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Usability Test of eHealth Promotion @HKIEd—A Community of Practice Platform to Promote Healthy Lifestyles

Wai Wing Ada Ma

Department of Health and Physical Education, The Hong Kong Institute of Education, Hong Kong, China
Email: ama@ied.edu.hk

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Abstract

Community of Practice (CoP) has been proved as an effective means for co-creation of knowledge. It is not yet widely used in health promotion, not to mention to utilize technological environment such as Web 2.0 to add value to the CoP. Under this study, an eHealth promotion @HKIEd, a CoP platform to promote healthy lifestyles was designed and constructed. It helped facilitate the CoP to share useful health information, locate expertise, promote health related events, communicate health updates effectively, co-construct shared repertoire of knowledge and build shared best practice on effective health promotion which was not limited to time, space and distance. Usability test was conducted to evaluate user acceptance of the eHealth promotion CoP platform using the Computer System Usability Questionnaire. A random sample of eighty-three active participants was recruited. Fifty females and thirty-three males with mean (S.D.) aged 21.1 were asked to evaluate the e-platform. The average scores of each domain were calculated with the corresponding means of the average scores of *System Use*, *Information Quality* and *Interface Quality* being 2.69, 2.83 and 2.74 respectively. The overall usability was 2.48 and the eHealth promotion @HKIEd demonstrated a high usability. It will provide a promising way to disseminate information for the public in health awareness promotion.

Keywords

eHealth Promotion, Community of Practice, Web 2.0, Usability Test

1. Introduction

The increasing occurrence of chronic and complex diseases is placing increasing demands on hospitals, and causing healthcare costs to escalate. To address this problem, primary healthcare is believed to decrease the

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overall healthcare cost to society by building a healthier population, decreasing healthcare resources and empowering individuals to manage and improve their health. The keystone to such system is education. To foster student-health educators to be self-reliant and lifelong learners that model healthy behaviors both personally and professionally, this study thus aims to design and establish a Community of Practice (CoP) on a Web 2.0 platform to co-create innovative evidence-based health promotion practices for effective promotion of healthy lifestyles in school and community settings, as well as to evaluate its usability.

1.1. What Is Community of Practice (CoP)

A community of practice is a group of individuals participating in communal activity, and experiencing/continuously creating their shared identity through engaging in and contributing to the practices of their communities [1] [2]. With the added value of technology and with the foundation of knowledge management, the community can co-construct a shared repertoire of knowledge and resources in a Web 2.0 platform and build shared effective health promotion practices.

1.2. Advantages of Using Web 2.0 as a Community of Practice Platform

Web 2.0 is adopted as a platform for CoP in this study, mainly due to its user-friendly and free usage. Web 2.0 is a concept for knowledge to be shared, interoperable, collaborated and user-oriented through a platform widely and easily accessible by the stakeholders [3]. It emphasizes active participation, connectivity, collaboration and sharing of wisdom and knowledge among users [4] [5]. The Web 2.0 environments do not only support interaction, but also facilitate the establishment of CoP in which colleagues and students of a tertiary institution in Hong Kong and stakeholders on the global level will share their teaching and learning experiments and co-create a resource bank on innovative and evidence-based health promotion practices via ongoing discussion and timely feedback. The technology in Web 2.0 is not limited to time, space and distance.

2. Construction of the CoP Platform-eHealth Promotion @HKIEd

The working principles for constructing the Web 2.0 environments for the CoP included the following:

- Personalization.
- User-centred approach.
- Easy navigation and reference.
- Concise and elegant style.
- Content display and management.
- Commenting system.
- Flexibility and Scalability.

2.1. Construction of the CoP Platform by Drupal Content Management System (CMS)

Drupal CMS was chosen as it could meet all the working principles for construction the Web 2.0 environments for the CoP. The major advantages of Drupal was three-folded: a) it was open and users could avoid the additional cost of expensive licenses; b) it was flexible with a wide range of modules and users could make use of existing standard modules with the option of further development; and c) users could layout and design the solution themselves. Advanced system of roles and permissions make Drupal a perfect platform to securely distribute content management to departments, students, and other stakeholders.

At a conceptual level, the CoP platform contains three basic layers [**Figure 1**]. The top layer (in blue) is the front-end of the website that one can see in the web browsers. It is generated by HTML, CSS, and JavaScript. The theme system outputs the page content, as HTML, although other types of rendering are supported. CSS is used to control the layout, colors, and fonts of each page. And, JavaScript is thrown in for dynamic elements, such as collapsible field-sets on forms and drag-and-drop table rows in Drupal's administrative interface.

The bottom layer (in red) is the operating system, web server, database, and PHP and they are running the show. The operating system handles the "plumbing" that keeps the website running: low-level tasks such as handling network connections, files, and file permissions. The web server enables that computer to be accessible over the Internet, and serves up the correct stuff when you go to the CoP website www.ehealthpromotion.ied.edu.hk. A database is used to stores data including the website's content, user accounts, and configuration settings, in a

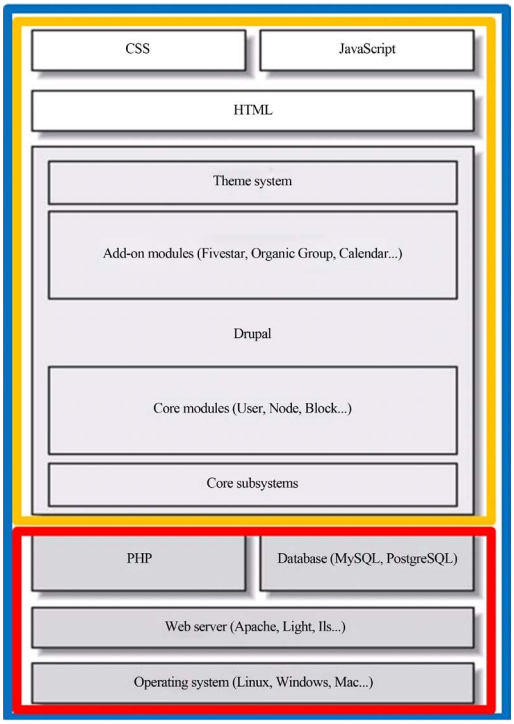

Figure 1. Basic layers of CoP platform for ehealth promotion by Drupal CMS. Key: (blue): Basic layer of CoP platform: www.ehealthpromotion.ied.edu.hk; (orange): Ready-to-use theme by WeebPal.com; (red): Out-of-the-box webhost service by Arvixe.com.

central place for later retrieval. And PHP is a programming language that generates pages dynamically and shuffles information from the database to the web server.

The middle layer (in orange) includes Drupal theme, system, and all functional modules. They, altogether, are called Drupal Content Management System (Drupal CMS). What one can see and what one can use in the CoP site are the tasks performed by Drupal CMS.

2.2. Ready-to-Use Education Theme Design

WeebPal.com provides Drupal-based web solutions that can be customized to meet with the specific needs of education purposes. They have both commercial and non-commercial products that assist individuals, corporates, e-commerce companies, hotels, educational organizations and many more. The ready-to-use education theme design was modified e to suit for this CoP study.

2.3. Out-of-the-Box Webhost Service

Arvixe.com is webhosting service provider. In partnership with other internet-related service providers, Arvixe.com can offer more than 30 optional additional web services. CloudFlare is one of the partners with Arvixe.com. It provides Content Delivery Network (CDN). Its proprietary technology can take advantage of changes to hardware, web server technology and network routing. CloudFlare operates out of 23 data centers around the world. Locations of data center are including Hong Kong. They can automatically catch our static files so that these files are stored closer to our users or visitors when we are delivering our dynamic content directly from our web server. CloudFlare uses a technology called Anycast to route our visitors or users to the nearest data center. Simply speaking, the result is that our website, on average, loads twice as fast for us regardless of where they are located.

3. Activity Web of the Community of Practice Platform

Construction of www.ehealthpromotion.ied.edu.hk, an e-Health promotion website utilizing Drupal CMS, was

completed in early 2015. A core group of members for the CoP, e-Health Promotion @HKIEd, comprising colleagues from nine disciplines across seven departments and three faculties were built up to initiate key learning and teaching projects on effective health promotion practices. Members of a CoP comprising of donors, leaders, facilitators and participants were interdependent and mutually accountable through implicit and explicit roles.

Under this study, innovative evidence-based health promotion practices were experimented under the supervision of learners' teaching practice, health education practice, internship or honour projects which were then be uploaded to a Web 2.0 platform www.ehealthpromotion.ied.edu.hk for peer critique, reflection, refinement and wider applicability with an aim to establish a CoP on effective health promotion practices. Community of practice offers a dynamic platform for undergraduates, post-graduates and educators of different disciplines at a tertiary institution in Hong Kong, and practitioners on global level to engage in ongoing mutual interactions to co-create a shared health promotion practices to promote healthy lifestyles in school and community settings.

Both individual participants, and the CoP as a whole, progress through stages of access, motivation and online socialization, information exchange, and collaborative knowledge and meta-knowledge building within the CoP at www.ehealthpromotion.ied.edu.hk by active engagement on learning and teaching in the activity web (**Figure 2**). Activities being taken place in the activity web, in the form of posting evidence of learning which allow visibility of ideas and creation of collaborative and reflective texts possible, are of key importance to the CoP as weaving individual. Threads of text together makes a strong knowledge fabric, on that represents, and creates the representation of the community as a whole. It is clearly that the reciprocity of collaboration and contribution within the CoP is strong.

4. Purpose of Study

The study aims to design and construct a CoP website for eHealth promotion and to evaluate its usability.

5. Methods-Usability Test

5.1. Subject and Sampling

A total of one hundred and ninety-four CoP participants registered as CoP members including 11 colleagues of a

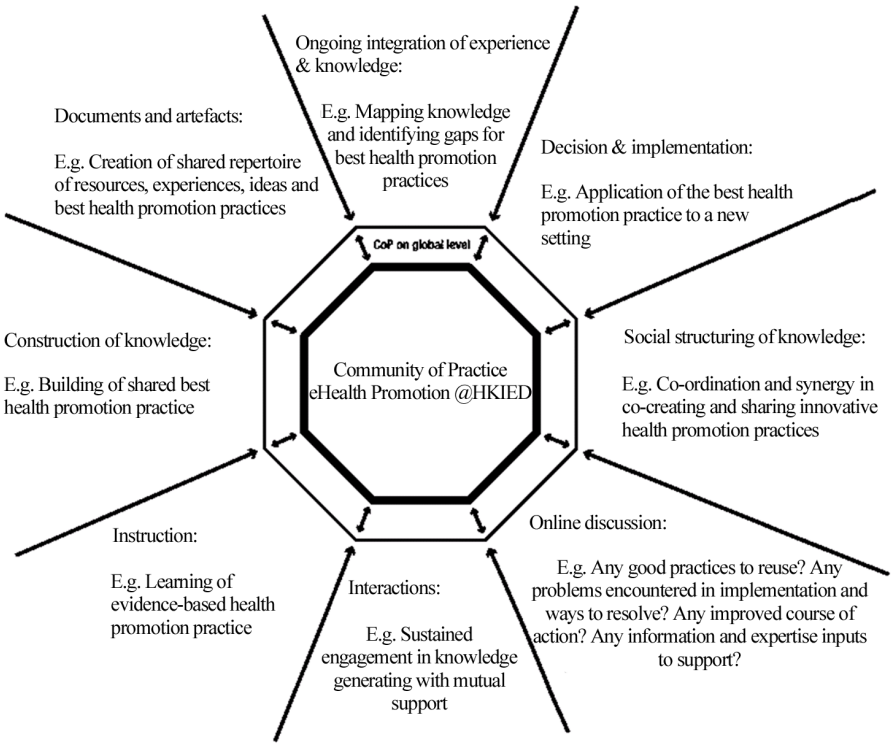

Figure 2. Activity web of CoP for eHealth promotion.

tertiary institution, 163 student-health educators, 17 local health academics and practitioners and 3 overseas health practitioners. Members who had rendered at least ten critical comments to the health practices being uploaded to the CoP Website within three months were considered as active participants. Eighty-three active CoP participants were recruited as subjects by random sampling. Free computer program R was used to generate the random allocation sequence with permuted blocks of size two. The author of the study generated the random allocation codes for the subjects. They were recruited by email invitation. Subjects had no prior experience in the design and construction of the Platform and sampling bias was thus not a concern.

5.2. Procedure

Subjects were engaged in the activity web of the CoP website for three months in 2015. They were then asked to complete the usability questionnaire for the CoP website.

5.3. Instrument

Usability test is a technique used to evaluate the website or an interface by testing on users [6]. To measure usability of the CoP website, Computer System Usability Questionnaire Version 3 (CSUQ v.3) was used. CSUQ is a variant of Post-study System Usability Questionnaire (PSSUQ) which is originated from an internal IBM project System Usability MetricS [7]. CSUQ v.3 is a 16-item, 7-point likert-scale questionnaire which is reliable with same scale and sub-scale reliability with PSSUQ ranging from 0.83 to 0.94 [8]. The 16 items produce scores in four domains: *Overall*, *System Quality*, *Information Quality*, and *Interface Quality*. Subjects were asked to complete the CSUQ v.3 after they had engaged in the activity web of the CoP website for three months.

5.4. Outcome Variables

There are 16 questions with 7-point scales in CSUQ v.3. Score (1) is *strongly agree*, the best score while score (7) is *strongly disagree*, the worst score. Question numbers 1-6 refers to *System Quality*, 7-12 refers to *Information Quality*, 13-15 refers to *Interface Quality* and question 16 refers to the *overall* score to the usability of the website. If subjects failed to answer any questions or marked *Not Applicable*, then average scores were calculated for the remaining number of the questions.

6. Results

6.1. Demographic Characteristics

All recruited participants attended the usability test and complete the questionnaires online at eHealth promotion @HKIEd CoP platform, www.ehealthpromotion.ied.edu.hk. The demographic characteristics of the participants in the usability test are given in **Table 1**. Fifty of them (60.2%) were female and thirty-three were male (39.8%). Their mean age (SD) was 21.1 years.

6.2. Computer System Usability Questionnaire Ratings (CSUQ Ratings)

Table 2 summarized the statistics for the CSUQ question items. For the evaluation of the *System Use*, the mean scores ranged from 2.5 - 2.79. The scores revealed strong agreement on the design of the system use functions. The best scores in this domain were obtained for Questions 1 and 5, which asked for whether the CoP website was *easy to use* and *easy to learn to use*. For the evaluation of the *Information Quality*, the mean scores ranged from 2.6 - 3.12. The best score in this domain was obtained for Question 12 and 11, which asked about the *clarity of organization of the information* displayed at the CoP website screens and the *effectiveness of completing work* with the CoP website. For the evaluation of the *Interface Quality*, the mean scores ranged from 2.67 - 2.83 indicating a strong agreement that the interface of the CoP website was of high quality. The average scores of each domain were calculated with the corresponding means of the average scores of *System Use*, *Information Quality* and *Interface Quality* being 2.69, 2.83 and 2.74 respectively while the mean score for the *Overall* was found to be 2.48, reflecting a very strong user acceptance of the CoP website.

7. Discussion

Construction of www.ehealthpromotion.ied.edu.hk, an e-Health promotion CoP platform utilizing Drupal CMS,

Table 1. Demographic characteristics of the participants in usability test.

	n	%	Chi-square
Gender			
Male	33	39.8	0.667
Female	50	60.2	
Education			
Tertiary	77	92.8	0.560
Postgraduate	6	7.2	
Occupation			
Student-health educator	77	92.8	
Health academics/professional	5	6.0	0.997
Information technology	1	1.2	
Age group			
Youth 15 - 24	75	90.4	0.370
Adult 25 - 59	8	9.6	

Table 2. Descriptive statistics for the CSUQ question items.

Question items	n	Mean	S.D.
System use			
1) Overall, I am satisfied with how easy it is to use this website.	83	2.66	1.21
2) It is simple to use this website.	83	2.69	1.36
3) I am able to complete my work quickly using this website.	83	2.73	1.26
4) I feel comfortable using this website.	83	2.8	1.23
5) It was easy to learn to use this website.	82	2.5	1.24
6) I believe I became productive quickly using this website.	82	2.79	1.07
Information quality			
7) The website gives error messages that clearly tell me how to fix problems.	78	3.12	1.25
8) Whenever I make a mistake using the website, I recover easily and quickly.	79	2.85	1.23
9) The information (such as online help, on-screen messages and other documentation) provided with this website is clear.	80	2.76	1.13
10) It is easy to find the information I needed.	82	2.96	1.19
11) The information provided with the website is effective in helping me complete my work.	82	2.71	1.22
12) The organization of information on the website screens is clear.	82	2.6	1.2
Interface quality			
13) The interface of this website is pleasant.	79	2.67	1.25
14) I like using the interface of this website.	81	2.74	1.14
15) This website has all the functions and capabilities I expect it to have.	81	2.83	1.16
Overall			
16) Overall, I am satisfied with this website.	82	2.48	1.1

was completed by early 2015 which could be easily accessible via computers, mobile devices, social media networking such as Facebook and Twitter. Findings of the CSUQ in 2015 revealed that 85.5% respondents (n = 83) strongly agreed/agreed that they were overall satisfied with the system use, information quality and interface quality of the constructed website. The mean score for the *Overall* was found to be 2.48, reflecting a very strong agreement on the usability of the CoP website.

The strong user acceptance of the CoP website was well reflected in the active participations of the CoP members around the website as well. To publish the shared outcomes, twenty evidence-based health projects were completed and uploaded to the CoP platform for peer critiques involving 1606 participants as direct beneficiaries. The initial usability report of the CoP revealed that the e-platform received more than 6000 hits from HK and 1000 hits from USA and with an average of 80 visits per day in 2015 as indirect beneficiaries. 92% of the audience responses were fine. One Health Practice, *Walk your life to health*: *Brisk walking in programme*, received 1952 reads and 113 comments within a month.

Recently, few studies have highlighted the potential of CoPs as a means to introduce evidence-based innovations and support for enhanced health performance [9]-[11]. Still, CoPs are not yet widely used in health promotion [12] [13], not to mention to utilize Web 2.0 as the eHealth promotion CoP platform to promote healthy lifestyles among the wider population. Community of practice is a concept for knowledge to be shared, interoperable, collaborated and user-oriented through a platform widely and easily accessible by the stakeholders. It emphasizes active participation, connectivity, collaboration and sharing of wisdom and knowledge among users. www.ehealthpromotion.ied.edu.hk, the eHealth promotion @HKIEd platform utilizing Web 2.0 created provides another means of providing information for the public in health awareness promotion which is a sustainable platform for the development of linkages and networks. It does not only support interaction, but also facilitate the establishment of CoP in which colleagues and students of a higher education institution and stakeholders on the global level will share their teaching and learning experiments and co-create a resource bank on innovative and evidence-based health promotion practices via ongoing advancing, refining and replicating the intellectual capital of constructed CoP website, as well as sustained discussion and timely feedback. The technology in CoP is not limited to time, space and distance [14].

Drupal CMS was utilized to construct the CoP website for eHealth promotion for this study. It has been employing by some renowned higher education institutions to build up their education websites such as Harvard University and MIT School of Science; as well as health related institutions including NYU College of Nursing, Columbia University Center for Psychoanalytic Training and Research, and Danish National Center for Teaching Natural Sciences and Health. As revealed in the results of the CSUQ, the merits of website usability employing Drupal CMS were summarized as follows: a) the system was easy to use and easy to learn to use, b) organization of the information displayed at the CoP website screens was clear, c) it was effective to work with the CoP website, and d) the interface of the website was pleasant. Undoubtedly, the platform will facilitate CoP to share useful information, locate expertise, promote health related events, communicate health updates effectively, co-construct shared repertoire of knowledge and build shared practice. It is anticipated that the members of CoP as an active and passionate core will effect change in teaching and learning in health education worldwide, using digital access to provide a platform for the disenfranchised. By visiting and replicating the tested intervention programmes on health in other schools/institutions, the number of participants worldwide can be benefited in a snowball effect.

Driving forces such as alerts, rewards, and grading will be added to the platform for enhancing the development, globalization and sustainability of the e-Health Promotion platform. Taxonomy management will be provided for CoP's easy reference. Quality control will be an important element to assure the e-Health Promotion Platform is reviewed critically so that knowledge in the repository will be maintained in proper standard.

8. Conclusion

eHealth promotion @HKIEd, a community of practice platform is proved to be an useful avenue for health promotion as it is well accepted by the users. It is anticipated that it will take a leadership role to promote healthy lifestyles in schools, in community and on a global level. Health awareness of the public will be enhanced by browsing the website. More importantly, student-health educators, health academics and professionals of various education sectors can actively participate in the CoP activities to co-create new practice, new understanding and new knowledge on effective health promotion in which the team can advance the intellectual capital of the community to build shared best practices.

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