Usability Assessment for a Problem-Based e-Learning Program in Convenience Store New Employee Training

Chiung-Sui Chang
Dept. of Educational Technology
Tamkang University
Taipei, Taiwan
e-mail: cschang@mail.tku.edu.tw

David Tawei Ku
Dept. of Educational Technology
Tamkang University
Taipei, Taiwan
e-mail: dtk@mail.tku.edu.tw

*Ya-Ping Huang
Dept. of Educational Technology
Tamkang University
Taipei, Taiwan
e-mail: picasso@mail.tku.edu.tw

Abstract— To ensure the quality of e-Learning training material, we utilized the usability evaluation heuristic in the design and development processes of convenience store new employee training material. The application of usability evaluations during this study is described. Additionally, participant selection, data collection and analysis; and results relevant to usability portions of this study are presented.

Keywords: e-learning; usability assessment; usabilty testing; problem-based learning

I. INTRODUCTION

Nowadays e-learning is the most popular way to deliver instructions. Via Internet, learners are able to receive various contents and instructional methods from distance to overcome the time and space barriers. Clark and Mayer [1] argued that e-learning is so unique because of the three potentially valuable instructional methods: (1) practice with automated tailored feedback, (2) integration of collaboration with self-study, and (3) use of simulation to accelerate expertise. Due to the obvious reasons, e-learning is not only accepted widespread in all academic levels, but it is also taken advantage in business and corporative training worldwide. In fact, the benefits of e-learning in organizations also embrace improving the efficiency of learning among organizational members, enhancing competitiveness of organizations, and minimizing training costs [2].

Convenience store is a very popular business in Taiwan. In the end of 2009, the density of the convenience stores in Taiwan is the highest of the world and average one store per 2,500 people [3]. 8.5 million people visit convenience store every day in Taiwan [4]. Even though the convenience business is booming, and provides huge number job opportunities, it suffered the insufficient training, especially due to the large number of staffs and fast turnover rate [5]. A well designed e-learning program will help resolve the problems mentioned and enhance the quality of the business. Therefore, a convenience store new employee training e-learning program has been designed and developed.

The main purpose of this training program is to (1) develop e-Learning training material according to the design principles for successful convenience store new employees' performance in their work, (2) evaluate the effectiveness of the new employee training material. According to the needs assessment, the interview from the convenience store owners and questionnaires from the employees, three major aspects in job which have to be emphasized: (1) receiving and checking in merchandises, (2) checking out customers, and heating up foods. Therefore, the e-learning instruction was consisted these three units for learners as the new employees of convenience store to learning and practice their basic services. The beginning of each unit included introduction and statement of objectives to focus learning. Whereas each unit was designed with different case-based situation, 10 situated problems were interwoven in the three units to provide practice. Since problem-based learning emphasizes that learners must participate actively, in the e-Learning instruction we arranged learners to play the role of the main character, a new employee of a convenience store. Learners solved the situated problems they encountered and engaged in the vivid simulation [6].

Even though instructional design and learning strategies play a critical role to the success of any e-learning program, fail to notice the importance of interface design and the reaction of users would cause the cognitive overloading or even failure of the program [7].

Therefore, in addition to evaluate the achievement of learners' learning, the purpose of this study employed a usability testing approach to assess this e-learning training program. Hopefully, from the perspective of usability, this study would provide some critical information for the modification of the interface design and make the program much more effective and efficiency.

II. USABILITY ASSEMENT IN E-LEARNING

In 1980s, the term "usability" has been created and took over the term "user friendly" [8]. Nielson [9] defined the usability is the user is able to use a product easily. In the perspective of learning, usability means that an application is learnable and allows users to achieve certain goals efficiently, effectively, and with a high degree of satisfaction [10]. In addition, Nielsen [11] also mentioned 5 specific features cross the usability: (1) learnability, (2) efficiency, (3) memorability, (4) errors, and (5) satisfaction. In other words, in terms of e-learning materials, usability is a critical factor to affect learner's learning from the very beginning and throughout the entire learning process.

Usability testing is a classical experimental methodology and various assessing methods are using for different situations. Yet, to conduct a high validity usability testing, using more one method to investigate from various dimensions is recommended.

Number of subjects is another important issue in usability testing. Nielson [11] first argued that the most appropriate number is 3-5 persons and some later studies seem to agree his suggestion [12, 13, 14]. Barnum et al [15] pointed out that 5 subjects are the most common participants in usability testing, since the number is effectively to provide feasible feedback to define 80% of usability problems. Eight participants were selected to join this study.

III. RESEARCH METHOD

The usability testing for e-learning program is somehow different from regular website evaluation. It does not only try to find out the problems of interface usage, but also try to investigate how the material content as the problem solving process integrate with the interface design. Therefore, this study consisted of three usability testing methods: observation, questionnaire and interview. During participants using the program, the entire process has been recorded for the later analysis. Surveys of the task difficulty level and experience for using this program have been conducted, and personal interview has been done in the end.

A. Participants

A total of 8 participants from different majors and grade levels attended this study. In order to realize the problems of the program and reflecting upon the real life situation, all of participants have convenience store working experience. Four of participants are male and the other four are female.

B. Learning Materials

According to the needs analysis, this program focuses on three major tasks: (1) receiving and checking in merchandises, (2) checking out customers, and (3) heating up food. The instruction integrated problem-based and situated learning strategies to assist learner who embraced in a real life situation and be able to "learning by doing" to solve the true problems. Fig. 1 shows that three situations which learners faced during the cashier duty. Fig. 2 shows that after learners selected using scanner, possible problems they had during serving the customer. Fig. 3 shows that when learners have problem to use the cashier register, clicking the working menu button, learners will find an interactive cashier register simulator to show the process step by step.

C. Evaluation Tools

- Tips for one to one observation: There are three major units of tasks (totally eleven tasks) in this training program. In each task, the observer focused on the same 4 tips which are (1) pointers and graphic icons are able to guide user clearly, (2) all function keys are easy to use, (3) user is able to complete the process and wait upon the feedback to finish, then go the next step, and (4) user is able to operate this program smoothly.

- Task difficulty level survey: All 11 tasks in this training program are surveyed by a five-point Likert scale. Learner has to rate the difficulty degree from 1 (easiest) to 5 (hardest). The design of the survey attempts to find out the possible hardest tasks and the cross exams with the experience for using the program may define some usability related problems. The Cronbach's coefficient alpha is 0.747 that indicated the survey has efficient internal consistency reliability for this study.

- Experience for using the program survey: A survey contains 4 parts were developed to investigate the user experience. They are (1) the quality of the training materials, (2) usage of the training materials, (3) learnability of the training materials, and (4) intention of behavior. Learners also have to rate the degree from 1 to 5 based on the section descriptions. The Cronbach's coefficient alpha is 0.832 that indicated the survey has efficient internal consistency reliability for this study.

- Interview outline: An interview was conducted after all the evaluation processes above were executed. The purpose of interview was to clarify the unclear parts which detected from those surveys previously. Interview outline are (1) can this program help you clarify the working concept of convenience store? Why?(2) if you work in a convenience store in the future, will this program guide you to solve some problems? Why? (3) what did you learn from this program? You may list some of them.

Figure 1.   The three main situations which learners faced during the cashier duty.

Figure 2.   After learner selected using scanner, possible problems they had during serving the customer.

Figure 3.   When learners have problem to use the cashier register, clicking the working menu button, learners will find an interactive cashier register simulator to show the process step by step.

IV.   FINDING AND RESULTS

Upon the experiment completion, the research finding and data analysis are discussed in the following section.

A.   Observation

Over all, the reports from the observer showed that users have no problems to complete all tasks. Most of the user spent lowest work time to finish task 11 and performed smoothly when working on task 1, 3, 4 and 5 while using the interface. It is interesting that task 1, 3, 4 and 5 all related to heating food.

Oddly, Task 2 also involved with the food heating process, yet users had no problem to complete the heating food process, they did have problem about using working menu. Take a look of this problem further, it indicated that learners might not used to use online menu. In a word, this task is not difficult for learner to perform.

Task 10 is the one most learners boggled at. In this particular task, users seem to be confused. The report of observer pointed out the problems as (1) "NEXT" prompt does not appear in some steps, (2) interface did not provide feedback, (3) working menu problem continued from Task 2, and (4) screen design was incorrect.

B.   Task difficulty level survey

The results of the tasks difficulty level survey show that the total mean of the 11 tasks was 2.63 (SD=1.05) out of 5-point scale (see Table 1). Five of 11 tasks were rated lower than 2 points that indicated the overall difficulty level was quite fair. The highest rate was the task 7, (M=3.75) "Please complete the process of receiving and checking in merchandises from the franchise store owner." Besides task 7, there are three tasks (task 6, 8, and 10) rated over 3 points (M=3.38). The task 6 is similar to task 7 which involves the receiving and checking problems. Task 8 is the credit related problem and task 10 the manual check out. Obviously, learners are quite comfortable to deal with more straight forward tasks such as heating the food and using scanner to check out. However, the rather complicate and non-linear problems such as credit related and receiving products from various places are more difficult to learners.

C.   Experience of using the program survey

This particular survey was trying to investigate learners' experience about this program. The results of the survey show that the total mean of the 21 questions was 3.87 (SD=0.87) out of 5-point scale. It indicated that learners provided quite positive feedback to the program. In part 1, the quality of the materials, the subtotal mean of the 9 questions was 4.04 (SD=0.70) (see Table 2) which suggested that the quality of the materials is highly accepted by the users. From questions 10 to 14, the usage of the materials, the mean was 3.88 (SD=0.81) which implied that users also quite agree the usage of the program. In part 3, learnability of the material, the mean was 3.75 (SD=1.19) which showed the fairly similar agreement from users. In part 4, intention of behavior, the mean was 3.87 (SD=0.87). Interestingly, the lowest rate average appeared in this section, question 21, *I*

rely on this program to learning very much, only 2.75 (SD=1.16). Yet, the result seems inconsistently to follow the rest of similar questions and it need to be further investigated.

D. Interview

The interview analysis of the perception of using experience is as following:

Q1. Can this program help you clarify the working concept of convenience store? Why?

> *In this question, all 8 users agreed the instruction of this program is able to understand more about convenience store.*
>
> *Yes, SOP makes the working process even clear (F03).*
>
> *I have no idea in the beginning. However, it taught me where should I start (M02).*
>
> *The instructions of bar code and checking in merchandises are quite clear, but it may not apply to all the situations (M03).*

Q2. If you work in a convenience store in the future, will this program guide you to solve some problems? Why?

> *Yes, it provides very understandable SOP (F02).*
>
> *It should be ok for the very basic problems but not all situations (F01).*
>
> *I think that I still need to practice in the real store (F04).*

Q3. What did you learning from this program? You may list some of them.

> *Using cashier register, receiving and checking in goods, and other situation about merchandises (F02).*
>
> *Some processes are different from my mind. I just learned that some packages and materials cannot heat in microwave oven (M02).*

In the overall impression about this program, learners also agreed the usefulness of this program, but they still not comfortable about their own performance. Therefore, if they will be convenience store owners, they will use this program as a new employee training material.

V. CONCLUSION AND DISCUSSION

The study aimed to investigate the usability of an e-learning program in convenience store new employee training. In general, users gave very positive feedback toward the program in quality, usage, learnability of the materials, and intention of behavior as well.

Cross-examining the survey of the evaluation of tasks difficulty level, experience of using this program and results of task observation, fairly consistent results are presented. All the program materials related with heating food processes were highest accepted by users and observers. As mentioned previously, the more linear process, less decision making and more real life situation are easier to be operated. On the other hand, the tasks for novel learners might be difficult because they are lack of prior knowledge about convenience stores management.

Generally speaking, the most critical factors to hold back learning is the poor interface design. The results of this study provided some very crucial indication about this issue. In order to enhance the quality of interface design, iterative cycles of usability evaluation are suggested [16]. Hence, the future studies can involve subject matter experts (store managers and senior employees) to review the entire process and more homogeneous and heterogeneous participants to make the review more thorough and complete. Therefore, the program can be truly useful for the new employee training in convenience stores.

.

REFERENCES

[1] R. C. Clark, and R. E. Mayer, e-Learning and the Sceince of Instruction: Proven Guidelines for Consumers and Design of Multimedia Learning, San Francisco, CA: Pfeiffer, 2007.

[2] B. N. Chou, C. C. Chang, and H. Y. Fu, "The status quo and trends I Taiwan organizational e-learning: A vies from organizational training aspect," Instructional Technology & Media Quarterly, vol. 62, 2003, pp. 69-84.

[3] Wikipedia, http://en.wikipedia.org/wiki/Convenience_store#Taiwan, 2009.

[4] NACS Online, Taiwan's Booming Convenience Store Industry: Country ranks number one in the world with the highest density of convenience stores, Jul, 2009.

[5] Y. C. Cheng, and C. S. Chang, "The design and development of an e-learning instruction that integrates problem-based learning strategy for convenience stroes new employee training," Proceedings of ED-MEDIA 2009: World Conference on Educational Multimedia, Hypermedia & Telecommunications, June, 2009, pp. 1248-1256.

[6] C. S. Chang, W. T. Wong, Y. C. Cheng, and Y. P. Huang, "Usability evaluation in an exploratory design-based research approach of convenience store new employee training e-learning material," Proceedings of Joint Conference on Pervasive Computing (JCPC 2009), the 2009 IEEE Workshop on Advanced Distance Education Technologies (ADET '09), Dec. 2009.

[7] D. L. Kirkpatrick, Evaluating training programs: The four levels, Berrett-Koehler Publishers, San Francisco, 1994.

[8] N. Bevan, J. Kirakowski, and J. Maissel, "What is usability," Proceedings of the 4th International Conference on HCI, Stuttgart, Sep. 1991.

[9] J. Nielsen, Usability engineering. Boston: AP Professional, 1993.

[10] M. J. Miller,Usability in e-learning. Retrieved Feb. 25, 2009 from http://www.astd.org/LC/2005/, 2005

[11] J. Neilsen, Heuristic evaluation. In J. Nielsen & R. L. Mack (Eds.), Usability inspection methods (pp. 25-62). New York: John Wiley & Sons, 1994.

[12] S. Weinschenk, P. Jamar, and S. C. Yeo, GUI design essentials. New York: Wiley Computer Publishing, 1997

[13] J. S. Dumas, and J. C. Redish, A practical guide to usability testing. Exeter, England: Intellect Books, 1999.

[14] D. Stone, C. Jarrett, M. Woodroffe, and S. Minocha, User interface design and evaluation. San Francisco, CA: Morgan Kaufmann, 2005.

[15] C. Barnum, N. Bevan, G. Cockton, J. Nielsen, J. Spool, and D. Wixon, "The "Magic Number 5": Is it enough for web testing. "Paper presented in CHI 2003: Conference on Human Factors in Computing Systems: New Horizons, New York, NY, April, 2003.

[16] J. Rubin, D. Chisnell and J. Spool, Handbook of usability testing: how to plan, design, and conduct effective test(2nd ed.) Indianapolis, IN: Wiley Publishing, Inc, 2008.

TABLE I. THE RESULTS OF THE TASKS DIFFICULTY LEVEL SURVEY

Task	M	SD
Please complete the "hot dog" checking out and heating process.	2.13	0.99
If you have any problem about heating the food, please check on menu and find out the correct process.	1.25	0.46
Please complete the "pork chop lunch box" checking out and heating process.	1.50	0.53
Please complete the "tetra pak green tea" and "bread" checking out and heating process.	1.63	1.06
Please complete the "canned coffee" and "bottle mike" checking out and heating process.	1.38	0.52
Please complete the process of receiving and checking in merchandises from the headquarter warehouse.	3.38	1.06
Please complete the process of receiving and checking in merchandises from the franchise store owner.	3.75	1.04
Please enter "credit problem section" to find the solution of credit problems among supply warehouse, customer and franchise store.	3.38	1.30
Please complete the "bar code" check out process.	2.38	1.51
Please complete the "manual" check out process.	3.38	1.60
Please complete the "receipt exchange" process.	1.88	1.46
Total	2.36	1.05

TABLE II. THE RESULTS OF THE EXPERIENCE OF USING THE PROGRAM

Part 1. The quality of the materials	M	SD
1. The learning content in the program is clear and easy to understand.	3.50	1.07
2. I think this program provides necessary learning content and information for convenience store employers.	4.38	0.92
3. Graphics and icons in this program provided are well indicated.	3.63	1.19
4. The learning content in the program is well arranged and edited.	3.75	0.46
5. The learning content in the program is clear presented on computer screen.	4.75	0.46
6. I think the learning content in this program is the "much learn" skills for convenience store employers.	4.75	0.46
7. I give the high mark to The learning content program provides a high quality learning content.	4.13	0.35
8. In general, this program provides a high quality learning content.	3.75	0.89
9. In general, this program provides a high quality learning content.	3.75	0.46
Part 1 subtotal	4.04	0.70
Part 2. Usage of the materials		
10. If I work in a convenience store, after using this program, I think I am able to carry more works.	4.13	0.64
11. I If I work in a convenience store, after using this program, I think it makes me finish my job faster.	3.50	0.53
12. If I work in a convenience store, after using this program, I think it makes my work more efficient.	4.00	0.93
13. If I work in a convenience store, after using this program, I think it makes me complete my work in ease.	3.75	0.89
14. If I work in a convenience store, after using this program, I think it is useful for my job.	4.00	1.07
Part 2 subtotal	3.88	0.81
Part 3. Learnability of the materials		
15. It is very easy to use this program.	4.13	1.46
16. It is very easy to get needed information from this program.	3.75	0.89
17. It is very easy to master how to use this program.	3.50	1.20
18. I think that this program is very easy to be used.	3.63	1.19
Part 3 subtotal	3.75	1.19
Part 4. Intention of behavior		
19. I think that using this program to learning is worthy.	4.50	0.53
20. If I work in a convenience store, I will use this program very often.	3.25	1.49
21. I rely on this program to learning very much.	2.75	1.16
Part 4 subtotal	3.50	1.06
Total	3.87	0.87