

An Evaluation of Compliance and Effectiveness of ELNP e-Courseware Quality Framework

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Abstract: - ELNP e-Learning Courseware Certification (eLCC) employed a systematic framework to evaluate the educational quality of self-paced e-courseware from perspectives of “content”, “navigation”, “instructional design”, and “instructional media”. The analysis of thirty-seven e-courseware certification cases revealed that a) the eLCC quality framework was a reliable mechanism for evaluating e-courseware, b) nine out of the fifteen eLCC quality criteria were capable of recognize well-designed e-courseware, and c) the quality aspect of instructional design played the most important role in distinguishing and determining an evaluated case’s quality performance.

Key-Words: - e-Learning, Courseware quality, Courseware evaluation, Quality assurance, Instructional design

1 Introduction

In the past decade, the application of Internet and multi-media technologies in learning has transformed the traditional face-to-face learning into a new and pervasive variety of “anytime, anywhere, and anyone” e-learning. The educational effectiveness of the Internet-based e-learning, however, was not automatically ensured through the use of Internet and multi-media technologies. To enhance e-learning quality, the e-Learning Courseware Certification (eLCC) program was introduced in 2005 to recognize and promote well-designed self-paced e-courseware in Taiwan under the “National Science and Technology Program for e-Learning (ELNP)” [1]. ELNP eLCC employed a systematic framework to evaluate the educational quality of e-courseware from perspectives of “content”, “navigation”, “instructional design”, and “instructional media”[2]. It was hoped that eLCC would serve as an accreditation service for e-courseware aimed to be used in corporate e-training and school e-learning. Therefore, ELNP eLCC provided the e-learning developers with the opportunity to access to a reliable quality assurance mechanism in order to ensure e-courseware quality before delivering to the market and to endorse the educational quality of e-courseware already on the market. It was also hoped that eLCC would provide trustful quality information for prospective e-learners, so they could base on e-courseware quality information to identify and select well-designed e-courseware confidently

and truly benefit from e-learning.

The responses regarding eLCC quality framework and quality criteria of e-courseware developers revealed that the introduction of eLCC has aroused a general awareness toward quality issues among e-learning related industries in Taiwan. The status quo of e-courseware quality, however, has not yet been investigated in a systematic manner. Therefore, this study aimed to examine the educational quality of the thirty-seven eLCC cases of 2005 from perspectives of the eLCC quality aspects and criteria.

2 e-Courseware Quality Frameworks

2.1 e-Courseware quality frameworks

E-learning quality frameworks represent potentially useful tools for managing educational quality of e-learning applications. Many organizations have developed quality measures for on-line courses. The Institute for Higher Education Policy [3] identified twenty-four benchmarks to ensure excellence in Internet-based learning. The Western Cooperative for Educational Telecommunications (WCET) developed a set of “Principles of good practice” for electronically offered higher education degree and certificate programs [4][5]. Likewise, the British Association for Open Learning (BAOL) has developed nine generic aspects, including five “enable” criteria and four “results” criteria, to examine an open education provider’s achievement

in quality [6]. Targeting on e-learning courseware, the American Society for Training and Development (ASTD) aims to promote the quality of asynchronous web-based and multimedia e-learning courseware in institutions and corporations through the E-Learning Courseware Certification (ECC) program [7]. ASTD ECC employs nineteen quality criteria categorized as four clusters of standards, including “compatibility”, “interface”, “production quality”, and “instructional design” to evaluate e-learning courseware [8]. Furthermore, WebCT annually recognizes e-learning courses that model best practices in “course design”, “interaction and collaboration”, “assessment and evaluation”, “meaningful technology use”, and “learner support” [9]. Brandon Hall employs eight categories of quality measures to recognize the best self-paced e-learning program in innovative workplace learning annually [10].

Ideally, the results derived from the application of a quality framework are invariably desirable. In the real situation, however, the consequences are usually problematic due to falling considerable short of the aim in using the quality instrument [11]. Similarly, the imposition of quality criteria is likely to lead participants to respond to the letter rather than to the intent of the quality criteria. Therefore, the compliance and effectiveness of a quality

framework need to be examined from the real world applications [12].

2.2 eLCC quality framework

The eLCC program was launched by the Quality Certification Center (QCC) of the e-Learning Network Science Park in January 2005. The eLCC e-courseware quality framework aims to recognize and promote well-designed self-paced e-courseware through a systematic process to examine the educational quality of e-courseware from four quality aspects, including “content”, “navigation”, “instructional design”, and “instructional media”. The quality aspects, quality criteria, and objectives of quality aspects are shown in Table 1. The eLCC e-courseware quality framework is composed of fifteen quality criteria, which can be further categorized as “the required criteria” and “the optional criteria”. Each eLCC quality criterion comprises a 4-level rubric to measure the extent of e-courseware quality from a specific perspective and accordingly gives 0, 3, 5, 7 points for a required criterion and 0, 2, 4, 6 points for an optional criterion. As shown in Table 1, the eLCC quality evaluation is measured on a 100-point scale for each certification case.

Table 1. eLCC quality aspects, criteria, objectives, and scoring method

eLCC quality aspects and criteria	Objectives of quality aspects	Points given by quality level	Sub-total points
1. Content	E-courseware should provide the learner with accurate, appropriately organized, and clearly expressed content in order to facilitate the expected learning.	0, 3, 5, 7	21
1-1 Accuracy (r)		0, 3, 5, 7	
1-2 Organization (r)		0, 3, 5, 7	
1-3 Clarity (r)		0, 3, 5, 7	
2. Navigation	E-courseware should provide the learner with navigational tools to facilitate smooth progress of learning and effective management of learning.	0, 3, 5, 7	19
2-1 Learning navigation (r)		0, 2, 4, 6	
2-2 Operational helper		0, 2, 4, 6	
2-3 Learner tracking		0, 2, 4, 6	
3. Instructional design	E-courseware should provide the learner with well-designed learning activities, such as clearly expressed objectives and content, appropriate learning methods and strategies, and appropriately designed practice-feedback and assessment, to facilitate learning interaction, comprehension, and elaboration.	0, 3, 5, 7	41
3-1 Goal and objectives (r)		0, 3, 5, 7	
3-2 Instructional presentation (r)		0, 3, 5, 7	
3-3 Practice and feedback (r)		0, 2, 4, 6	
3-4 Assessment		0, 3, 5, 7	
3-5 Learning strategies		0, 3, 5, 7	
3-6 Congruence (r)	0, 3, 5, 7		
4. Instructional media	E-courseware should employ well-designed instructional media to arouse and sustain motivation and facilitate learning comprehension.	0, 3, 5, 7	19
4-1 Media design (r)		0, 2, 4, 6	
4-2 Interface		0, 2, 4, 6	
4-3 Media elements		0, 2, 4, 6	

Note 1. (r): required quality criterion, 2. Total points = 100

The reviewing process of eLCC employed individual reviews and a joint meeting of reviewers for each certification case. The quality reviewing committee of eLCC consisted of content experts, e-learning experts, academicians, instructional design practitioners, and e-learning leaders in the industry. Individual reviews were conducted for each eLCC case by two randomly selected reviewers and one invited content expert, and then a joint meeting of reviewers was held to decide on the quality level for each quality criterion based on the results of individual evaluation. As shown in Table 2, eLCC certified e-courseware with Level A (Bronze medal), Level AA (Silver medal), and Level AAA (Gold medal) for passing all the required criteria and with a total score equal to or higher than 60, 75, and 90 points, respectively.

3 Methods and Results

In this present study, the profile of eLCC cases was examined first, and then reliability analysis and item discrimination analysis were performed to examine

the adequacy of the eLCC quality framework. The results are described as follows.

3.1 Profile of eLCC cases

The distribution of the thirty-seven e-courseware cases applied for eLCC in 2005 was summarized in Table 3. For the field of use, 43.2% of the e-courseware cases were developed for corporate training, 35% of the e-courseware cases were developed for the field of education, and the other 21.6% were not limited to a specific field of use. As for the target audience, 67.6% of the e-courseware cases were targeted on adults' learning, 21.6% were targeted on school students, and the other 10.8% claimed to be suitable for audience of all ages. For the length of learning, about half of the e-courseware cases were less than 2 hours of learning. Finally, as for the certified quality level, only 5.4% of the cases were certified as Level AAA, 24.3% of the cases were certified as Level AA, and 10.8% of the cases were certified as Level A, and there were 59.5% of the e-courseware cases failed in eLCC quality certification.

Table 2. eLCC certification levels, criteria, and quality medals

eLCC certification levels	Certification criteria	Awarded quality medals
Level A	1. Passing all required quality criteria, and 2. Scoring equal to or higher than 60 points	Bronze medal
Level AA	1. Passing all required quality criteria, and 2. Scoring equal to or higher than 75 points	Silver medal
Level AAA	1. Passing all required quality criteria, and 2. Scoring equal to or higher than 90 points	Gold medal

Table 3. The distribution of cases by field of use, target audience, length of learning, certified levels

Category	Case number	Percentage in category	Cum. percentage
Field of use	Corporate	16	43.2
	Education	13	35.1
	Not limited	8	21.6
Target audience	Adult	25	67.6
	Student	8	21.6
	Not limited	4	10.8
Length of learning	16hr ~	6	16.3
	6~16hr	7	18.9
	2~6hr	7	18.9
	0~2hr	17	45.9
Certified Level	Level AAA	2	5.4
	Level AA	9	24.3
	Level A	4	10.8
	Uncertified	22	59.5

Note. N = 37

The means and failing rates for each eLCC quality criterion are shown in Table 4. The failing rates of failing cases were low (less than 30%) for quality criteria of the “content” aspect and the “instructional media” aspect. The results indicated that most of the eLCC cases possessed adequate quality in the “content” aspect and the “instructional media” aspect. In contrast, most of the eLCC cases did poorly in the quality criteria of “learner tracking” and “practice and feedback” with failing rates of 70.3% and 48.6%, respectively. For the “navigation” aspect, two third of the criteria possessed a failing rate higher than 30%. Moreover, five out of the six “instructional design” criteria possessed a failing rate higher than 30%. The overall results revealed that the “navigation” aspect and the “instructional design” aspect played the most important role in filtering quality e-courseware. The results also indicated that the eLCC’s aim to emphasize the educational quality of e-courseware was achieved.

3.2 Reliability and validity of eLCC

The construct validity of the eLCC quality framework was ensured by means of a series of experts’ reviews and focus groups during the development of the quality framework. The internal consistent reliability of the eLCC quality evaluation was .808 (Cronbach’s alpha) as measured from the thirty-seven cases of 2005. Therefore, the eLCC e-courseware quality framework possessed adequate reliability and validity. Furthermore, the eLCC trail e-courseware, which was selected for the pilot-test of the eLCC quality framework in late 2004, was certified as eLCC Level AA with a total score of 84 points in 2005, and it was also certified by ASTD ECC in 2005. Based on the adequate reliability and the cross-referencing of ASTD ECC results of the eLCC trial e-courseware, it was concluded that eLCC is a reliable quality framework in recognizing excellence of e-courseware quality. From the low certifying rates (40.5%), however, it also revealed that eLCC is a rigorous quality framework for e-courseware.

3.3 Item discrimination analysis on eLCC Criteria

For analyzing whether the application of the fifteen quality criteria of eLCC is capable of discriminating well-designed e-courseware from inadequately designed e-courseware, item analysis was employed

with the top 27% cases (10 cases) as the high-performance group and the lowest 27% cases (10 cases) as the low-performance group. The summary of item discrimination analysis on eLCC quality criteria is shown in Table 5. Nine out of the fifteen quality criteria possessed significant item discrimination indexes ($D > .30$). In other words, these nine criteria are capable of differentiating well-designed e-courseware from inadequately designed e-courseware. In contrast, there was no significant difference between the high-performance group and the low-performance group in the other six criteria, including criterion of accuracy ($D = .17$), learning navigation ($D = .07$), learner tracking ($D = .30$), learning strategies ($D = .20$), interface ($D = .13$), and media elements ($D = .13$). Although the item discrimination indexes of these six non-significant criteria indicated that they were not capable of differentiating well-designed e-courseware from inappropriately designed e-courseware, it is reasonable for a quality framework to maintain some fundamental quality criteria in order to assert the essential quality of e-courseware.

As for examining the failing rates shown in Table 3 and the item difficulty indexes shown in Table 4, the quality criterion of “learner tracking” showed the highest failing rate (70.3%), and followed by the quality criterion of “assessment” (48.6%). In other words, “learner tracking” and “assessment” were the top two difficult-to-achieve criteria among the fifteen quality criteria for all e-courseware cases. This might indicate that “learner tracking” and “assessment” criteria are too difficult or not welcomed for the developers to implement in the e-courseware. It was suggested to study the reasons for failing to implement “learner tracking” and “assessment” in e-courseware in future studies.

As for the “instructional design” quality criteria, the criteria of “goal and objectives”, “practice and feedback”, “assessment”, and “congruence” possessed discrimination indexes higher than .50. In other words, these four “instructional design” criteria played the most important role in the eLCC quality framework to discriminate well-designed e-courseware from inadequately designed e-courseware. This finding also indicated that the major goal of distinguishing e-courseware quality from an educational viewpoint has been achieved through these four “instructional design” criteria.

Table 4. Summary of means and failing rates by quality criterion

Quality aspects and criteria	Number of sub-criteria	Mean of passed sub-criteria	SD	Number of failing cases	Percentage of failing cases
1. Content					
1-1 Accuracy	3	2.65	.79	3	8.1%
1-2 Organization	3	2.14	.95	6	16.2%
1-3 Clarity	3	2.22	.71	6	16.2%
2. Navigation					
2-1 Learning navigation	3	2.57	.50	0	0.0%
2-2 Operational helper	3	1.86	1.16	13	35.1%
2-3 Learner tracking	3	.81	1.15	26	70.3%
3. Instructional design					
3-1 Goal and objectives	3	1.76	.98	13	35.1%
3-2 Instructional presentation	3	2.16	.73	7	18.9%
3-3 Practice and feedback	3	1.65	1.03	12	32.4%
3-4 Assessment	3	1.46	1.22	18	48.6%
3-5 Learning strategies	3	1.95	1.03	12	32.4%
3-6 Congruence	3	1.65	1.01	13	35.1%
4. Instructional media					
4-1 Media design	3	2.24	.76	7	18.9%
4-2 Interface	3	2.62	.55	1	2.7%
4-3 Media elements	3	2.16	.65	5	13.5%
Average		1.99	0.88		25.65%

Note. N = 37

Table 5. Summary of item difficulty and item discrimination analyses on eLCC quality criteria

Quality aspects and criteria	High-performers' average rate of correctness	Low-performers' average rate of correctness	Item difficulty (P)	Item discrimination (D)	t	p
1. Content						
1-1 Accuracy	0.97	0.80	0.88	0.17	1.51	0.16
1-2 Organization	0.90	0.43	0.67	0.47	3.80	0.00*
1-3 Clarity	0.90	0.50	0.70	0.40	4.43	0.00*
2. Navigation						
2-1 Learning navigation	0.90	0.83	0.87	0.07	0.89	0.39
2-2 Operational helper	0.90	0.50	0.70	0.40	2.51	0.03*
2-3 Learner tracking	0.43	0.13	0.28	0.30	1.80	0.09
3. Instructional design						
3-1 Goal and objectives	0.83	0.30	0.57	0.53	5.09	0.00*
3-2 Instructional presentation	0.93	0.57	0.75	0.37	4.37	0.00*
3-3 Practice and feedback	0.80	0.30	0.55	0.50	4.39	0.00*
3-4 Assessment	0.73	0.07	0.40	0.67	7.51	0.00*
3-5 Learning strategies	0.73	0.53	0.63	0.20	1.43	0.17
3-6 Congruence	0.83	0.27	0.55	0.57	5.08	0.00*
4. Instructional media						
4-1 Media design	0.90	0.57	0.73	0.33	3.81	0.00*
4-2 Interface	0.93	0.80	0.87	0.13	1.55	0.14
4-3 Media elements	0.77	0.63	0.70	0.13	1.27	0.22

Note. * $p < .05$, N = 37 cases

4 Conclusion

The development of e-courseware is a costly and complex multi-dimensional task, and relies on collaborative works of subject matter experts, teaching experts, instructional designers, educational psychologists, multi-media specialists, and web-technology specialists. At the same time, the use of web-based multi-media technology in implementing e-courseware should suit the educational underpinning in order to bring about effective learning of the learner. The introduction of eLCC quality framework not just successfully aroused the awareness of e-courseware quality among e-learners, e-learning developers, and e-learning vendors, but also provided a reliable quality framework for these participants to examine and ensure the educational quality of e-courseware products.

Furthermore, it is justifiable for a quality framework to maintain some fundamental quality criteria in order to assert the essential quality of e-courseware, though they might be incapable of differentiating well-designed e-courseware from inappropriately designed e-courseware. It is arguable that whether the fundamental criteria should be "required" instead of "optional" for all applied e-courseware cases. In considering the educational quality of e-courseware, the eLCC quality framework placed the "required" criteria mainly in the quality aspects of "content" and "instructional design". It is open to change if there is solid evidence upholds a different scheme that is capable of maintaining the essential quality for e-courseware and optimizing the discrimination ability of the quality framework.

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