explain the preparation, ensuring that the professional literacy of e-learning material can be identified by the indigenous people.

This study developed the e-learning material of “the making of A-bai”, which can serve as an important resource for learners of indigenous food preparation.

Research Methods

Research Methods and procedures

This study first conducted literature review to collect results and theories from previous literature, in order to generalize the framework and strategy of instructional systematization design. The researcher interviewed the indigenous elders, and collected the interview data of food

preparation. Using the ADDIE model, this study set the research framework and produced the e-learning material of “the making of A-bai”.

Research Subjects and Tools

At the evaluation stage of the e-learning material of “the making of A-bai”, 10 experts in teaching materials and 30 students from the hospitality program of a vocational school were invited to watch the material and fill in questionnaire. After eliminating 1 invalid questionnaire, there were 29 valid questionnaires.

This study revised the standard of e-learning material accreditation self-report of the Ministry of Education into the “evaluation of e-learning materials” in order to determine the appropriateness of the design of e-teaching materials.

Content of scale

The design of the “evaluation of e-learning materials” in this study was based on the “standard of e-learning material accreditation self-report” of the Ministry of Education. “Obligatory indicators” were kept as the items of evaluation. There were three dimensions, “instructional content and framework”, “design of teaching materials” and “media and interface design”, with a total of 16 items. In addition, with users’ satisfaction analysis, there were five items. In total, this study included four dimensions and 21 items.

Implementation and scoring

As to scoring, regarding the description of each item, the subjects selected the responses from “strongly agree”, “agree”, “no comment”, “disagree” and “strongly disagree”, whereas “strongly agree” is 5 points and “strongly disagree” is 1 point.

Reliability and validity of study

This study treated the “obligatory indicators” in the “standard of self-report of e-learning material accreditation” as the content of “evaluation of e-learning materials”. Based on governmental standard scale announced by the Ministry of Education, this study invited scholars

and experts to provide opinions on the content and items of the questionnaire in order to construct expert validity.

Cronbach's Alpha of four dimensions, “description and framework of teaching material content”, “design of teaching materials”, “media and interface design” and “users satisfaction” are .786, .628, .652 and .679. Cronbach's Alpha of overall scale is .78 and reliability is good.

Research process

The research process is shown in Figure 1. The data were analyzed by descriptive statistics for each dimension. T-test of independent samples was conducted to determine whether different users (experts and students) have significant differences on the dimensions.

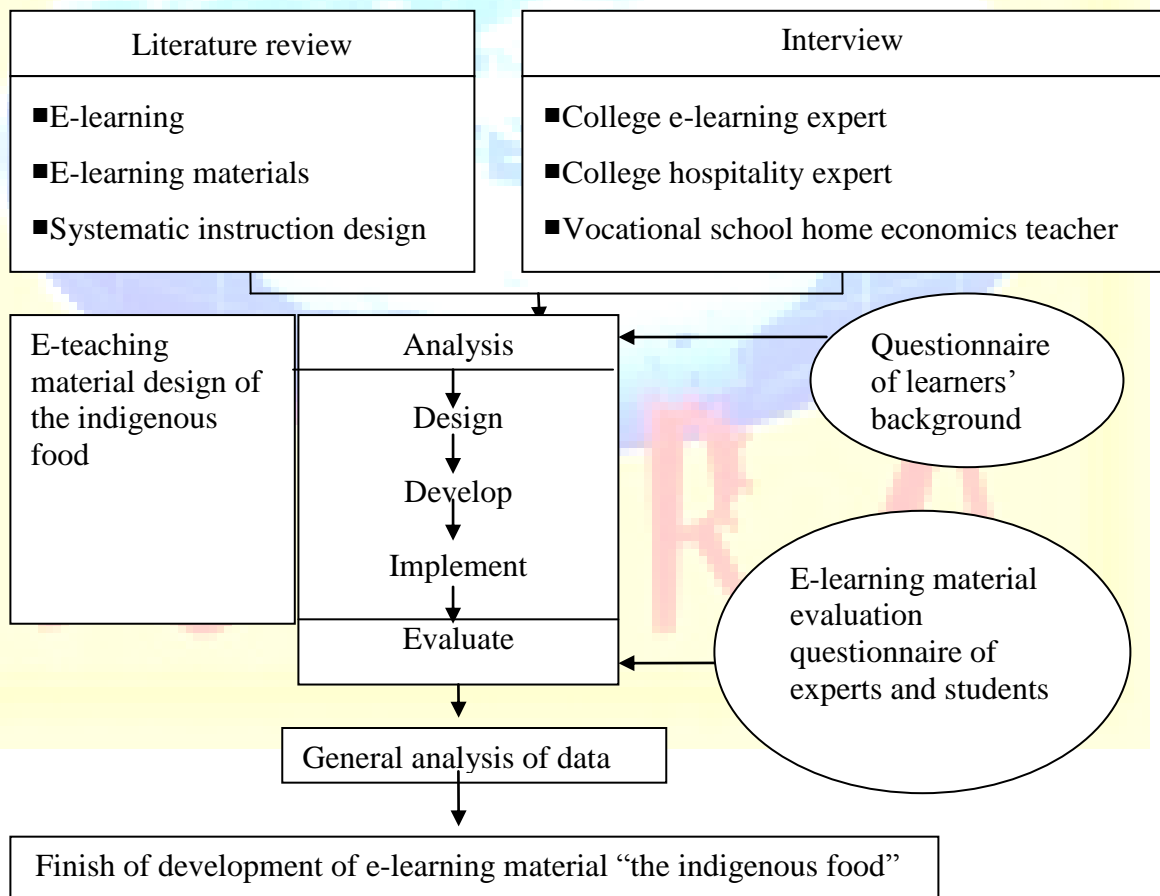


Figure 1 Research process

Development of e-learning material of the indigenous food in hospitality program of vocational school

The development of e-learning material was based on the ADDIE model. The e-learning material was produced by the steps of Analysis, Design, Development, Implement and Evaluate.

Analysis demand: by questionnaire and interview, this study confirmed the basic dimensions of teaching materials.

Learner analysis: the research subjects were 30 students in the hospitality program of a vocational school in eastern Taiwan.

Demand analysis: by “investigation on students’ learning background”, the researcher probed into their learning background. There are 13 males and 16 females, including 11 indigenous students and 18 non-indigenous students; 26 students have computer access at home and 23 of them are online for at least 5 hours every week. Therefore, in order to allow students to learn by internet, it is necessary to design proper online courses.

Goal analysis: (1) to instruct basic knowledge and skills of food, cooking and food culture of the indigenous people; (2) to cultivate the talents’ interest and potential to work for food culture of the indigenous people; (3) to cultivate the correct concept of security and health and work ethics.

Teaching material analysis: by literature review and interview with scholars and experts, instructional framework established by the indigenous elders, this study reorganized six measures of the making of A-bai for the content of e-learning materials and complete the instruction.

Software and hardware media analysis: media used in this study include digital camera (for picture taking and video recording) and MP3 (sound recording). Software include Word and Powerpoint of word processing; Photoimpact and Namon Freemotion of image processing; Frontpage and Namon Webeditot of webpage editing; Captive, Movie Maker and Powerdirector of video editing, etc.

Design of teaching materials: this study designed instructional goal, instructional framework, instructional strategy, instructional activity and evaluation of teaching material. For

the precision of process, at the stage of design, the researcher improved the teaching materials according to experts' opinions.

Table 1 Instructional activity design of making of the indigenous food "A-bai"

Sections	Instructional activity and time
Section 1	Briefing of "introduction of the indigenous people's food culture", 20 minutes. Attention points of the learning sheet report of the indigenous food as one of the explanation activities, 10 minutes.
	Demonstration of skills to collect related information online, 15 minutes.
Section 2	Students search for the websites of the indigenous food, and accomplish the report of "learning sheet of the indigenous food", 45 minutes.
Section 3	Report of learning sheets (6 minutes for each group) and students score the groups by "learning sheet of the indigenous food" of students' evaluation, 45 minutes.
Section 4	Watching "e-learning website of A-bai preparation" and explanation of A-bai preparation, 20 minutes. Preparation of ingredients and washing of nicandra physalodes leaves and shell flower leaves, 25 minutes.
Section 5	Students wrap the stuffing by nicandra physalodes leaves and shell flower leaves. They finish A-bai and start steaming, 25 minutes. Students' writing of "report of learning", 20 minutes.
Section 6	Students' writing of "report of learning", 15 minutes. Students' presentation of "report of learning" and sharing of the finished "A-bai", 30 minutes.

Design of teaching material evaluation: students score the groups by "learning sheet of the indigenous food" in students' evaluation. In addition, on the e-learning website of "the making of A-bai", students can evaluate their learning of the indigenous food culture and A-bai preparation.

Development of e-learning course: at this stage, instructional materials were integrated. As to video material development and production, multimedia adopted by this study included pictures, sound recording and video recording. Pictures and videos were recorded by digital camera and sound was recorded by MP3.

Production of teaching materials: by Frontpage and Namo Webeditot of webpage editing, this study established the model of e-learning website of "the making of A-bai" in order to test the functions of e-learning materials. The content of website includes food culture, introduction

of A-bai, preparation of materials, e-instruction, satisfaction and learning, instructional archives room, etc. According to the test result, teaching materials can be used regularly. Figure 2 to Figure 3 are the presentation of the finished model of e-learning material webpages.



Figure 2 Sound recording of outline of the making of A-bai



Figure 3 Video of the making of A-bai

Evaluation of e-learning materials: The researcher invited the students of Department of Home Economics to complete the self-report of teaching material, in order to confirm the appropriateness of the formats, words and terms. The formal evaluation of teaching materials was conducted. The expert evaluation included 2 associate professors of information management, 1 director of information department, 1 assistant professor of hospitality, 1 director of the Department of Home Economics, 4 teachers of the hospitality program, 1 food preparation expert, and 1 indigenous elder. A total of 10 experts evaluated the teaching materials. As to user evaluation, teaching materials were presented in class, and the students of the hospitality program evaluated them in order to confirm that the teaching materials match users' needs. Data analysis was conducted according to the results.

Data Analysis and Results

This study used SPSS for Windows to conduct statistical analysis on returned questionnaires. The reliability analysis was conducted, and descriptive statistics were used to conduct the mean analysis. By t-test of independent samples, this study determined whether different users (experts and students) have significant differences on the dimensions.

Table 2 shows the scores of the groups in the items of four dimensions. As seen, the mean of item 7 “proper amount of the content of different sections” is the highest ($M=4.32$, $SD=.474$), while that of item 16 “convenient and consistent operation of media interface” is the lowest ($M=3.61$, $SD=.551$).

Table 2 Means and standard deviation of the dimensions of questionnaire

Dimensions	Number of item	Mean	SD
Instructional content and framework	1	3.82	.588
	2	3.67	.570
	3	4.01	.550
	4	4.16	.716
	5	3.73	.612
	6	3.91	.567
	7	4.32	.474
Design of teaching materials	8	3.94	.520
	9	3.88	.477
	10	4.29	.629
	11	3.73	.567
	12	4.29	.759
Media and interface design	13	3.70	.523
	14	3.88	.537
	15	3.73	.511
	16	3.61	.551
Satisfaction analysis	17	4.14	.500
	18	4.23	.553
	19	4.26	.511
	20	4.23	.605
	21	4.26	.567

N=39

t-test of independent samples

T-test of independent samples was conducted to determine whether the users have significant differences on different dimensions. According to Table 3, regarding “description and framework of teaching material content”, “design of teaching materials” and “users’ satisfaction”, the means of students were higher than those of experts. In addition, the standard deviation of “description and framework of teaching material content” of students was the highest ($SD = 2.858$), indicating that the distribution of the scores of the students was wide.

Table 3 Group statistics

Expert or	Number	Mean	SD
-----------	--------	------	----

	student			
Instructional content and framework	Expert	10	27.60	1.140
	Student	29	27.79	2.858
Design of teaching materials	Expert	10	19.80	.837
	Student	29	20.07	2.017
Media and interface design	Expert	10	15.40	.894
	Student	29	14.86	1.457
Satisfaction analysis	Expert	10	20.00	2.550
	Student	29	21.34	1.818

F test result of Levene method is shown in Table 4. As seen, the *F* values of “description and framework of teaching material content”, “media and interface design” and “users’ satisfaction” are not significant, indicating the homogeneity of variance of two groups. As to “design of teaching materials”, *F* value is significant, indicating the heterogeneity of variance of two groups. According to Table 4, *t* values of four dimensions do not reach significance level. Therefore, in this study, the scores of experts and students in four dimensions are not significantly different.

Table 4 Different users’ significant difference in dimensions by t test of independent samples

	Levene test of equality of variance		<i>t</i> test of equality of mean	
	<i>F</i> test	Significance	<i>t</i>	Significance (two-tailed)
Instructional content and framework	3.403	.074	-.147	.884
Design of teaching materials	5.719	.023*	-.508	.619
Media and interface design	.660	.423	-.291	.433
Satisfaction analysis	.018	.894	.794	.159

**p* < .05

According to data analysis results, for the e-learning material of “the making of A-bai” developed by this study, the “description and framework of teaching material content”, “design of teaching materials”, “media and interface design” and “user satisfaction” are positively regarded by experts and users.

Conclusions

Using the five steps of the ADDIE model, this study created e-learning material of the indigenous food. Following each stage of the model, the researcher guaranteed the quality of e-learning material, thus, the finished e-learning material was positively accepted by the experts and students. This study demonstrated that the e-learning material of the indigenous food is feasible and can serve as references for other teachers to develop e-learning materials.

References

- Chen, Y. C.(2007). *E-learning Content Design Principles and Models in the Psychomotor Skill Domain*. (Master's thesis, Department of Educational Technology, Tamkang University, New Taipei City). Retrieved from <http://www.airitilibrary.com/searchdetail.aspx?DocIDs=U0002-0407200712542700>
- Chang, C. H.(2005). *Modern Psychology*. Taipei City: Dong Hua.
- Clark, R. C. and Mayer, R. E. (2008). “*e-Learning and the Science of Instruction* (2nd 88 ed.)”, San Francisco, CA: Pfeiffer.
- Gu, D. W., Huang, Y. H.(2011). Study on Rapid e-Learning Material Production and Design by Bloom's Cognition and Technological Education Goals. *Journal of Educational Media & Library Sciences*, 48 (4), 511-538.
- Hsu, L. C. (2011). *A Study on Applying the ADDIE Model to Develop a Rapid E-Learning Content for Stand-Up Comedies*. (unpublished Master's thesis), Department of Information and Communications, Shih Hsin University, Taipei City.
- Huang, Y. W.(2010). *College and University General Education Courses Use Digital Teaching Materials of Learning - an Example of Information Law Courses*, (unpublished Master's thesis), Graduate Institute of Information and Communications, Shih Hsin University, Taipei City.
- Lin, C. R.(2008). *ISD Systematization Instructional Design and Workshop of e-Learning Materials*. Taipei City: Hsin Li.

- Lin, C. H.(2001). *A Study of Management and Consumer Behavior of the Aboriginal Restaurants in Taipei Area*, (unpublished Master's thesis), Graduate Institute of Tourism, Shih Hsin University, Taipei City.
- Lai, C. R. (2010). *Developing an e-Learning Tool for Satisfying the Quality Assurance Based on Education Ministry*. (unpublished Master's thesis), Department of Information and Communications, Shih Hsin University, Taipei City.
- Ministry of Education (2011). E-Learning Accreditation and Information Exchange, MOE ROC. *Promotion of e-learning accreditation of Ministry of Education*, Retrieved on January 31, 2012: <http://ace.moe.edu.tw/>.
- Ministry of Education (2011). Skills Education Information Network. *Outline of Skills Education Courses in Junior High Schools*, Retrieved on February 11, 2012: <http://140.122.71.231/WTAE/default.aspx>.
- Mayer, R. E.(2001).*Multimedia Learning*.Cambridge,UK:Cambridge University Press.
- National Science Council (2010). Taiwan e-Learning and Digital Archives Program. *Chinese Introduction of TELDAP*, Retrieved on January 20, 2012 : http://teldap.tw/Download/download_de.php.
- Yan, C. H. (2008). Production and Examples of e-Learning Materials. *Journal of National Open University* , 394, 73-78.