

# Web-based Cancer Control Training for Public Health Practitioners

What Can We Learn from Five Disciplines?

## REPORT

March 18, 2009

Developed by:

**PREVENTION RESEARCH CENTER IN ST. LOUIS  
WASHINGTON UNIVERSITY**

Paula Ballew, MEd

Nupur Kittur, PhD

Ross Brownson, PhD

Debra Haire-Joshu, PhD

Matthew Kreuter PhD

Hope Krebill, MSW

## **TRANSTRIA LLC**

Sarah Castro, MPH

Julie Claus, MPH

Tim McNeil, MPH

Laura Brennan, PhD

Sponsored by:

**THE NATIONAL CANCER INSTITUTE**

Grant No. 5R25CA113433-02

# 1

## Executive Summary

Cancer and obesity are emerging as key issues in public health practice, with an adequately trained workforce at the state and local level becoming vital to controlling these chronic diseases. Effective evidence-based interventions are available, but too often are not disseminated or translated into community settings where the information is likely to be applied. Moreover, there is evidence of a growing gap between the skills necessary to reach cancer and obesity control goals and the actual skill level of the public health workforce. Therefore, this project seeks to use competency-based education to help reduce the burden of cancer due to obesity by properly training the cancer control practitioner workforce. The project uses a two-pronged approach to facilitate this process: 1) development of a competency-based training curriculum and 2) dissemination of training materials through a web-based format. The end goal of the training development and subsequent dissemination activities is to increase the likelihood of adoption of evidence-based interventions to control obesity and cancer through promotion of physical activity and healthy eating.

A set of competencies for evidence-based cancer control education was developed by systematically obtaining input from practitioners in health departments and trainers in academia and community agencies. A master list of competencies was gathered from existing training courses and a set of 26 competencies likely to be important in improving delivery of cancer control interventions were identified. The competencies were prioritized by practitioners and trainers through a card sorting exercise. Ratings were given to each competency for level of difficulty (beginner to advanced) and perceived priority (low to high). These competencies will be used to develop training modules to enhance the likelihood that cancer control practitioners will adopt evidence-based interventions to control obesity and cancer.

To inform the effective delivery of these training modules, a literature review was performed to explore the possibility of developing a web-based version of the training program. Because of the relevance of web-based training use across different fields, literature was gathered from five main disciplines: Information Technology, Public Health, Education, Business and Communications.

Five key research questions guided the literature review process:

**To present the rationale for use of web-based training as opposed to traditional training formats:**

1. What are the benefits to users and organizations of web-based training?
2. What are the barriers for users and organizations with respect to web-based training?

**To guide the development, implementation and maintenance of web-based training:**

3. What are the best ways to promote web-based training among various user audiences?
4. What are the essential components to retain users throughout the duration of the web-based training?
5. What are the evaluation criteria for the effectiveness of web-based training?

Information gathered for this report was identified through publicly available literature databases, using keywords related to web-based training. A total of 136 articles relevant to web-based training design and implementation were identified through the literature review. The majority of resources were found in the Information Technology field and were research-based (i.e., provided information on use or evaluation) versus practice-based (i.e., provided information on design and implementation). Case studies were identified through the review and provide supplemental information on cost effectiveness, cost savings, effectiveness of web-based training, internal marketing strategies, organizational change and evaluation methods and measures. Model web-based trainings were also gathered to provide visual illustrations of premier training designs and features.

Key recommendations from the literature purport that:

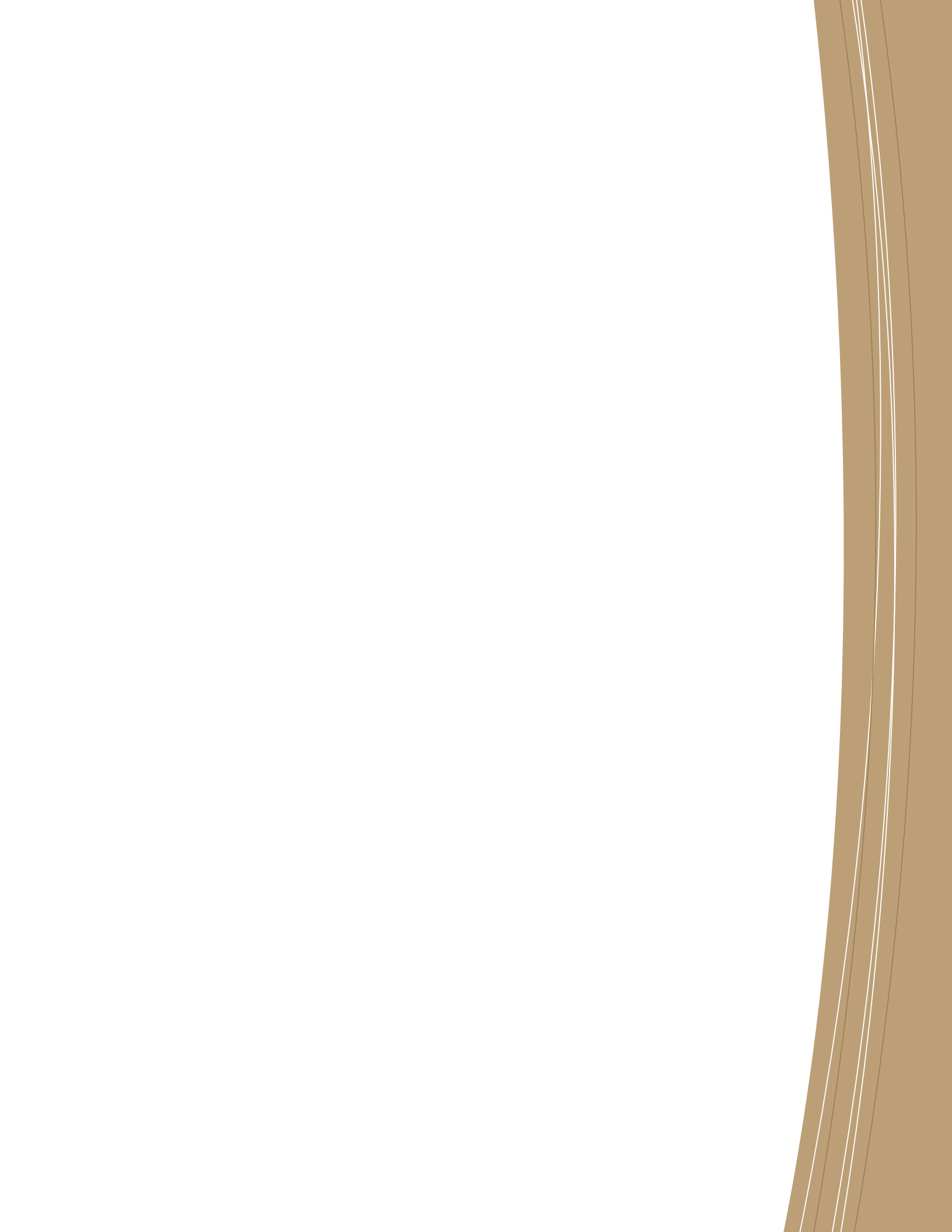
1. **Formative Research** is essential to web-based training development. Assessment and planning with intended users should be conducted prior to training development and users should be involved in the creation of the training components. Training needs, personnel skills and capacity, organizational culture and priorities should be assessed and included in training development.
2. **Training Design/Layout** should include a clear and consistent organizational flow, use clear, concise and consistent formatting, provide visual appeal, use appropriate multimedia, enhance compatibility with multiple platforms and provide flexibility to accommodate different learning styles and physical abilities.
3. **Training Content** should use concise and relevant text, provide background information, use concrete, real-world examples and provide links to websites that provide additional relevant information.
4. **Interactivity** is necessary to engage users and should include features that are dependent on input or responses from the user as part of the training, as well as opportunities for users to communicate with each other and with the trainers.
5. **Technical Support** should always be available and incorporate at least one of the following: an initial tutorial to introduce users to the web-based training format, automated help desks, toll-free hotlines, 24/7 service, remote online troubleshooting and a frequently asked questions page.
6. **Evaluation and Feedback** should provide users with meaningful feedback throughout the training and allow users to provide feedback regarding their satisfaction with the training.
7. **Marketing and Promotion** techniques should introduce the public to the web-based training through links strategically placed on frequently used websites, peer testimonials that are relevant to the target audience and search engine optimizers; and introduce personnel within an organization to web-based training through newsletters, flyers, brochures, e-mails, telephone messages, staff meetings, peer testimonials and training demonstrations.
8. **Incentives** should be provided to users upon completion of the training, including certificates for completion, rewards or recognition in newsletters, memos, bulletin boards or e-mails.

This report outlines a comprehensive set of expert- and literature-informed guidelines for the development of a web-based training. These guidelines are planning tools that may not apply to all web-based trainings but provide insight into key considerations. It is essential to understand and utilize the needs of the target audience when developing a web-based training in order to create the most effective learning environment. Further research is needed to identify effective criteria for measuring training design and functionality.

# 2

## Table of Contents

|  |       |
|--|-------|
| <b>INTRODUCTION AND BACKGROUND</b>   | p. 1  |
| Background on Competency Development   | p. 2  |
| Literature Review of Web-based Training  | p. 3  |
| <b>METHODS</b>   | p. 5  |
| <b>RESULTS</b>   | p. 11 |
| What Are the Benefits to Users and Organizations of Web-based Training?                              | p. 12 |
| What Are the Barriers for Users and Organizations with Respect to Web-based Training?                | p. 13 |
| What Are the Best Ways to Promote Web-based Training Among Various User Audiences?                   | p. 18 |
| What Are the Essential Components to Retain Users Throughout the Duration of the Web-based Training? | p. 21 |
| What Are the Evaluation Criteria for the Effectiveness of Web-based Training?                        | p. 28 |
| <b>RECOMMENDATIONS</b>   | p. 33 |
| <b>LIMITATIONS</b>   | p. 37 |
| <b>CONCLUSION</b>  | p. 39 |
| <b>APPENDIX A: COMPETENCIES</b>  | p. 41 |
| <b>APPENDIX B: CASE STUDIES</b>  | p. 43 |
| <b>APPENDIX C: MODEL TRAINING SITES</b>  | p. 49 |
| <b>ACKNOWLEDGEMENTS</b>  | p. 59 |
| <b>REFERENCES</b>  | p. 61 |



# 3

## Introduction and Background

As cancer control has become a key component of day-to-day public health practice over the past two decades,<sup>1-3</sup> the need for practitioners knowledgeable in evidence-based approaches has grown.<sup>4</sup> Effective interventions are now available from sources including the Guide to Community Preventive Services<sup>5</sup> and Cancer Control P.L.A.N.E.T..<sup>6</sup> State and local public health departments are in key positions to control cancer because of their ability to assess a public health problem, develop an appropriate program or policy and assure that programs and policies are effectively delivered and implemented.<sup>7, 8</sup> Efforts must be concentrated on disseminating these effective cancer control interventions more effectively at state and local levels.<sup>9</sup>

Both researchers<sup>2, 10</sup> and practitioners<sup>1, 11</sup> have identified cancer and obesity control training as a high priority. Yet, implementing competency-based training will require sustained efforts. This project seeks to help reduce the burden of cancer due to obesity by training cancer control practitioners in state of the art, evidence-based approaches. The overall goal for the trainings and subsequent dissemination activities is to increase the likelihood of adoption of evidence-based interventions to control obesity and cancer through promotion of physical activity and healthy eating. To achieve this goal the project specifically focused on answering the following questions:

1. **'Who' should be trained?:** The answer to the "who" question for a public health agency includes public health agency staff and persons from key disciplines (e.g., epidemiology, health promotion, public information, administration) who are involved in delivering cancer control programs or who encourage others to be trained. (e.g. supervisors, management, local funders)
2. **'What' should be learned?:** The "what" question can be largely answered by the competencies that we identified and rated.
3. **'How' should trainings be delivered?:** The "how" is an additional consideration that includes attention to mode of delivery (e.g., web-based trainings, in-person). The specific considerations associated with web-based training development are the focus of this report.

## BACKGROUND ON COMPETENCY DEVELOPMENT

Competency-based education is rapidly becoming a norm in all levels of education in the United States<sup>12-14</sup> and it applies well to training cancer control practitioners.<sup>15</sup> Competency-based education allows public health departments to better develop a workforce aimed at conducting evidence-based cancer control. For this reason, a set of competencies for evidence-based cancer control was generated to guide curriculum development for practitioner-focused training efforts. A competency is defined as a cluster of related knowledge, attitudes and skills that affects the major part of one's job and can be measured against well-accepted standards and improved through training.<sup>16</sup> Competency sets are used both to guide curriculum development and credentialing processes.<sup>14, 17-19</sup>

A two-phased, competency development process was conducted that systematically obtained input from practitioners in health departments and trainers in academia and community agencies (n = 60).<sup>20</sup> In phase one, an initial, general list of competencies on evidence-based decision making was assembled from numerous sources, including on-going training courses in evidence-based public health,<sup>21, 22</sup> findings from a recent project disseminating the Community Guide,<sup>23, 24</sup> the National Cancer Institute Using What Works trainings<sup>25</sup> and competencies for training in public health.<sup>26, 27</sup> A draft list of 56 competencies was compiled and evaluated by the project team in five iterative rounds of review. This review process resulted in a list of 26 competencies (See Appendix A). In the second phase of the project, a card sorting exercise was administered among practitioners and trainers in cancer control. Card sorting is a technique that explores how people group and prioritize items,<sup>28-30</sup> allowing a curriculum focusing on key competencies to be developed. Among the 26 competencies developed, 10 were rated at the beginner level, 12 were intermediate, and 4 were advanced. While adaptation to various audiences is needed, these competencies provide a foundation on which to develop appropriate content for practitioner-focused training programs.

Initial next steps include developing a comprehensive set of training modules to enhance the likelihood that cancer and obesity control practitioners will adopt evidence-based interventions to control these chronic diseases. To our knowledge, no previous cancer or obesity training program has addressed a comprehensive set of competencies across skill levels. In an effort to reach as many practitioners with this training program as possible, a new mode of delivery will be explored: web-based training. To fully understand the implications of moving from a traditional, face-to-face classroom delivery method to a virtual, web-based delivery method, the project team also performed a comprehensive literature review to identify the key components needed to develop and promote an effective and efficient web-based training.

## LITERATURE REVIEW OF WEB-BASED TRAINING

The overall aim for disseminating the competency-based cancer training program was to identify a distribution method that could reach the target audience in an effective and far-reaching manner. With the growth of the Internet, web-based training was identified as a promising distribution channel that could reach a large number of potential users, while simultaneously saving costs. Just as the project used an evidence-based method for developing the competencies curriculum, the project also used evidence-based methods to guide research on using the Internet as a dissemination channel for the training curriculum. Due to the variety of topics and methods used in web-based training, the project team identified the need to learn across disciplines. Therefore, a comprehensive, multi-disciplinary literature review was conducted to identify strategies used to create and promote effective training websites.

The goals of the literature review were:

1. To learn about different approaches used to create web-based educational materials.
2. To integrate the lessons learned from various disciplines in order to formulate guidelines for designing training content and interface.
3. To identify the aspects of web-based training that are proven to be effective in a variety of situations.
4. To document current knowledge about the feasibility and credibility of web-based training in the field of public health.
5. To prioritize recommendations, bearing in mind the limitations of time, money and personnel.
6. To draw attention to model trainings and identify characteristics which make them successful.
7. To highlight gaps in the literature, if they exist.





# 4

## Methods

To guide the literature review process, the project focused on five questions related to website use for online education. Research studies, reports and articles were collected that addressed methods of introducing potential users to an educational website, strategies for holding their interest and motivating users to use the website to its maximum potential. The literature review also sought to understand the major barriers that keep people from participating in web-based learning, and conversely, the factors that facilitate web-based learning. Lastly, methods for determining the effectiveness of web-based trainings were explored. To summarize, the literature review was guided by five key research questions:

**To present the rationale for use of web-based training as opposed to traditional training formats:**

1. What are the benefits to users and organizations of web-based training?
2. What are the barriers for users and organizations with respect to web-based training?

**To guide the development, implementation and maintenance of web-based training:**

3. What are the best ways to promote web-based training among various user audiences?
4. What are the essential components to retain users throughout the duration of the web-based training?
5. What are the evaluation criteria for the effectiveness of web-based training?

An extensive literature review was conducted from five main disciplines including Information Technology (IT), Public Health, Education, Business, and Communications. A brief search of psychology and marketing literature was also performed with few relevant findings. Since web-based training incorporates aspects from many different disciplines and is still in its infancy, it was important to gather information from multiple disciplines in order to provide a comprehensive summary of information relevant to web-based training development. This trans-disciplinary approach allows the developer to collectively determine which components constitute a strong web-based training from a website standpoint (IT and Communications), a learner standpoint (Education), a content standpoint (Public Health) and an organizational standpoint (Business). Additionally, these disciplines also provide insight into the benefits and barriers to web-based trainings and the most effective way to evaluate web-based trainings.

The information gathered for this report was identified through publicly available literature databases (e.g., PubMed). Online searches were conducted utilizing subscriptions through several databases (e.g., EBSCO, LISA, ERIC, Web of Science) including the core fields of Information Technology, Education, Business, Communications and Public Health, along with others from related disciplines. In addition, a thorough search of relevant articles was conducted through general Internet searches using Google Scholar. Books and other resources supplemented the information found in peer-reviewed and practice articles. See Table 1 for a complete list of the databases utilized.

**TABLE 1: MASTER LIST OF DATABASES, SEARCH ENGINES AND WEBSITES**

|  |  |
|--|--|
| Applied Science  | IEEE XPlore                                  |
| ABI/Inform Complete  | International Journal of Electronic Commerce |
| ArticleFirst   | Journal of the Academy of Marketing Science  |
| Bizjournals.com  | Journal of Consumer Research                 |
| Community of Science   | Journals@Ovid Full Text                      |
| CRISP (Computer Retrieval of Information on Scientific Projects) | Lexis Nexus Academic database                |
| ERIC   | Library Literature and Information Sciences  |
| EBSCO  | LISA   |
| Education Full Text  | Marketing Research                           |
| Emerald Full Text  | NSPEC (inspect)                              |
| Factiva  | Ovid   |
| FirstSearch  | ProQuest                                     |
| Global Health  | Pubmed                                       |
| Google   | PsychInfo                                    |
| Google Scholar   | Science Direct Journals                      |
| HCEM (digital library)   | TRIP (Turning Research Into Practice)        |
| Health Source Consumer   | Web of Science                               |
| Healthy Source Nursing/Academic                                  | Yahoo  |

For journal database searches, specific keywords and combinations of keywords were used to locate relevant literature related to the research questions. All relevant databases were searched for primary terms associated with web-based training (e.g. web-based training, e-learning, online training, distance learning). Secondary terms were combined with primary terms to narrow the search and gather more specific information (e.g. barriers, benefits, effectiveness, motivation). Table 2 includes a complete list of search terms used in the research process.

**TABLE 2: MASTER LIST OF SEARCH TERMS**

|  |  |
|--|--|
| Accessibility                            | Motivation                               |
| Barriers                                 | Online training                          |
| Barriers to website use                  | Online audience                          |
| Benefits                                 | Public health web site                   |
| Business                                 | Public health Internet use               |
| Continuing professional education online | Public health professionals Internet use |
| Communication                            | Professional Online Development          |
| Designing distance education             | Retention                                |
| Distance learning                        | Search Engine Optimization               |
| E-education marketing                    | Successful websites                      |
| Education                                | Tailored Health Communication            |
| Effectiveness                            | Traffic                                  |
| E-learning                               | Technology Acceptance Model              |
| E-learning usage                         | Training                                 |
| E-learning planning                      | Uses and Gratification Theory            |
| E-learning program development           | Virtual learning environment (VLE)       |
| Elaboration Likelihood Model             | Visibility                               |
| Getting people to use a website          | Web traffic research                     |
| Goal-based scenarios                     | Web-based communication                  |
| Health website use                       | Web-based curriculum                     |
| Health website promotion                 | Web-based health                         |
| Internet                                 | Web-based health communication           |
| Internet marketing                       | Web-based training (WBT)                 |
| Information Technology                   | Website                                  |
| Internet usage statistics                | Website success                          |
| Internet use                             | Website marketing                        |
| Internet Traffic                         | Website use                              |
| Internet Browsing Behavior               | Website usability                        |
| Keys to websites                         | Website promotion tools                  |
| Marketing                                | Usability testing                        |

Additional literature resources were identified through thorough review of the reference sections of articles found to be relevant for the project and which were also helpful in answering the five questions identified for the project. Many of the online databases provided links to “similar articles” which were perused for relevant information.

A final source of information for the project was that of expert opinion interviews. Two professionals were consulted for information regarding web-based trainings: Dr. Kemi Jona, Research Associate Professor of Learning Sciences and Computer Science at Northwestern University and Rich McNeil, information technology Professor at Joliet Junior College. These experts provided insight into the development of web-based trainings, the current literature available in the fields of Information Technology, Education and Business and examples of model web-based training seminars and courses.

Research and practice-based resources were collected in an effort to examine information from both experts in the field of web-based training and real-world organizations. Each article was classified as either research-based or practice-based. Research-based articles referred to peer-reviewed articles that provided evaluation data and findings related to web-based training development and curriculum. Practice-based articles referred to articles that were not peer-reviewed, but which provided some evaluation data, findings, and/or recommendations for the development and effectiveness of web-based trainings. The practice-based articles were further categorized as quantitative or qualitative, to delineate between the objective and subjective nature of the information. Articles were classified as quantitative if they provided evaluation data and results, or were classified as qualitative if they included recommendations and strategies but no research or evaluation data. Articles were excluded from the final set if they were not specific to web-based training (e.g., commercial or shopping websites, Internet usage, Internet user demographics) or were not related to the scope of the project (i.e., introducing people to web-based trainings, keeping people at web-based trainings, benefits or barriers to web-based trainings, evaluation of web-based training).

## DEFINITION OF PROJECT TERMS

**Research-based** – refers to scientific, peer-reviewed articles or reviews that provide evaluation data or findings related to web-based training development and curriculum.

**Practice-based** – refers to resources that focus on recommendations and strategies for the development of web-based trainings as well as associated evaluation data or findings.

- **Qualitative documents** – no evaluation data and results are presented in the article (recommendations or strategies only).
- **Quantitative documents** – evaluation data and results are presented in the article.

Each research- and practice-based article was carefully read and relevant information was synthesized into five evidence tables using the project's research questions as themes. Within each evidence table, subtopics related to the overarching theme were identified and described, and literature references that supported these subtopics were recorded by discipline.

**1) What are the benefits to users and organizations of web-based training?**

Provides advantages of using web-based training over traditional classroom-based training for various audiences: users, developers and organizations.

**2) What are the barriers for users and organizations with respect to web-based training?**

Outlines barriers for training users and developers, including information on the intrapersonal, technological, and training design barriers that discourage the use and development of web-based trainings.

**3) What are the best ways to promote web-based training among various user audiences?**

Outlines strategies that are effective in promoting web-based trainings to the public and within organizations.

**4) What are the essential components to retain users throughout the duration of the web-based training?**

Identifies web-based training design, layout, content, feedback and support characteristics that are essential to retaining web-based training users over time.

**5) What are the evaluation criteria for the effectiveness of web-based training?**

Summarizes the recommendations identified in the literature for evaluating web-based trainings, including criteria to evaluate effectiveness of a web-based training and criteria to identify key components critical to the design and implementation of strong web-based trainings.

Case studies (e.g., "real world" examples) were gathered as a supplemental source of information, to provide examples of cost effectiveness and cost savings, effectiveness of web-based training, internal marketing strategies, organizational change and evaluation methods and measures. Case studies were gathered through keyword searches in databases relevant to each discipline (e.g., ERIC, EBSCO) and through online search engines (e.g. Google, Google Scholar). Information on cost-effectiveness was sought to determine if web-based training provided overall learning benefits compared to traditional classroom-based training while also saving costs over traditional training methods. Though considerable evidence of cost savings was found, none of the case studies measured cost effectiveness, therefore results are not included in this report. In addition, information on changes in organizational processes or culture as a result of web-based training was researched, however, due to limited information, results are not included. Case studies were found that addressed the benefits of web-based training versus traditional classroom training (e.g., greater learning outcomes), strategies to market web-based trainings within an organization for increased uptake and evaluation methods and measures used to evaluate web-based training effectiveness. Information gleaned from the case studies is presented in Appendix B.

Model web-based trainings were gathered to provide visual illustrations of premier training designs and features available within existing training websites. The best features identified from each site were matched with evidence from the literature review to illustrate recommendations for developing a new training website (the end product for this literature review process). Google searches were performed in the areas of health, business, nutrition, safety, human resources and education to identify organizations offering web-based trainings. Training websites were also identified through word of mouth and other networking opportunities. These training websites were then reviewed and evaluated based on evidence found in the literature review regarding ways to retain users at a web-based training. If the web-based training utilized multiple (>3) features previously identified as necessary to keeping people at a web-based training, it was included in the list of model web-based trainings. Illustrations of the key features found in each model web-based training are presented in Appendix C.

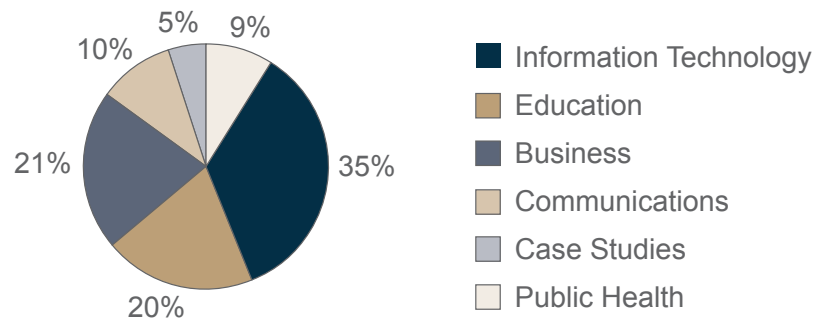
# 5

## Results

A total of 136 articles relevant to web-based training design and implementation were identified through the literature review: 48 from Information Technology, 27 from Education, 28 from Business, 14 from Communication, 7 from Public Health and 12 case studies (Figure 1). As might be predicted, the majority of the literature concerning web-based training came from the Information Technology field. Information from the Education and Business disciplines was equally split suggesting that web-based learning may be moving beyond distance education in universities to practical application in organizations. Little information was found in the Public Health field regarding web-based training. Figure 1 illustrates the breakdown of resources collected through the literature review process by discipline.

**FIGURE 1**

### Distribution of Resources by Discipline



More of the sources of information collected were research-based than practice based. Of the 136 articles collected and reviewed, 92 were found to be research-based while 44 were practice-based. The results suggest that significant research regarding web-based training is being conducted by experts in the field. The smaller quantity of practice-based evidence supports literature that states web-based training is still in its infancy within organizations.<sup>31</sup> The lack of published information suggests organizations are in the initial stages of implementing web-based trainings and do not consistently write about their experiences. Within the practice-based articles the majority (n=30) included qualitative data that summarized experiences with web-based training and provided recommendations for designing and implementing trainings online. Of the practice-based articles, 14 were quantitative that assessed specific web-based trainings and included some evaluation data and results.



## WHAT ARE THE BENEFITS TO USERS AND ORGANIZATIONS OF WEB-BASED TRAINING?

### Increased reach, accessibility, flexibility and individualized learning

Web-based trainings, while still in their infancy, have already proven to offer multiple benefits to users and organizations (Table 3). Web-based trainings provide easy access to widespread geographic areas.<sup>32-56</sup> By providing trainings that are available via the Internet, users from around the globe can be given access. In addition, web-based trainings offer users greater flexibility in the timing of their participation.<sup>33, 35-37, 39, 40, 42-50, 54, 57</sup> Users can participate in trainings at times that are most convenient for them and can revisit training modules for refreshers or for checking on specific details. Since web-based trainings can be accessed at any time, disruptions to work responsibilities are minimized. Web-based trainings also provide the opportunity for individualized learning, as trainings can be designed to meet the individual needs of the user.<sup>33, 37, 40-42, 44-50, 55, 56, 58-63</sup> This allows users to have greater control over their learning environment, allows them to move at their own pace through the training and provides users with the opportunity to enhance their learning experience.

### TABLE 3: BENEFITS TO WEB-BASED TRAININGS

- Widespread reach
- Accessible at any time
- Flexible
- Individualized learning
- Low cost
- No travel
- Cross-cultural learning
- Changes can be made quickly and easily
- Simultaneous implementation
- Consistent and standard message
- Risk free environment
- Improved computer skills

### Lower costs and no travel

A significant benefit for organizations implementing web-based training is a decrease in the time and money spent training employees.<sup>38-40, 42, 44-50, 52, 54, 55, 59, 60, 64-69</sup> Many organizations have seen a significant decrease in costs associated with travel, meeting space and hiring of trainers. Participants spend less time in the classroom and traveling to and from trainings. Web-based trainings also help to minimize disruptions to work and family that often arise from having to attend multiple face-to-face training sessions.

### Opportunity for cross-cultural learning

Another benefit to web-based training is the opportunity to engage in cross-cultural learning. Web-based trainings can be developed with input from users, trainers and experts worldwide, which can greatly enhance the overall learning experience.<sup>32, 34, 35, 38, 41, 47, 49, 55, 57, 70</sup> Users have the opportunity to interact with a large number of people across the organization or beyond through online discussion opportunities.<sup>37, 47</sup>

### Changes made quickly and easily

Changes to web-based trainings can be made quickly and easily, which is a benefit for both developers and users.<sup>33, 34, 39-41, 50, 51, 59, 64, 71, 72</sup> Developers do not have to spend as much time updating, reprinting or distributing paper-based training materials, while users are able to receive up-to-date learning content as it is made available.

## Accelerated training and evaluation

Organizations benefit from web-based trainings since trainings can be implemented throughout organizations simultaneously.<sup>37, 48, 56, 60, 68</sup> There is no limit to the number of users who can participate, therefore, web-based trainings accelerate the adoption of new information and new programs within an organization at a greater pace than traditional training methods. For organizations with a limited budget, web-based trainings assist management in reaching entry-level employees who are too low in the organizational hierarchy to be able to travel to in-person trainings.<sup>64</sup> Web-based trainings can be implemented simultaneously, so users can receive consistent and standard messages organization-wide. Web-based trainings also allow trainers to track user performance more easily through automated tracking of quiz scores and other evaluation methods.<sup>40, 50, 54, 66, 69</sup> Training developers are also able to provide website links to additional information, which provides users with immediate access to current and related resources.<sup>35, 50, 63, 71</sup>

## Risk-free environment and improved skills

Additional benefits include a risk-free environment supportive of trying out new things and making mistakes.<sup>42, 46, 52, 73</sup> Many participants feel less threatened and more comfortable contributing in the web environment compared to the classroom environment. This allows for greater participation by shy participants or those who may be self-conscious speaking out in front of others.<sup>34, 35, 43, 53</sup> Web-based trainings provide participants an opportune method for obtaining continuing education credits<sup>59</sup> as well as the ability to improve computer, writing and time management skills.<sup>47, 53</sup> One online trainer observed improvements in writing skills, as he stated, “Over several years now I have observed people contributing what I consider to be higher quality work than what I have seen before. All these courses I have taught before that [the students] write better than they wrote before...I attribute that to the technology.”<sup>53</sup>

## WHAT ARE THE BARRIERS FOR USERS AND ORGANIZATIONS WITH RESPECT TO WEB-BASED TRAINING?

When developing a web-based training, it is important to keep in mind some of the challenges or barriers that may exist regarding its use and development. Obstacles exist for both the organization and personnel developing the site, as well as for the individual user taking part in the training. Addressing these concerns at the onset is important from an organizational standpoint in order to determine the feasibility of the training and the cost effectiveness of its development. Equally important from a user standpoint is to alleviate fear, technological barriers and time constraint issues that many individuals experience during the course of a web-based training. If these barriers are not addressed and resolved quickly, an organization faces the possibility of significant financial and time losses during the development stages, and little return regarding the overall satisfaction and impact of the training for its employees. Table 4 identifies the main barriers to web-based training use.

**TABLE 4: BARRIERS FOR WEB-BASED TRAINING USERS**

- |                         |                          |                              |
|-------------------------|--------------------------|------------------------------|
| • Interpersonal factors | • Technical support      | • Unattractive design/layout |
| • Time                  | • Access/Availability of | • Isolation                  |
| • Cost                  | computers and/or         |                              |
| • Learner initiative    | the Internet             |                              |

## Barriers for Users

### Interpersonal factors

Much research has been done to identify the key factors that hinder people from using a web-based training format over a traditional classroom-based format. The most significant obstacles to overcome from a user's perspective are those that are intrapersonal in nature. Previous trainings have shown that many users lack skills and knowledge related to computer and Internet use that are critical to having a successful training experience.<sup>34, 45, 74-81, 42, 46, 50, 54, 59, 82-89</sup> Some sub-populations, such as older adults, women, lower income individuals and those with less than a high school education have been found to have less experience with computers and the Internet making innovative web-based trainings more difficult to master. This lack of confidence or self-efficacy for using computers can contribute to low enrollment or participation in web-based training programs.<sup>64, 90</sup> Some users have even reported they feel there is a lack of technological skill on behalf of the trainers and teachers, which may further their anxieties when it comes to participating in a web-based training environment. Further, some people have an overall negative attitude towards computers and technology, based on previous experiences,<sup>73</sup> which in turn can create fear or anxiety towards computer usage and the Internet. This is often referred to as "technophobia" in the information technology field.<sup>35, 74, 79, 90-93</sup>

Users have stated that they have a lack of motivation for completing the training due to feelings of intimidation, anxiety about the potential expectations of the training or an overall lack of interest in the subject matter.<sup>43, 46, 50, 77</sup> Fears also exist about an increase in workload as a result of mastering the web-based training content.<sup>92</sup> Other users feel they will not gain anything personally from the web-based training such as raises, promotion or an increase in personal status, which can feed into their resistance or cynicism about the training.<sup>58, 90, 92</sup> At the same time, some users prefer instructional delivery methods such as face-to-face learning or learning from print-based materials instead of web-based delivery methods via a computer monitor.<sup>43, 50, 61, 76, 94</sup> Those who prefer face-to-face instruction or learning from print-based materials often report that web-based training restricts the locations where they can study since they need to be near a computer. They also cite difficulty taking notes on course materials that are web-based, and problems jumping between different parts of the course materials that must be completed in sequence before proceeding to the next section. Due to these concerns there is a feeling of skepticism about the quality of web-based education.<sup>48</sup> In addition to being skeptical about the quality, many report a lack of trust, safety and security when it comes to taking part in web-based trainings.<sup>85</sup> Evidence has also shown that physical health problems, such as carpal tunnel syndrome, vision impairment, eye strain and even sitting in a fixed position for extended periods of time are potential intrapersonal barriers that discourage people from fully utilizing web-based trainings.<sup>50, 94, 95</sup>

### Time

Time has emerged as a major obstacle for individuals using web-based trainings. For many, time commitments to family, school and work significantly take away from the time they have to participate and perform well in web-based training courses.<sup>32, 36, 74-77, 96-99, 46, 58, 79, 80, 87, 100, 101</sup> Employees report having limited time to study while at work since they are not able to set aside their everyday duties and responsibilities during the training course.<sup>43, 76, 87, 102</sup> Concerns have been expressed regarding the amount of time that is required to learn how to use a new website<sup>42, 76</sup> and how to apply the new training information and skills learned into the work routine.<sup>89</sup>

## Cost

Another barrier to using a web-based training is that of the cost associated with taking the course. For much of the general public who would like to take advantage of web-based training courses, the cost can be extremely high and, subsequently, prevent them from enrolling.<sup>32, 46, 48, 59, 64, 70, 74, 79, 103</sup> This cost can include enrollment fees, supplemental course materials and Internet connection charges. Depending on the course and training needed, the costs could range anywhere from one hundred dollars to a few thousand dollars, making it difficult to afford without assistance.

## Learner initiative

When a training is not mandated by an organization, another potential barrier is the level of learner initiative required to actively participate in a web-based training compared to in-person trainings.<sup>45, 50, 53, 61, 78, 79, 83, 104-107</sup> The user is required to have a higher level of focus and discipline in a web-based training than in traditional trainer-led courses to stay on target with the course and its requirements. A lack of initiative on the user's behalf and lack of incentives to complete some courses<sup>76</sup> pose significant challenges to keeping users interested and motivated to complete the course.

"An employee must take initiative and must have the necessary computer or Internet skills to log onto a [web-based training] lesson. [Web-based training] would become useless if employees are not motivated and/or not well trained to use it."<sup>50</sup>

## Support

Receiving or obtaining technical support when problems arise is often cited as a significant problem for many users participating in a web-based training course. Users reported that the lack of technical support was the main reason they had difficulties continuing with the course and one of the greatest barriers they faced.<sup>34, 35, 46, 50, 54, 67, 76, 80, 87, 88, 101, 108</sup> For others, there was a lack of supervisor support to engage in web-based training for personal development.<sup>74, 76, 77</sup>

## Access and availability of computers and Internet

A related obstacle is the lack of access and availability of computers and the Internet that some users experience. Oftentimes, users do not have access to these trainings sites from their home or office<sup>34, 74, 77</sup> due to the lack of a computer, Internet connection or the use of a printer.<sup>34, 35, 47, 48, 50, 54, 68, 74, 79, 88, 100</sup> For many, computers may be outdated and may not carry the suitable technology to run the training program and its components.<sup>33, 42, 48, 50, 53, 74, 77, 80, 82, 92, 93, 109, 110</sup> Many older computers have difficulty playing audio and video clips as well as using certain bulletin board services. Some users may have difficulty accessing the training due to an incompatible operating system (e.g., Personal Computer or Macintosh) to that of the training program. The issue of having unreliable Internet service (e.g., dial up) makes it difficult for the user to access the training.<sup>33, 38, 43, 49, 67, 68, 70, 75-77, 88, 95, 97</sup> Computer systems that have viruses or servers that are not functioning properly create problems for users at unanticipated times making accessing the system variable. Other usability concerns include computers with small bandwidth (the rate that data will be transferred) resulting in considerably long download times, thereby making it difficult to interact with the training in a meaningful manner.<sup>38, 42, 43, 46, 48-50, 58, 68, 73, 75, 82, 83, 93, 105, 108, 110-112</sup> Other usability issues include computers with poor sound quality<sup>96, 113</sup> and cameras or microphones that are difficult to manipulate.<sup>96</sup> Finally, general technology difficulties such as insufficient memory on the user's computer may cause the computer to freeze or crash affecting usability during the training and often leading to course withdrawal.<sup>79, 82, 87</sup>

Participants in web-based trainings have cited barriers with the course content and web page design. Some have suggested that using the latest technology for the course often obscures the content.<sup>73, 114</sup> Doris Lee, et al. states that, “Advances in technology may tempt web-based training designers to use the fastest or the latest technological features possible, but if content and intent are obscured and instructional effectiveness sacrificed, the web-based training becomes another neglected eye-catching, yet useless, lesson.”<sup>114</sup>

### **Unsuitable design, layout and content**

Having an unattractive web page design and layout is another aspect which has been found to be a barrier to web-based training use.<sup>75, 76, 109, 114</sup> This includes unattractive pages, lack of background colors and textures, lack of icons or symbols, lengthy text pages, unnecessary graphics, redundant moving images and unreadable text. Other components that can make it difficult for the user are complicated navigation through the pages<sup>76</sup> or unsuitable web page design for the user’s needs.<sup>48, 93, 96, 115</sup> Some web pages have been criticized for having unclear instructions<sup>76</sup> for both the training course components and the overall website. Clear instructions on how to save course work should be included so participants can continue a training at a later time without having to start over, and can refer back to training materials when needed. An additional barrier with some web-based trainings is that the difficulty and expectations of the training are either too high or too low.<sup>76, 77</sup> Individual users have cited a lack of updates to the course content, irrelevant content that does not meet the user’s expectations<sup>46, 48, 76</sup> and inconsistent, illogical or unclear content as barriers and discouraging aspects to training courses.

“Effective content is among the greatest challenges facing any [web-based training] initiative. If the content does not teach, it has no value, regardless of how ‘high-tech’ or cost-effective it might be.”<sup>102</sup>

### **Isolation**

A final barrier that users have experienced when working with web-based trainings is that of a lack of interaction with other participants. Many users have mentioned that a major aspect they missed with web-based trainings was the face-to-face interactions with other participants and the trainer.<sup>45, 48, 56, 70, 74, 80, 83, 95, 97, 113</sup> Many felt isolated due to a lack of contact with others in the course.<sup>33, 34, 43, 46, 50, 54, 58, 78, 79, 84, 85, 96, 101, 103-105</sup> Besides feeling isolated, users often felt that the exchange of information and ideas between users and professors was poor.<sup>48, 78, 84, 106</sup> Due to the fact that most of the learning takes place online, some users report a lack of participation by other users<sup>103, 115</sup> and that feedback from the trainers is limited when compared to traditional classroom environments.<sup>46, 48, 70, 93, 99</sup>

## Barriers for developers

While it is important to understand the barriers and challenges that a user may face during a web-based training, it is equally important for organizations to address and understand the difficulties they may experience when developing an online training. Failure to recognize these potential problems can lead to the development of a training that is not effective, user-friendly, cost effective or easily maintained. With the overall goal of producing trainings that will enhance the knowledge and skill level of the current workforce, it is essential to develop a system that can accommodate a range of users and produce the best overall results for an organization. Table 5 outlines the most commonly identified barriers for web-based training developers.

**TABLE 5: BARRIERS FOR WEB-BASED TRAINING DEVELOPERS**

- Cost
- Technological skills
- Technology support
- Time
- Administrative support

### Cost

Initially, when an organization is contemplating moving their training from a typical classroom environment into the online world, the first obstacle that must be overcome is that of cost, both upfront in development and over time with maintenance.<sup>34, 43, 47, 50, 53-55, 61, 65, 69, 74, 80, 116</sup> Developing the system from the ground up can be considerably expensive due to the need for new computer hardware and software, personnel time to design the website and course content and training time to instruct staff and trainers on how to use and make changes to the training system. In addition to the initial set-up costs, there needs to be financial support available for future upgrades. Organizations should evaluate a web-based training to determine if it is meeting the training goals and whether immediate or significant modifications are needed. However, evaluation and subsequent upgrades can be time-consuming and costly depending on the personnel required and resources needed to complete the activities.

### Technological skills

As mentioned previously, trainers need to be educated on how to use the training system. A lack of technological skills on behalf of the trainers has been cited as a significant barrier and should be taken into consideration when developing a web-based training course.<sup>34, 43, 50, 55, 65, 67, 74, 79, 80, 93, 117</sup> Specific areas important in preparing the trainers include course design, development and delivery of web-based learning, information technology and information management.<sup>74</sup>

### Technology support

Another barrier that exists when developing a web-based training is the lack of technology support within an organization.<sup>35, 50, 53, 61, 74, 79</sup> Oftentimes, there is limited access to adequate computer equipment within an organization to develop and implement a web-based training. In addition, equipment that is unreliable and has Internet connectivity problems significantly hinders the ability of organizations to produce quality web-based trainings. Some organizations lack the infrastructure needed to support the development and implementation of web-based trainings. In these situations, additional equipment, equipment with greater capabilities or increased personnel may be needed, which could greatly add to the overall development costs.



## Time

Time constraint is another challenge that needs to be examined when an organization embarks on new web-based training development. The process of instituting a training website is exceptionally labor intensive and many organizations have found that they lack the time needed to design, develop, maintain, evaluate and support a web-based training.<sup>35, 53, 65, 67, 74, 79, 93, 116, 117</sup> Organizations typically use their current information technology departments to develop their web-based training systems, however these employees must also maintain their current job responsibilities, posing a significant challenge.

## Administrative support

A lack of administrative support for development of a web-based training has been cited as a barrier.<sup>61, 69, 74, 79, 80, 93, 116</sup> Organizations are often opposed to changes in training methods and are resistant to adopting web-based training innovations. Learning new methods of training employees and how to use innovative web-based systems can be time consuming, which contributes to the resistance. In addition, research has shown that some staff members fear new technology and prefer the traditional face-to-face instructional methods. Staff members may also be reluctant to change due to the unproven efficacy of web-based learning.<sup>50</sup> High staff turnover is another reason organizations are reluctant to develop web-based trainings.<sup>110</sup> Each new staff member joining the organization will require additional training to be able to successfully use the web-based training system. It is important to address administrative support challenges, since buy-in from both the organization and employees are critical to successful utilization of a web-based training system.

Web-based trainings can be an exceedingly efficient way to train employees, however, some training courses may require supplemental face-to-face interaction to convey messages and materials successfully (e.g., sales training).<sup>69</sup> Trainers must also have the necessary skills to lead a web-based training efficiently and effectively. This includes well developed skills in writing, communication, interpreting, conveying and providing logical concise information, as well as the ability to maintain flexibility, address isolation concerns, include elements of asynchronous learning, and develop learning objectives that relate to the users' goals.<sup>43,67</sup> Trainers also need to understand new pedagogy for teaching online (i.e. the most effective practices for teaching when much of the learning environment is online).<sup>67</sup> Moreover, not all work environments provide the most conducive learning atmosphere.<sup>69</sup> For example, those that work in loud, open-spaced offices or cubicles may find it difficult to focus on the task at hand with all of the outside distractions that these environments contain. Overall, numerous challenges to developing and implementing a web-based training have been identified by users and organizations. Proactively addressing these barriers and challenges before launching a new web-based training will result in a more efficient and effective development and implementation process.

## WHAT ARE THE BEST WAYS TO PROMOTE WEB-BASED TRAINING AMONG VARIOUS USER AUDIENCES?

As the demand for continuing education in corporate environments increases, it becomes important to identify and utilize the most effective methods for introducing and marketing training opportunities to organizations and employees. Organizations are beginning to deliver their trainings in a web-based format, but since these trainings are new to many organizations, it is helpful to apprise them of the benefits and showcase how these trainings are essential to furthering the potential of their employees and overall organization. Promoting training opportunities to employees is necessary in order to gain interest and adoption by the greatest number of users and to increase motivation for completing the training. Introducing employees to trainings also provides them with valuable information about what to expect in the training and shows organizational support for training completion. Two major strategies for introducing users to web-based trainings emerged from the literature: marketing web-based training to the general public and marketing web-based trainings within organizations.

## Marketing web-based trainings to the general public

In order to effectively introduce the general public to a web-based training, it is important to know the intended audience. If the target audience has limited computer and Internet use skills, it would be beneficial to provide demonstrations or training opportunities to introduce users to the nuances of the training site. This would allow them to gain a better understanding of how the training website works and may alleviate any fears regarding participation in the training.<sup>89</sup> It is also beneficial to use peer testimonials when introducing users to web-based trainings.<sup>88, 118-120</sup> Utilizing support from people who others recognize and relate to is an effective way to gain public acceptance. Research has shown that providing local opinion leader endorsements can increase visits to a website (12%) compared to those that do not provide them (4%).<sup>88</sup> Buller, DB., et al. state that: "Usually, people contemplate a new product based on communication with others that they feel are expert and trustworthy, especially when uncertainty is high and they want to resolve dissonance about the innovation."<sup>88</sup>

### TABLE 6: MARKETING A WEB-BASED TRAINING TO THE GENERAL PUBLIC

- Audience specific
- Peer testimonials
- Opinion leader endorsements
- Links to training on company website
- Search engine optimization

Organizations promoting web-based trainings to the public should consider placing a link to the training website on homepages that are visited often by intended users.<sup>58, 71</sup> In a corporate environment, links should be provided on departmental web pages allowing employees in various departments to be aware of trainings relevant to their specific backgrounds and needs. This method of introducing people to web-based trainings is important because links provided on paper or in e-mails run the risk of being accidentally misplaced, mistyped or deleted.<sup>58</sup>

One of the strategies that is best suited for reaching and introducing a large number of people to a new website is to ensure that search engines (e.g., Google, Yahoo) can find the training website when users perform a search query. This process, called search engine optimization, can increase the volume and quality of traffic to the training website by making the website as visible as possible to users. Search engine optimization is an important component to website development and marketing since most people usually look at only the first 10 listings that are produced by a search before making a selection or refining their search.<sup>121</sup> Therefore, in order to optimize the results from online search engines, it is important to use topic- or industry-related key words in the text of the website.<sup>121-124</sup> Search engines organize all of the information available on the Internet and begin to rank the websites by linking keywords found on websites to those used in the searches.<sup>121</sup> Providing relevant keywords increases the likelihood that search engines will identify the training website and rank it higher than similar websites, in turn making it more likely that users will visit the website of interest. Pringle et al. concluded that a higher ranking required: "...informative title, headings, meta fields...text...important keywords in the title, but do not use excessive repetition which will be caught out."<sup>125</sup>



Another well-used strategy for optimizing search engines is to provide hyperlinks within the website.<sup>121, 122</sup> These hyperlinks can be in the form of interlinking web pages, relevant inbound links and links to external websites. Interlinking web pages are those that include links to other web pages within the site, in turn, increasing search engine rankings and allowing visitors to locate what they are looking for quickly and easily.<sup>121</sup> Providing related inbound links from third party sites can also increase rankings by increasing site visibility.<sup>121</sup> Some third party affiliates that should be considered include national affiliates, partners and grantors who would be willing to provide a link to the training website.<sup>121</sup>

Web developers should appropriately label graphics that are used within a website in order to increase the likelihood that search engines will direct a user to the desired website.<sup>121</sup> Images on the web have a property called an ALT tag which contains a short description that appears when users move their mouse over the image. By providing phrases in ALT tags that relate to the content on the page, search engines are better able to determine if the material is relevant, which can increase the overall ranking from the search.<sup>121</sup>

One pitfall to avoid when developing a training website is using Flash player videos on the homepage, since search engines have difficulty reading them.<sup>123, 126</sup> Search engines have programs built into them that “crawl” the Internet identifying content and links within web pages. Most search engines are unable to crawl into and index a Flash site, which can lower the ranking result considerably.<sup>126</sup> Table 6 summarizes the strategies for marketing web-based trainings to the general public.

### **Marketing web-based trainings within an organization**

The second emergent strategy for introducing people to a web-based training is to market within organizations whose operations are related to the training content. This method is a more straightforward approach because of the ability to discern who the targeted audience members are and how best to reach them. Table 7 identifies methods for marketing web-based trainings within an organization. Several inexpensive and effective ways to reach a large number of users within an organization quickly and easily include newsletters, flyers, brochures, e-mails and the company intranet.<sup>42, 88, 120, 124, 127-129</sup>

### **TABLE 7: MARKETING A WEB-BASED TRAINING WITHIN AN ORGANIZATION**

- Newsletters, flyers and brochures
- E-mails and telephone messages
- Staff meetings
- Company intranet
- Peer testimonials
- Opinion leader endorsements
- Companies’ marketing departments

Promotion techniques such as integrating web-based training into new employee development or orientations,<sup>102, 127</sup> encouraging organizations/managers to recommend the training<sup>71, 77</sup> or mandating the training<sup>120, 127</sup> are all effective ways to achieve the goal of ensuring all employees are trained appropriately. Other techniques to promote a web-based training include holding an open house where employees receive more information about the benefits of web-based training and how it could enhance their careers.<sup>127</sup> Some companies have distributed formal invitations and served refreshments during the informational open house to reward the employees for attending.<sup>127</sup> Similarly, organizations have held brown-bag lunches for managers, supervisors and human resource professionals where food is served and a short seminar instructs them on how to introduce web-based training into their development plans for new and current employees.<sup>127</sup> Workshops and demonstrations on how to use the training website have also been effective techniques used by organizations.<sup>58, 89</sup>

While policies can be set in place to ensure that employees receive the required training, it is more worthwhile to showcase the successes and benefits that can be achieved through participation in the training.<sup>42, 120</sup> This, in turn, can encourage voluntary participation as opposed to mandatory participation. One technique is to use an in-house newsletter to outline the successes and benefits that others have achieved after completing the web-based training.<sup>120</sup> Management should also acknowledge their support for the training and provide examples of how they are actively involved in making the web-based training worthwhile for their employees.<sup>42, 73</sup> Detailing the experiences that managers have had with the training and the resources being invested in the training will give employees an understanding of the commitment level of the organization, and the long-term goals for making the organization stand out in the field. Several organizations have used rewards and recognition as incentives for completion.<sup>58, 118, 120, 127</sup> Organizations have recognized users personally, departmentally or on a company-wide basis by presenting certificates of achievement<sup>118, 127</sup> or recognition through internal newsletters, memos, bulletin boards or e-mails.<sup>127</sup> Other incentives have included access to post-training resources, such as citations of scientific literature, lists of websites for additional information and other downloadable materials that further reinforce training concepts.<sup>118</sup>

## WHAT ARE THE ESSENTIAL COMPONENTS TO RETAIN USERS THROUGHOUT THE DURATION OF THE WEB-BASED TRAINING?

Understanding the retention factors that keep users at a web-based training is critical to designing and implementing a course that fully meets the needs of individual users and organizations. Incorporating these factors into a web-based training will ensure users are more engaged in the training and are able to expand their learning beyond what can be learned in a classroom.<sup>114</sup> When web-based trainings are well-designed with user needs in mind, there is increased satisfaction and users are more likely to not only complete the training, but to also participate in additional trainings.<sup>85</sup> Satisfied users are more likely to recommend the training to co-workers, which facilitates greater reach of the training throughout an organization.

This section provides evidence-based information that identifies characteristics of web-based trainings essential to retaining users at a training course until completion (Table 8). These characteristics fall into two main themes: 1) characteristics related to the initial design and development of web-based trainings and 2) characteristics related to maintaining web-based trainings over time.

**TABLE 8: RETAINING USERS AT A WEB-BASED TRAINING**

- |   |                                 |                          |
|---|---------------------------------|--------------------------|
| • Interactivity                           | • Visual appeal                 | • Real world examples    |
| • Safety and security                     | • Multi-media                   | • Feedback & follow-up   |
| • Clear organizational flow               | • Accessible, simple technology | • Incentives             |
| • Clear, concise, & consistent formatting | • Independent learning          | • Administrative support |
| • Hyperlinks                              | • Concise & relevant content    | • Technical support      |

## Design and Development Characteristics

### Interactivity

One of the most critical elements in designing and developing web-based trainings to attract and retain users is interactivity. Web-based trainings should provide features that allow users to interact with the website in a meaningful way.<sup>32, 44, 48, 51, 52, 56-58, 65, 72, 110, 114, 121, 127, 130-134</sup> This includes providing interactive quizzes which provide automatic feedback, using games to present and practice training topics, and providing realistic simulations and role-playing opportunities. Dan Yaman, president of Learning Ware, Inc., a company that specializes in game-based learning supported the idea of using interactive games: “Just like children, adults enjoy playing games. They like to laugh, and they remember information this is tied to strong emotions. When a game is introduced into a serious classroom environment, participants relax, they get excited, they compete, and most importantly they remember the event and the information tied to it.”<sup>135</sup>

Wentline, TL et al. discuss the need to move beyond simple interactivity: “To be effective, [web-based training] needs to step beyond simple interactivity such as ‘Next’ buttons and move to a more engaging form of interactivity that promotes insight, skill and the ability to reapply knowledge in numerous work contexts.”<sup>73</sup>

Another interactive feature important to the development of web-based trainings is providing opportunities for users to communicate with each other and the course trainer.<sup>32, 38, 43-45, 48, 51, 56-58, 60, 70, 73, 80, 93, 95, 99, 100, 105, 106, 110, 111, 129, 132, 136-142</sup> Facilitation of this communication can be supported through the development of chat rooms or instant messaging features, bulletin boards, blogs, e-mail, audio and video conferencing and online learning coaches. Along with this idea, web-based training courses should incorporate interactivity by allowing users to work in teams, similar to traditional classroom-based methods. A successful team strategy is illustrated by the Enhancing Data Utilization Skills through Information Technology program (EDUSIT). This web-based education program offered through the Department of Maternal and Child Health and the School of Public Health at the University of North Carolina Chapel Hill instructed users to work in teams and apply skills they learned in the online training to a health status problem significant in their state. As a team, users developed reports on their state-specific health status problems and posted them on the Internet. This exercise allowed users to interact with one another and apply what they learned to a relevant issue.

### Safety and security

Guaranteeing safety and security through the use of web-based training is an important feature to retaining users.<sup>63, 67, 95</sup> When developing a web-based training, it is essential that user information remains confidential, in an effort to generate trust.<sup>111, 143</sup> In addition, it is important to ensure the website is secure, free from viruses and unable to be infiltrated.<sup>67, 95</sup> Website security can be established by utilizing anti-virus software as well as making sure the software is updated and scanned regularly.<sup>95</sup>

## Clear organizational flow

A major factor found to largely influence the retention of web-based training users is that of the site's design and layout. A strong web-based training design should have a clear organizational flow.<sup>41, 48, 52, 56-58, 61, 73, 74, 81, 89, 93, 112, 114, 121, 124, 137, 139-141, 144-149</sup> The home page should serve as a table of contents and allow users to quickly reach the training areas of interest to them. A site map should also be provided that outlines all of the content available in the training. Navigation should be clear and simple. The path users take through the training must be intuitive, and the operations (or clicks) needed to follow the path should be straightforward. Good training websites often incorporate multiple pathways throughout the course content so individual users are able to select their most preferred path. Moreover, users should be able to navigate through the training with minimal clicks and should be able to move back and forth through the training sections easily. It is helpful for website page lengths to be limited to a single screen for the home page and no more than three screen lengths for all other pages, in order to facilitate easy viewing and minimize the need for scrolling.

## Clear, concise, and consistent formatting

Clear, concise and consistent formatting should be used throughout the web-based training site.<sup>36, 41, 56, 58, 73, 82, 89, 111, 112, 114, 134, 145, 146, 148, 150, 151</sup> It is important that the layout of the training be consistent from page to page, and the training name and logo should be present on each web page. It is useful to present a navigation bar on each page with a fixed position and consistent appearance so users can easily find their way around the training site.<sup>36,111,150</sup> The navigation bar should include, at a minimum, a link to the home page, a link to different sections within the training and a search function. To minimize confusion for the users, it is helpful to provide instructions for each section of the training within the section.<sup>36,82,146</sup> In addition, clear organization of information on the training web pages is needed to retain users. Headings should be used on each page with a consistent look throughout the training. Topics should be grouped logically and consistently to help orient the users. In order to grab users' attention it is important to place relevant information higher on the page and less relevant information further down the page.<sup>58</sup> In addition, the space within each page can be used appropriately by aligning the content horizontally and vertically. Visual distractions such as unnecessary color, graphics and animation should be minimized. Lastly, the training site should be designed to be accessible for disabled users (e.g., visually impaired, hearing impaired).<sup>112</sup> Comprehensive guidelines for website accessibility can be found at: <http://www.usability.gov>.

## Hyperlinks

Clear and consistent hyperlinks should be used throughout the web-based training to link users to additional information regarding the training content.<sup>32, 37, 48, 56, 58, 61, 65, 73, 86, 89, 109, 111, 135, 145, 147, 150</sup> Hyperlinks should be clearly identified with a standardized format throughout the training. Hyperlink labels should be descriptive, unambiguous and not include distracting graphics. Repeating important hyperlinks on multiple pages as needed is preferred, so users do not need to search for them.

## Visual appeal including multi-media

Visual appeal is an aspect of design and layout that is relatively simple, yet significantly important to retaining users at a web-based training.<sup>32, 38, 48, 56, 58, 61, 65, 73, 86, 89, 109, 111, 145, 147, 150, 152</sup> Color combinations used in the training should be easy to view and read. For instance, text should be a different and distinct color from the background color to facilitate ease of reading. The training design should utilize user interface design components by being visually attractive to the user while still emphasizing functionality through a simple and efficient design. Adding to the visual appeal is the use of graphics, video clips, audio clips and animation. The addition of graphics and multi-media components are essential in developing strong web-based trainings.<sup>32, 33, 35, 36, 41, 42, 44-47, 58, 65, 73, 98, 105, 106, 109-111, 114, 132, 147, 150, 152-154</sup> Moreover, the use of graphics and multimedia should be appropriate for the training topic, used in balance with the training content, and informational as opposed to decorative.<sup>36, 150</sup> The appropriate use of graphics and multimedia adds to the visual appeal of a training by gaining the attention of users and increasing their engagement with the training.<sup>111</sup>

## Accessible, simple technology

Other important design elements include using technology that is accessible and simple (e.g. uncomplicated graphics) and compatible with multiple platforms (e.g., Macintosh, PC) and Internet browsers (e.g., Explorer, Firefox, Safari).<sup>48, 57, 60, 65, 80-82, 109, 147, 151</sup> When designing a web-based training it is important to utilize technology that is available to the majority of users, and to avoid using components that may “crash” a user’s system (e.g., large download files, detailed animation).<sup>81, 151</sup>

## Independent learning

Allowing flexibility in learning is key to retaining web-based users.<sup>33, 37, 41, 47, 48, 52, 73, 74, 81, 89, 105, 111, 114, 128, 132, 144, 145, 148, 155</sup> Web-based trainings should support open or independent learning where the user is allowed to take control of the learning process. Users can be “given greater control over the learning environment by allowing them to select from among multiple different learning opportunities within a given course and move at their own pace.”<sup>33</sup> Independent learning should be facilitated by allowing the user to make choices about the training exercises in which to engage, the nature of feedback received, the order of training module completion, the nature of the examples and training topics chosen. Moreover, web-based training modules can address differences in learning styles by using various instructional elements to meet individual user preferences and needs (e.g., case studies, storytelling, demonstrations).<sup>73</sup> Web-based trainings should be designed so that users can take trainings at times when there will be little disruption to their work. Users should also be able to download and print training materials from the training site when needed.<sup>38, 48, 147, 151</sup>

“Creating a simulation that allows learners to try things out and make mistakes is an effective way to help learners generate the questions that lead to learning. Providing learners with a simulation means creating the opportunity for them to make choices – choices about what action to try next and when to request help.”<sup>52</sup>

## Concise and relevant content

In addition to key design and layout elements, strong course content is critical to retaining users. Information within a web-based training must be concise and relevant.<sup>32, 36, 44, 48, 51, 52, 58, 61, 65, 71, 81, 85, 86, 89, 98, 106, 109-111, 114, 121, 124, 129, 132, 137-139, 146-148, 150, 153-155</sup> Short phrases and bullets are most effective, and sentence and paragraph length should be limited. One source recommends using no more than twenty words per sentence and five sentences per paragraph.<sup>58</sup> To minimize disruption of normal work responsibilities, trainings should utilize short training modules (2-4 hours). It is also important to avoid using professional terminology or jargon and to clarify terms when needed.<sup>71, 89, 146, 147</sup> Web-based training content can be personalized by writing text in the first and second person, so the computer is seen as a conversational partner rather than an information delivery agent.<sup>132</sup> Content for web-based trainings should be developed at an appropriate reading level that takes into account the education and skill level of a range of intended users. In addition, content should be evidence-based and relevant to the user’s job tasks, be kept up-to-date, comprehensive, culturally sensitive and free of errors. To facilitate development of relevant and timely content, course developers are encouraged to seek real-world experts and practitioners to help design content and include their insights and stories into the course itself.<sup>52</sup>



It is helpful to include course and site background information in a web-based training course along with the purpose of the training.<sup>38, 43, 58, 105, 110, 114, 136, 146, 154</sup> The goals and objectives for the training should be clearly stated, as well as the course requirements, instructions on how to use the training and standards for grading. If possible, the trainer's contact information should be provided in the event a user has specific questions. It is useful for each module to express the time required and difficulty expected prior to the start of the module so users are adequately prepared before beginning each section of the training.

### **Real world examples**

Using concrete real world examples is an essential element in developing a successful web-based training.<sup>32, 38, 43, 44, 51, 52, 56-58, 60, 65, 81, 85, 98, 101, 102, 105-107, 110, 111, 114, 132, 139, 140, 142, 146, 148-150, 153, 154</sup> Successful web-based trainings use stories and goal-based scenarios to present instructional material, which emphasizes skill-building and application rather than rote memorization of instructional material. Trainings should allow opportunities for users to apply their new knowledge to a problem in the field. Roger Schank suggests that one way to facilitate "doing" is to "prepare students to do something, have them do it, and then have them reflect upon how well they did it and prepare to try again."<sup>149</sup> Another method of providing real world examples is including web links on the training site to other industry-related sites where users can find additional information.<sup>45, 48, 52, 58, 85, 89, 109, 114, 147, 151, 153</sup>

### **Web-based training maintenance characteristics**

#### **Feedback and follow-up**

Though sound design and development is critical to launching a strong web-based training, it is also important to build in capacity for maintenance of the site over time. Maintenance is the second emergent theme in retaining users over time, and equally important to development. Maintaining connections to users can come in various forms. One such element is providing feedback and follow-up to users to facilitate long-term engagement with the web-based training.<sup>36, 43-45, 48, 51, 52, 56-58, 60, 65, 73, 74, 80, 81, 85, 92, 93, 100, 101, 105, 106, 110, 114, 121, 136, 138, 139, 145, 146, 148, 156</sup> Users benefit when feedback from quizzes, assignments and practice exercises is provided in a timely manner. Feedback should be meaningful by summarizing individual performance throughout the training experience, reinforcing learning and highlighting areas in which the user is now competent.<sup>41, 52, 138, 154</sup> Users should also be granted opportunities to provide feedback to the trainer and evaluate the training course and experience.<sup>58, 121, 136</sup> Along with feedback, follow up and communication between the user and trainer should be promoted and encouraged to maintain user engagement throughout the training.<sup>36, 56, 57, 106, 138, 139, 156</sup> Capella University instructors maintained follow-up with their online students through e-mail and private discussion spaces accessible to each individual user.<sup>156</sup> Other trainings have encouraged users to schedule chat times with their instructors.<sup>73</sup>

#### **Incentives**

Providing incentives for training participation is another way to retain users and recruit new users. Incentives that have been found to be effective include certifications for training completion, rewards or recognition for completion and intrinsic motivators.<sup>36, 41, 46, 58, 77, 105, 114, 118, 120, 127, 150</sup> Certifications can be presented to employers at the completion of the training and placed in employee personnel files. Users can be recognized through internal newsletters, memos to the company, announcements on bulletin boards and e-mail messages. Additionally, web-based trainings can support intrinsic motivation by emphasizing the opportunity for personal growth and life-long learning.<sup>114</sup>

## Administrative and technical support

Web-based trainings require administrative support to update and refresh content, provide technical support and control training costs. Ensuring timely and up-to-date content is important to maintaining use of a web-based training over time.<sup>44, 48, 58, 71, 139, 156</sup> Users are more likely to complete web-based trainings that are continually offering new information and corresponding to the environment in which they currently work – an advantage over traditional, paper-based training methods. Continuous technical support is also critical in maintaining a web-based training that is available and functional for all users.<sup>37, 42, 43, 46, 48, 57, 60, 67, 71, 74, 81, 85, 89, 91, 92, 94, 110, 113, 114, 120, 127, 136, 138, 146, 151</sup> For web-based trainings that are always accessible, technical support should be offered twenty-four hours a day, seven days a week. Support may be offered through toll-free hotlines, automated help desks, remote online troubleshooting, computer bulletin board systems, and frequently asked questions pages.<sup>37</sup> Since many users have differing technological skill levels, web-based trainings can provide either a virtual learning tutorial or initial face-to-face training to provide users with an adequate introduction to the web-based training format.<sup>68, 80, 81, 98, 141</sup>

## EXPERT INFORMATION ON EFFECTIVE WEB-BASED TRAINING DEVELOPMENT

David A. Cook, MD and Denise M. Dupras, MD, PhD from the Mayo Clinic College of Medicine developed a practical guide to the development of effective web-based trainings that supports many of the key findings identified throughout the report.<sup>58</sup> Two lists were developed that outlined steps to effective web-based learning and characteristics of effectively designed web pages.

### Ten Steps to Effective Web-based Learning

1. Perform a needs analysis and specify goals and objectives
2. Determine your technical resources and needs
3. Evaluate preexisting software and use it if it fully meets your needs
4. Secure commitment from all participants and identify and address potential barriers to implementation
5. Develop content in close coordination with website design
  - Capitalize on the unique capabilities of the Web by appropriately using multimedia, hyperlinks, and online communication
  - Adhere to principles of good web page design
  - Prepare a timeline; plan for up-front time investment
6. Encourage active learning – self-assessment, reflection, self-directed learning, problem-based learning, learner interaction, and feedback
7. Facilitate and plan to encourage use by the learner
  - Make the website accessible and user-friendly
  - Provide time for learning
  - Motivate and remind; consider rewards and/or consequences
8. Evaluate – both learners and course
9. Pilot the website before full implementation
10. Plan to monitor online communication and maintain the site by resolving technical problems, periodically verifying hyperlinks and regularly updating content

## EXPERT INFORMATION ON EFFECTIVE WEB-BASED TRAINING DEVELOPMENT (CONTINUED)

### Characteristics of Effectively Designed Web pages

1. Clear and consistent page organization
  - Hierarchy of importance for items on the page, with more important things higher on page
  - Logical groupings, with visual cues to help organize groups
  - Headings and navigation labels reflecting a single theme (e.g., topic, function, sequence)
  - Consistent format from page to page
2. Wise use of space
  - Division of page into grid of defined areas
  - Alignment of all screen elements horizontally and vertically using grid
  - Limited unused space (web pages require less white space than paper)
  - Few distractions (e.g., unnecessary color, graphics, or animation)
3. Concise text that facilitates “scanning”
  - Clear headings
  - Short phrases and bulleted outlines
  - Limited length of sentences (20 words) and paragraphs (5 sentences)
  - Limited page length (single screen for homepage, scrolling limited to 3 screens for other pages)
  - Topic summarized before presenting details
4. Clear and consistent navigation
  - Site name/logo on every page with consistent position and appearance
  - Navigation bar on every page with consistent position, appearance and content including:
    - Link to homepage
    - Links to sections/categories
    - Search function
    - Utilities (help, additional information, contact information)
    - Navigation bar on right
5. Clear and consistent hyperlinks
  - Clearly identified hyperlinks
  - Descriptive and unambiguous hyperlink labels
  - No use of graphics as hyperlinks
  - Repetition of important hyperlinks elsewhere on the page (as needed)
  - Minimum number of “clicks” to access a given point
  - Consistent hyperlink format on all pages



## WHAT ARE THE EVALUATION CRITERIA FOR THE EFFECTIVENESS OF WEB-BASED TRAINING?

The literature on evaluation methods and measures for web-based training is limited. Due largely to the cost of designing and conducting trainings, few organizations invest the time and finances into evaluating them for learning outcomes and achievements.<sup>50, 157</sup> As a result, little is known about what criteria best measure the key characteristics and effectiveness of web-based trainings. Some research and practice-based resources have established criteria to generally evaluate web-based trainings. These can be classified into two main categories: 1) criteria to evaluate training effectiveness and 2) criteria to evaluate training design and functionality.

### Criteria to evaluate training effectiveness

The criterion used most often to evaluate web-based training effectiveness is user reaction.<sup>37, 38, 46, 48, 56, 70, 78, 110, 127, 133, 158, 159</sup> Organizations typically gauge user reaction by measuring satisfaction with what was learned, along with overall training satisfaction. Measuring learning satisfaction might include asking users about their satisfaction with the knowledge and skills acquired and improvement in their problem solving ability, computer literacy and self-learning ability. User reaction can be measured by asking users to identify the strengths and weaknesses of the training. Users are often asked to comment on the appropriateness of the learning methods (e.g. videos, interactive quizzes, stories) used within the training, the appropriateness and practical application of the content and the promptness of feedback. Users' reactions concerning the features and usability of the website format are assessed to gain insight about the training design and format. Users are often asked to comment on any problems faced within the training, recommendations for improving the training and suggestions for future training topics.

“Conduct frequent course evaluations to pinpoint the strengths and weaknesses of your online learning initiative. Those can be formal evaluations or simple phone calls to random employees once they've completed a course. Survey employees to find out what topics interest them and consider ways to incorporate those interests into your online offering.”<sup>127</sup>

### REAL WORLD EXAMPLE

The University of North Carolina School of Public Health developed a blended classroom and web-based Public Health Leadership MPH curriculum to train professionals across North Carolina. Through the development of this program, the University identified three fundamental evaluation questions that should be used to evaluate a web-based training effectiveness. These questions included:

1. What are the fundamental motivations of learners in the program?
2. What do learners see as the strengths of the program?
3. What are learners' areas of concern about the program?

A self-administered, open-ended questionnaire was used to gather information about these three questions. The questionnaire addressed issues related to participants' motivations, funding, access to computers and the Internet, perceived advantages and disadvantages of distance learning, the public health problems in which they were engaged and how the program might help them with their work. Responses were read and coded as themes were identified.

Learning effectiveness and attitudes are additional criteria used to evaluate training effectiveness.<sup>37, 42, 46, 110, 153, 159</sup> Pre- and post-tests are often used to measure comprehension of the subject matter in order to determine if knowledge has increased as a result of the training. Pre- and post-tests can also be used to measure attitudes about the training and subject matter.

### REAL WORLD EXAMPLE

The Enhancing Data Utilization Skills through Information Technology (EDUSIT) program measures learning effectiveness and attitudes by utilizing a pre- and post-survey.<sup>110</sup> EDUSIT is a distance education program that trains, via a web-course, maternal and child health professionals in state and local health departments to collect, analyze and interpret data. The program has users complete a baseline survey to assess their data and technology knowledge, beliefs, self-efficacy and current practices, as well as agency factors and demographic characteristics. Six months after completion of the training, the survey is re-administered to determine whether users have experienced changes in knowledge, attitudes, use of computers and information technology.

Behavior and organizational change are criteria that measure whether a web-based training is effective in influencing job performance.<sup>42, 65, 110, 153, 159-161</sup> Behavior change has been evaluated through on-the-job observation of users who have completed web-based trainings. Performance indicators are defined prior to the training and are measured before and after the training to detect change.<sup>159</sup> When possible, it is important to include a control group that does not receive the training.<sup>159</sup> To measure organizational change, important measures can be assessed before and after the training. These measures, though often more difficult and timely to assess, might include company costs, turnover, absenteeism, number of grievances, quality and quantity of production and employee morale.<sup>159, 161</sup> Table 10 summarizes the key criteria often used to evaluate web-based training effectiveness.

### TABLE 10: CRITERIA TO EVALUATE WEB-BASED TRAINING EFFECTIVENESS

- User reaction
- Knowledge
- Attitudes
- Behavior change
- Organizational change

## EXPERT INFORMATION ON WEB-BASED EVALUATION

Donald Kirkpatrick, Professor Emeritus, University of Wisconsin developed a training evaluation model that identifies four levels of evaluation: reaction, learning, behavior and results. Kirkpatrick's model is considered an industry standard across the human resources and training communities.

He defines the four levels of evaluation as follows:

- Reaction – how well the trainees liked a particular program
- Learning – the principles, facts and techniques understood and absorbed by the conferees
- Behavior – behavior and capability improvement and time implementation/application of knowledge
- Results – the effects of the trainee's performance on the business

Kirkpatrick offers several guideposts that should be considered when evaluating reaction, learning and behavior.

### Standards for measuring Reaction

1. Determine what you want to find out
2. Use a written comment sheet covering those items determined in step one above
3. Design the form so that the reactions can be tabulated and quantified
4. Obtain honest reactions by making the forms anonymous
5. Encourage the conferees to write in additional comments not covered by the questions that were designed to be tabulated and quantified

### Standards for measuring Learning

1. The learning of each conferee should be measured so that quantitative results can be determined
2. A before and after approach should be used so that any learning can be related to the program
3. As far as practical, the learning should be measured on an objective basis
4. Where practical, a control group (not receiving the training) should be used to compare with the experimental group which receives the training
5. Where practical, the evaluation results should be analyzed statistically so that learning can be proven in terms of correlation or level of confidence

### Standards for measuring Behavior

1. A systematic appraisal should be made of on-the-job performance on a before and after basis
2. The appraisal of performance should be made by one or more of the following groups (the more the better):
  - a. The person receiving the training
  - b. Their superior or superiors
  - c. Their subordinates
  - d. Their peers or other people thoroughly familiar with their performance
3. A statistical analysis should be made to compare before and after performance and relate changes to the training program
4. The post-training appraisal should be made three months or more after the training so that the trainers have an opportunity to put into practice what they have learned
5. A control group (not receiving the training) should be used

For evaluating results, Kirkpatrick states that it would be best to evaluate training programs directly in terms of results desired. However, he comments that there are so many complicating factors that make it extremely difficult, if not impossible to evaluate certain kinds of program in terms of results.

He therefore suggests beginning to evaluate in terms of the other three criteria: reaction, learning and behavior.<sup>159</sup>

### Criteria to evaluate training design and functionality

Ultimately, there is no singular design or function characteristic that is successful for all web-based trainings. Web-based trainings must meet the needs, wants and expectations of the end users in order to be successful<sup>157</sup> and should be designed accordingly. Formative research with the target training audience is essential in developing and implementing a web-based training that will be acceptable and adopted by users and organizations. The literature has identified a few common elements that have been assessed by organizations in the evaluation of their training websites: content, design, accessibility, usability, resource availability and technology (Table 11). While the literature states that it is important to evaluate these elements, it offers very little information on specific evaluation measures or tools. Findings often illustrate what constitutes a strong web-based training design (e.g., clear and concise content, good organizational flow), but does not identify criteria used to evaluate these design components (e.g., specific survey questions, direct observation methods). Therefore, few recommendations are provided for methods to evaluate web-based training design and function, as additional research is needed in this area.

#### **TABLE 11: ELEMENTS ASSESSED IN WEB-BASED TRAINING DESIGN AND FUNCTION EVALUATION**

- Content
- Design
- Accessibility
- Usability
- Resources availability
- Technology

## EXPERT INFORMATION ON WEB-BASED EVALUATION

One expert has identified specific criteria for evaluating web-based trainings. Dr. Roger Schank, a leader in the field of interactivity in e-learning, developed the FREEDOM criteria for evaluating e-learning and identified ways to measure the criteria in each area.<sup>149</sup> Dr. Schank is one of the world's leading researchers in artificial intelligence, learning theory, cognitive science and the building of virtual learning environments. He is President and CEO of Cognitive Arts Corporation, a company that designs and builds high quality multimedia simulations for use in corporate training and for online university-level courses and Socratic Arts, a company that is devoted to making high quality e-learning affordable for both businesses and schools (<http://www.cognitivearts.com/> & <http://www.socraticarts.com/>).

### FREEDOM Criteria

- Failure: a good course must enable failures that surprise the student
  - Measure failure by counting the number of times a student fails to easily achieve the various subgoals in a course
- Reasoning: a good course encourages practice in reasoning
  - Measure reasoning by asking the following questions:
    - Are assignments given for which there are no obvious right answers?
    - Are the problems presented to students to work out on their own fundamentally different from ones they may have worked on in class?
    - Are students asked hard questions in class and given the opportunity to come up with original answers to those questions and the chance to defend those answers?
  - A course will score high on reasoning if a large percentage of the course is devoted to these issues
- Emotionality: a good course must incite an emotional response in the student
  - Measure emotional impact by counting the number of emotional experiences (e.g. accomplishment, stress, fear) provided by the course
- Exploring: a good course promotes exploration and enables inquiry
  - Measure exploration by asking the following questions:
    - When a student has a question, can he or she ask it?
    - How many varieties of answers are possible?
    - Is dialogue encouraged?
    - Are the issues covered interesting enough to warrant inquiry and dialogue?
- Doing: a good course encourages practice by doing
  - Measure doing by counting the number of practice exercises included in the training
  - A course should be mostly doing and listening should be in support of doing
- Observation: a good course allows students to see things for themselves
  - Measure observation by asking the following questions:
    - Is every practice exercise (doing) accompanied by images?
    - Is every informational component (telling) accompanied by images?
    - Are those images emotionally powerful and relevant?
- Motivation: a good course supplies motivation
  - Measure motivation by asking the following questions:
    - Is the material inherently interesting?
    - To the extent that it is not, does the course provide a means of transforming the material in such a way as to make it inherently interesting?
    - Is the means of transformation natural or forced?

# 6

## Recommendations

Through the literature review process and review of model web-based trainings, a number of characteristics have repeatedly emerged as being important to the design and implementation of successful web-based trainings. Based on these emerging themes a list of eight recommendations has been developed to summarize the fundamental elements identified by the literature that should be incorporated into a web-based training. This list of recommendations should be used as a planning tool only, as these characteristics may not be the most important or sole ingredients needed for all web-based trainings. It is critically important to understand and incorporate the needs of training participants when developing a web-based training in order to create the most effective learning environment. Details about these recommendations are provided in the results section of the report.

### FORMATIVE RESEARCH

#### **1) Conduct needs assessment with users prior to web-based training development to assess:**

- Computer literacy
- Baseline knowledge of the subject matter
- Learning needs and expectations
- Learning style
- Demographic information
- Technological capabilities (available hardware, software, personnel)

#### **2) Assess organizational culture and incorporate organizational priorities into training development.**

#### **3) Involve users in the development of web-based training components.**

“Learners can be involved in development work to increase the likelihood that the content matches the needs of their job practices. As more staff members engage in [web-based training] in various ways, they get to know concretely the possibilities learning technology can provide for them.”<sup>102</sup>

## DESIGN AND LAYOUT

- 1) Include a clear and consistent organizational flow.
- 2) Use clear, concise and consistent formatting throughout the training.
- 3) Include clear and consistent hyperlinks.
- 4) Provide visual appeal.
- 5) Use appropriate multimedia (graphics, video clips, audio clips, animation).
- 6) Create trainings that are compatible with multiple platforms (e.g., PC, Macintosh) and browsers (e.g., Explorer, Firefox).
- 7) Provide flexibility in learning.

## CONTENT

- 1) Use concise and relevant text.
- 2) Provide training background information.
- 3) Use concrete real-world examples.
- 4) Provide links to websites that provide additional relevant information.

## INTERACTIVITY

- 1) Provide features that allow users to interact with the training.
- 2) Provide opportunities for users to communicate with each other and trainers.
- 3) Provide opportunities for users to learn from their mistakes.

## TECHNICAL SUPPORT

### 1) Provide technical support by incorporating at least one of the following:

- Initial training to introduce users to web-based training format
- Automated help desks
- Toll-free hotlines
- 24/7 service
- Remote online troubleshooting
- Frequently Asked Questions page

## EVALUATION AND FEEDBACK

### 1) Provide users with meaningful feedback throughout the training.

### 2) Allow users to provide feedback about the training.

“Prepare and follow a timeline. Allow sufficient time to develop the content, create or find appropriate multimedia, develop active learning techniques, prepare evaluation instruments and pilot the site prior to full implementation.”<sup>58</sup>

## MARKETING AND PROMOTION

### 1) Market web-based trainings to the public through:

- Links strategically placed on frequently used websites
- Peer testimonial that is relevant to the target audience
- Search engine optimizers

### 2) Market web-based trainings within an organization through:

- Newsletter, flyers, brochures, e-mails and telephone messages
- Staff meetings
- Rewards or recognition for completion
- Peer testimonial
- Workshops or demonstrations on training use

## INCENTIVES

### 1) Provide certificates for completion.

### 2) Provide rewards or recognition for completion (e.g., newsletters, memos, bulletin boards, e-mails).





# 7

## Limitations

While the literature review process conducted for this project was comprehensive in looking at both research and practice-based articles from multiple disciplines, there are a few limitations that should be mentioned. Perhaps the greatest limitation in this research project was the sheer lack of information available to address the research questions. The topic of web-based training is still in its infancy, and as such, limited research has been done on the development, implementation and evaluation of web-based trainings.<sup>31</sup> As with any new field, much of the developing knowledge has not been published in peer-reviewed outlets (i.e., tacit knowledge).

Since organizational adoption of web-based trainings is still in its infancy, the amount of information available is relatively minimal. In fact, it has been acknowledged that the majority of research examining the effectiveness of web-based training has been conducted in educational settings with students. While many of the findings can be translated to employees within organizations, it should be noted that there could be certain conditions in web-based training that affect employees differently than students (e.g., immediate application of training skills, high accessibility, brevity). Therefore, more research should be conducted in organizations to understand the nuances with training employees via the web.<sup>132</sup> Because trainings should be tailored to users' needs and are often restricted by organizational capabilities, the project team was unable to provide recommendations on the specific hardware and software needed to develop a web-based training. The required technology and development tools depend on the format and components included in the training, and must be decided upon on a case by case basis.

The research was also limited by information that could be gathered from libraries, online databases and search engines. The project team did not have access to trade magazines, organizational newsletters or other organizational publications. Online journal databases were limited to those accessible through a university library system, which further precluded the project team from being able to comb the breadth and depth of information related to the project. Minimal information was available concerning cost-effectiveness, organizational change and evaluation of web-based training design and functionality. The literature often discussed the cost savings associated with web-based trainings, but very little evidence was available that assessed training benefits compared to costs.

“...across all training research, there is a paucity of research examining the return-on-investment and business outcomes of organizational training programs.”<sup>132</sup>

In addition, minimal information was available on changes in organizational culture as a result of training participation, which was a topic of interest for project partners. Information on evaluation criteria was also limited, as organizations do not consistently evaluate web-based trainings, due to time and cost restrictions.<sup>50, 157</sup> Another limitation was the availability of model web-based trainings. The project team was able to access only the training sites that could be viewed free of charge on the Internet. However, there were potentially strong web-based trainings (often offering certifications for completion) that could be viewed for a significant fee. It is important to note that these web-based trainings could have provided additional information and model characteristics that the project team was not able to view. Lastly, though the project team has experience with research in the field of public health, the other disciplines were relatively new to the team (e.g., information technology, education, communications, business). Therefore, experts who represented these disciplines (e.g., librarians, practitioners, researchers) were consulted to ensure appropriate and adequate resources were being captured in the review process.

# 8

## Conclusion

It is evident that web-based learning is “here to stay.” Web-based trainings are diverse and are being developed by many different disciplines, covering numerous learning topics and utilizing many different formats. While still in its infancy, evidence is quickly emerging on the benefits and barriers to web-based training. Organizations are starting to identify the key aspects of training design, content and promotion that are most effective in overcoming barriers and achieving positive learning outcomes. However, web-based training effectiveness and potential to return real benefits to organizations depends, for a large part, on how it is designed, implemented and evaluated to meet the target audience’s needs.<sup>132</sup> There is no one web-based training design that will be effective for all audiences.

The evidence and recommendations presented in this report highlight key factors found to be successful, however it is critically important to understand and incorporate the needs of the target audience in order to utilize the training content and design elements that will create the most effective learning environment.<sup>50</sup> Although some research has been conducted to evaluate web-based training sites, additional investigation is still needed. Specifically, more information is needed on effective criteria for measuring training design and functionality. This report directly supports the development of a competency-based, online cancer and obesity control training program for practitioners by providing a comprehensive set of evidence-based guidelines that should be used when developing the content, design and layout for a web-based training course. The next step for this work is to design a training program that takes these guidelines into account.



## Appendix A: Competencies

| APPENDIX A: APPLYING ASSESSMENT METHODS TO DIFFERENT TYPES OF SOCIAL DETERMINANTS |                     |                    |  |
|---|---------------------|--------------------|--|
| Title   | Domain <sup>a</sup> | Level <sup>b</sup> | Competency   |
| 1. Community input  | C                   | B                  | Understand the importance of obtaining community input before planning and implementing evidence-based interventions to prevent obesity.   |
| 2. Knowledge of relationship between obesity and cancer                           | E                   | B                  | Understand the relationship between obesity and various forms of cancer.   |
| 3. Community assessment   | C                   | B                  | Understand how to define the obesity issue according to the needs and assets of the population/community of interest.  |
| 4. Partnerships at multi-levels   | P/C                 | B                  | Understand the importance of identifying and developing partnerships in order to address obesity and cancer with evidence-based strategies at multi-levels.                        |
| 5. Developing a concise statement of the issue                                    | EBP                 | B                  | Understand the importance of developing a concise statement of the obesity and cancer issue in order to build support for it.  |
| 6. Grant writing need   | T/T                 | B                  | Recognize the importance of grant writing skills including the steps involved in the application process.  |
| 7. Literature searching   | EBP                 | B                  | Understand the process for searching the scientific literature and summarizing search-derived information on obesity prevention.   |
| 8. Leadership and evidence  | L                   | B                  | Recognize the importance of strong leadership from public health professionals regarding the need and importance of evidence-based public health interventions to prevent obesity. |
| 9. Role of behavioral science theory  | T/T                 | B                  | Understand the role of behavioral science theory in designing, implementing, and evaluating obesity-related interventions.   |
| 10. Leadership at all levels  | L                   | B                  | Understand the importance of commitment from all levels of public health leadership to increase the use of evidence-based, obesity-related interventions.                          |
| 11. Evaluation in 'plain English'   | EV                  | I                  | Recognize the importance of translating the impacts of obesity programs or policies in language that can be understood by communities, practice sectors and policy makers.         |

<sup>a</sup>C = community-level planning; E = etiology; P/C = partnerships & collaboration; EBP = evidence-based process; T/T = theory & analytic tools; L = leadership; EV = evaluation; P = policy.

<sup>b</sup>B = beginner; I = intermediate; A = advanced.

## APPENDIX A: APPLYING ASSESSMENT METHODS TO DIFFERENT TYPES OF SOCIAL DETERMINANTS (continued)

| Title   | Domain <sup>a</sup> | Level <sup>b</sup> | Competency   |
|---|---------------------|--------------------|--|
| 12. Leadership and change                                 | L                   | I                  | Recognize the importance of effective leadership from public health professionals when making decisions in the midst of ever-changing environments.  |
| 13. Translating evidence-based interventions              | EBP                 | I                  | Recognize the importance of translating evidence-based interventions to prevent obesity to unique 'real world' settings.   |
| 14. Quantifying the issue                                 | T/T                 | I                  | Understand the importance of descriptive epidemiology (concepts of person, place, time) in quantifying obesity and other public health issues.   |
| 15. Developing an action plan for program or policy       | EBP                 | I                  | Understand the importance of developing an obesity plan of action which describes how the goals and objectives will be achieved, what resources are required, and how responsibility of achieving objectives will be assigned. |
| 16. Prioritizing health issues                            | EBP                 | I                  | Understand how to choose and implement appropriate criteria and processes for prioritizing program and policy options for obesity prevention.  |
| 17. Qualitative evaluation                                | EV                  | I                  | Recognize the value of qualitative evaluation approaches including the steps involved in conducting qualitative evaluations.   |
| 18. Collaborative partnerships                            | P/C                 | I                  | Understand the importance of collaborative partnerships between researchers and practitioners when designing, implementing, and evaluating evidence-based programs and policies for obesity prevention.                        |
| 19. Non-traditional partnerships                          | P/C                 | I                  | Understand the importance of traditional obesity prevention partnerships as well as those that have been considered non-traditional such as those with planners, department of transportation, and others.                     |
| 20. Systematic reviews                                    | T/T                 | I                  | Understand the rationale, uses, and usefulness of systematic reviews that document effective obesity interventions.  |
| 21. Quantitative evaluation                               | EV                  | I                  | Recognize the importance of quantitative evaluation approaches including the concepts of measurement validity and reliability.   |
| 22. Grant writing skills                                  | T/T                 | I                  | Demonstrate the ability to create an obesity-related grant including an outline of the steps involved in the application process.  |
| 23. Role of economic evaluation                           | T/T                 | A                  | Recognize the importance of using economic data and strategies to evaluate costs and outcomes when making public health decisions related to obesity and cancer prevention.  |
| 24. Creating policy briefs                                | P                   | A                  | Understand the importance of writing concise policy briefs to address obesity and cancer using evidence-based interventions.   |
| 25. Evaluation designs                                    | EV                  | A                  | Comprehend the various designs useful in obesity program evaluation with a particular focus on quasi-experimental (non-randomized) designs.  |
| 26. Transmitting evidence-based research to policy makers | P                   | A                  | Understand the importance of coming up with creative ways of transmitting what we know works (evidence-based interventions for obesity prevention) to policy makers in order to gain interest, political support and funding.  |

<sup>a</sup>C = community-level planning; E = etiology; P/C = partnerships & collaboration; EBP = evidence-based process; T/T = theory & analytic tools; L = leadership; EV = evaluation; P = policy.

<sup>b</sup>B = beginner; I = intermediate; A = advanced.



# 10

## Appendix B: Case Studies

### Department of Maternal and Child Health – University of North Carolina at Chapel Hill School of Public Health

#### Enhancing Data Utilization Skills through Information Technology (EDUSIT)<sup>110</sup>

##### OVERVIEW AND PURPOSE OF TRAINING PROGRAM

The Enhancing Data Utilization Skills through Information Technology (EDUSIT) program is an e-learning course that aims to train maternal and child health professionals in state and local health departments to collect, analyze and interpret data. The overall goal of this program is to develop these employee skills in order to improve access to health care services for mothers and children. To achieve this goal, a year-long, six-module, web-based training was developed that allowed participants to complete modules at their own pace.

##### DESCRIPTION OF TRAINING COMPONENTS

- Provided ten Internet exercises to ensure participants had the proper technology skills needed to effectively use the training program
- Focused content on quantitative and qualitative data collection, analysis and interpretation
- Included online tutorials and slides with audio and video
- Utilized online discussion forums, chats and space for participants to post written assignments and for faculty to give feedback
- Provided online self-tests and quizzes with instant feedback
- Incorporated team exercises that required participants to apply the skills they learned to a health problem that was significant in their state
- Required 15-20 hours to complete each module

##### EVALUATION METHODS AND MEASURES

- Pre- and post-tests assessed participant data and technology knowledge, beliefs, self-efficacy and current practices as well as agency factors and demographic characteristics
- Formative evaluation was administered after each module to determine what worked (successes, limitations and recommendations)
- Summative evaluation assessed knowledge on the content, beliefs about topic usefulness, self-efficacy and current practices
- Impact evaluations looked at the benefits of the training for the health department, skills developed, directors' willingness to institutionalize training into their program and benefits to community-level programs

## OUTCOMES OF TRAINING

- None reported

## SUMMARY/LESSONS LEARNED

Several lessons were learned through the evaluation of this program. The first was the need for a syllabus that contained a checklist of activities and tasks associated with each module. This would help participants keep track of the tasks that needed to be completed. In addition, the course could be improved by utilizing training modules that take two to four hours to complete instead of lengthier sessions. Participants described the modules as being too lengthy and lacking natural stopping points, which often interfered with their normal work responsibilities. Course instructors and designers need to be flexible in order to adapt the trainings based on participant feedback. In addition, developers concluded that extra time should be allowed during the development phase to make sure materials are completed on time. Instructional designers should be utilized from the beginning to the end of the development phase to reduce the number of unexpected problems. In addition, a help desk providing technical assistance should be available to participants. The developers also realized that a year long course was not practical due to the frequent turnover of employees at the state and local level, which made it hard to completely train a cohort of employees.

# Cingular Wireless<sup>128</sup>

## OVERVIEW AND PURPOSE OF TRAINING PROGRAM

With the many products and services offered by Cingular Wireless, it was apparent that a sales training program was needed that would teach salespeople how to consistently sell their products. Executives decided an online learning method would be the best way to train its more than 400,000 employees. “We wanted to establish a consistent curriculum, offer anytime access to learning and reduce travel, which would translate into increased selling opportunities,” says Brenda Posey, executive director of retail operations and strategy.

## DESCRIPTION OF TRAINING COMPONENTS

- Utilized a learning management system (LMS) that coordinated all classroom training
- Included new hire training that utilized self-paced and instructor-led online learning, classroom-based sessions and on-the-job training
- Reserved classroom training topics that required face-to-face interactions such as selling skills
- Reserved self-paced lessons on the Internet for information unlikely to change or become obsolete
- Utilized real-time learning platforms that allowed employees to interact with a live instructor via the Internet to introduce new products and promotions

## EVALUATION METHODS AND MEASURES

- Trained half of the employees traditionally and the other half with a blended e-learning curriculum and compared the two groups
- Did not identify methods or measures for comparison

## OUTCOMES OF TRAINING

- Employees trained online were achieving quotas two weeks earlier than traditionally taught salespeople.
- Travel and time-out-of-field costs were significantly reduced

## SUMMARY/LESSONS LEARNED

Cingular Wireless found that salespeople were fond of the online training and performed well in the field. Employees stated that they preferred the online training because classroom instruction moves at a slower pace due to the people who are involved. With web-based trainings users can move at their own paces and not feel bogged down with all the paperwork that is associated with traditional classroom instruction.

# Capital One<sup>162</sup>

## Capital One University – Leaders as Teachers

### OVERVIEW AND PURPOSE OF TRAINING PROGRAM

Employee development at Capital One has improved through the use of a corporate university and the “leaders for teachers.” Capital One University was officially launched in January 2004 and serves as the corporation’s hub for employee development. Through the university, web-based learning is offered along with more traditional instructor-led training, which allows employees to learn from their own desk or home, and at the pace that suits them best. Internal communications are sent to employees making them aware of the new trainings that are available. The university uses a “leaders as teachers” approach where senior leaders help to pass on their knowledge and skills to other employees. “In the last quarter of 2005, in the UK, the leaders as teachers programs attained an average satisfaction rate of 85 percent,” said Siobhan Sheridan, head of Capital One University. “In some cases they outperformed some of the external suppliers.”

### DESCRIPTION OF TRAINING COMPONENTS

Trainings focused on five learning categories:

- Capital One fundamentals – prepares associates for success at Capital One
- Management and leadership – provides skills training for basic management and advanced-leadership
- Corporate competencies – teaches Capital One’s core-competency model
- Business-unit learning – provides customized learning that meets unique needs or requirements within a specific business unit
- Job-specific skills – provides specific learning opportunities for functional specialties, such as those involved in project management

### EVALUATION METHODS AND MEASURES

- None reported

### OUTCOMES OF TRAINING

- In 2004, 82% overall associate satisfaction – up from 62% in 2003
- University library usage more than doubled in 2004
- Almost 25,000 associates took part in training during 2004
- Almost 1,500 classes have been completed globally since January 2004
- Usage of job-specific e-learning courses has risen by 40%
- The business has realized an increase in efficiency and streamlining

### SUMMARY/LESSONS LEARNED

Developers of Capital One University and the “leaders as teachers” program are confident that this training environment is meeting the learning needs of the organization. The program sets out to define the needs of the employees and ensures that the approach taken is in line with the organization’s strategic direction. Executive team members are active and integral sponsors of the trainings that are put in place and continue to be a positive asset for the organization.

# Texas A&M University System<sup>65</sup>

## OVERVIEW AND PURPOSE OF TRAINING PROGRAM

The Human Resource (HR) offices at Texas A&M University are responsible for training all employees throughout the state in soft skill areas, such as performance management and HR-related laws. Traditionally, this has been done through classroom-based trainings, but a limited budget has caused Texas A&M to develop web-based trainings. The challenges and steps taken to design and develop their web-based trainings are discussed and recommendations are made for other organizations planning to develop web-based trainings.

## DESCRIPTION OF TRAINING COMPONENTS

- Utilized a simple tutorial format for the design of the course
- Included many practice questions (about one-third of the pages) that provide an opportunity for active learning
- Incorporated content that provided clear explanations, frequent and realistic practice and useful information
- Utilized a bookmark feature that allowed employees to stop and resume their place in a course at any time
- Provided lists of downloadable job aids: forms, lists of sample questions, tables and course summaries.

## EVALUATION METHODS AND MEASURES

- None reported

## OUTCOMES OF TRAINING

- None reported

## SUMMARY/LESSONS LEARNED

Texas A&M identifies a number of challenges to developing a web-based training. These challenges include: limited training development resources, dry subject matter, lack of personnel time and difficulty in evaluating soft skill knowledge. Along with identifying challenges, Texas A&M describe their systematic approach to designing and developing web-based trainings. The initial 2-3 months of their training development process was spent laying the groundwork, which included the following steps: identifying minimum hardware and software requirements, identifying learner characteristics and selecting development tools. The next step was course design and development, which includes conducting background research on the subject matter, determining how the subject should be taught, determining exactly what the target audience needs to know, identifying course goals, determining what the learner needs to be able to do to achieve the course goals, developing practice questions and test items, developing instructional strategies and materials and conducting formative evaluation to assess the effectiveness of the training. Through this process, Texas A&M has developed a few recommendations for other organizations attempting to develop web-based trainings. These recommendations include hiring outside developers if personnel do not have the necessary technical and instructional design skills, keeping programming simple, analyzing the subject before developing instructional materials, making sure use of technological bells and whistles add to the training and including as many real world examples as possible.

# Simon Fraser University School of Interactive Arts and Technology<sup>142</sup>

## OVERVIEW AND PURPOSE OF TRAINING PROGRAM

Simon Fraser University's new School of Interactive Arts and Technology (SIAT) offers three undergraduate and graduate degree programs in information technology, interactive arts and management and technology. The school has developed a highly-scalable, self-perpetuating process for developing online courseware. One of the steps in this process is training faculty on how to use new technologies. Four main methods are discussed for training faculty on how to use, teach and develop web-based learning programs.

## DESCRIPTION OF TRAINING COMPONENTS

- Initiated intensive, multi-faceted approach to increase baseline knowledge of faculty regarding how to develop content for web-based trainings and technological considerations
- Included a faculty orientation that provided an overview of the course development process
- Included a mandatory course that presented information on designing measurable learning objectives, effective use of asynchronous conferencing and how to integrate learning objects into online content
- Provided ongoing workshops that focused on designing concept maps for content, matching learning objectives, content and assessments
- Developed work clusters that combined 4-10 faculty members, an instructional designer and a project manager into working groups to develop sets of courses

## EVALUATION METHODS AND MEASURES

- None reported

## OUTCOMES OF TRAINING

- Increased productivity from faculty
- Reduction in over-assessment of learners
- Establishment of peer-to-peer support networks
- Effective use of specialized support for technically challenging projects
- Learner satisfaction

## SUMMARY/LESSONS LEARNED

Overall, investing in training opportunities to educate staff on the use of technology, when it is appropriate, and why it is appropriate, has created a self-sustaining process to web-based course development. The baseline knowledge of all staff increased and SIAT has created a culture that “understands the benefits and limitations of current technologies in educational delivery and is prepared to look for and evaluate new and innovative ways to improve education through technology and better instructional design.”

# 11

## Appendix C: Model Training Sites

Model web-based trainings are presented to illustrate premier training designs and features available within existing training websites. Web-based trainings were identified as model sites if they utilized greater than three key features identified through the literature review as beneficial to retain users at a web-based training. Training websites covered diverse topics such as evidence-based public health, infectious disease, bioterrorism, immunization, occupational safety and stroke prevention. Examples of the web-based trainings are presented and the key features within these trainings are highlighted. The best features identified from each training were collected and utilized in developing recommendations for customizing a new training website for this project.



## NEW YORK/NEW JERSEY PUBLIC HEALTH TRAINING CENTER

### From Evidence to Practice – Using a Systematic Approach to Address Disparities in Birth Outcomes

<http://www.ebph.org/>

The screenshot shows the 'From Evidence to Practice' course interface. The top navigation bar includes 'State the Issue', 'Find Data', 'Clarify the Issue', 'Search for Interventions', and 'Select Interventions'. The main content area is titled 'A few more hints...' and contains text explaining the 'My Folder' feature, the 'References' section, and the 'Mentor' feature. A 'Continue' button is visible in the top right and bottom left of the main content area. A sidebar on the left contains icons for 'Add this page to My Folder', 'My Folder', 'Reference', and 'Mentor'. A 'Mentor' profile picture is also visible in the main content area. Three callout boxes with red borders and lines pointing to specific elements are present: one pointing to the 'Add this page to My Folder' icon, one pointing to the 'My Folder' icon, and one pointing to the 'Mentor' profile picture. A fourth callout box points to the 'Reference' section of the main text.

My Folder icon for saving resources

Uses a "live mentor"

Reference section for lesson materials

- Uses a "live mentor" that answers questions
- Ability to save web pages to "My Folder" for future reference
- Includes reference icon that you can click to see the materials for the current lesson
- Visually appealing

## NEW YORK/NEW JERSEY PUBLIC HEALTH TRAINING CENTER (CONTINUED)

### From Evidence to Practice – Using a Systematic Approach to Address Disparities in Birth Outcomes

<http://www.ebph.org/>

**From Evidence to Practice**

State the Issue > Find Data > Clarify the Issue > Search for Interventions > Select Interventions

Good organizational flow – users can quickly reach pages of interest to them

**Edit the fishbone diagram**

Allows user to apply knowledge

Back to Agenda

Lois, mentor

Before we meet with the workgroup, let's review the fishbone diagram and prioritize the factors that contribute to disparities in birth outcomes.

The fishbone diagram below shows six potential contributing factors of the disparities in birth outcomes. Select which of these contributing factors are relevant for Jay County. The workgroup may ask you to defend your decisions, so be sure that your choices are based on the evidence you reviewed.

Click on the contributing factors that are relevant to the problem in Jay County. The contributing factors you select will be marked. When you have finished selecting the appropriate contributing factors, click the "Submit Edited Fishbone" button.

| Unintended Pregnancy | Prenatal Care            | Women's Health                             |
|----------------------|--------------------------|--|
| Family planning      | Quality & access to care | Alcohol & substance abuse                  |
| Out of wedlock       | Nutrition                | Folic acid                                 |
| Teen pregnancy       | Screening & counseling   | Smoking                                    |
| Genetics             | Finances                 | STDs                                       |
| Toxic exposures      | Violence, sexual abuse   | HIV/AIDS                                   |
| Birth Defects        | Stress                   | Sexually-Transmitted Diseases & Infections |

- Allows user to apply knowledge
- Good organizational flow

# JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH

## Emerging Infectious Diseases

<http://www.jhsph.edu/preparedness/training/online/index.html>

TRAMS

Welcome, Timothy

My Trainings My Account Logout Feedback Help

» Decline and Re-Emergence of Infectious Diseases

Return to the main page for this training

Decline and Re-Emergence of Infectious Diseases

Kenneth Nelson, MD

Content from known expert

Rate

Crude Infectious Disease Death Rate: U.S. 1906-96

Year

40 states have health departments

Influenza pandemic

Last human-to-human transmission of plague

First continuous municipal water

First use of penicillin

Salk vaccine introduced

Passage of Vaccination Assistance Act

1. Emerging Infectious... 00:14

2. Decline and Re-Em... 00:23

3. Crude Infectious Di... 02:22

4. Crude Mortality Rat... 01:04

5. The Ten Leading Co... 00:39

6. Death Rates for Co... 00:44

7. Surgeon General's ... 01:01

8. Some Recent Emer... 01:34

9. Some Recent Emer... 00:27

10. Some Emerging I... 01:21

11. Some Emerging I... 00:20

12. Global Estimates f... 00:11

13. Global Estimates f... 00:08

14. Estimates of Thos... 00:12

15. Estimates of New... 00:21

16. Proportion of ... 01:18

28 Minutes 28 Seconds Remaining

Interactive features (next, back, pause, view attachments)

- Content is from known experts in the field
- Interactive features (next, back, pause, view attachments)
- Uses audio recordings
- Good organizational flow
- Visually appealing
- Uses concrete world examples

UNIVERSITY OF CONNECTICUT HEALTH CENTER AND CONNECTICUT DEPARTMENT OF PUBLIC HEALTH

Newborn Screenings

http://www.genetrain.org

The screenshot shows a web-based training interface. On the left is a navigation menu with a table of contents. The main content area is titled 'Benefits of NBS' and contains a table comparing screened and unscreened newborns. A video player is visible at the top left of the content area, with a red circle around its controls. A red box highlights the video player controls with the text 'Uses innovations (podcasts, audio/video)'. Another red box highlights the navigation menu with the text 'Uses concrete real-world examples'. A third red box highlights the table with the text 'Interactive features (next, back, fast forward, rewind, pause)'. At the bottom of the content area, there is a link: 'Click here to return to the Main Menu.'

| Newborns                       | Screened<br>n=32 | Unscreened<br>n=26 |
|--------------------------------|------------------|--------------------|
| Hospitalized before diagnosis  | 6%               | 81%                |
| Hospitalized after diagnosis   | 25%              | 62%                |
| Neurologic complications       | 17%              | 67%                |
| Vineland Social Assessment <71 | 0%               | 42%                |
| Median parental stress index   | 62%              | 72%                |

(Waisbren et al., New England Consortium of Metabolic Programs, 2002)

Click here to return to the Main Menu.

- Uses innovations (podcasts, audio/video clips)
- Provides interactive features (next, back, fast forward, rewind, pause)
- Uses concrete world examples
- Visually appealing
- Good organizational flow

## CENTERS FOR DISEASE CONTROL AND PREVENTION

### Radiological and Nuclear Terrorism: Medical Response to Mass Casualties

<http://www.orau.gov/hsc/RadMassCasualties/content/GettingStarted.htm>

The screenshot shows a course page with a blue header and a sidebar. The main content area features a video player and a list of bullet points. Callouts point to various elements:

- Course name on every page**: Points to the title "Radiological and Nuclear Terrorism: Medical Response to Mass Casualties" in the header.
- Navigation links on every page (glossary, index, search)**: Points to the "Glossary", "Index", and "Search" links in the top right.
- Link to lesson sections or categories**: Points to the sidebar menu containing "Getting Started", "Potential Incidents", "Planning", "Decontamination", "Triage", "Treatment", "Pharmacotherapy", "Scenario 1-6", "Resources", and "Self Test".
- Provides PDF handouts for lesson**: Points to the "Handout" link at the bottom right of the page.

- Course name on every page
- Navigation links on every page
- Provides links to lesson sections or categories
- Provides link to PDFs for the lesson
- Provides certification of completion at the end of the lesson
- Uses graphics, video/audio clips from the instructor



## CENTERS FOR DISEASE CONTROL AND PREVENTION

### You Call the Shots

<http://www2.cdc.gov/nip/isd/ycts/mod1/courses/genrec/start.asp>

The screenshot shows a web browser window displaying the 'Immunization You Call the Shots' course. The interface includes a navigation menu on the left, a main content area with a diagram of the human immune system, and a glossary of terms. Annotations highlight specific features:

- Course name and logo on every page:** A callout points to the 'Immunization You Call the Shots' logo in the top left corner.
- Interactive features – hovering mouse over the image displays a description:** A callout points to a text box that appears when hovering over the immune system diagram. The text reads: 'The immune system is a network of organs and tissues that work together to protect the body against disease. To understand how vaccines work, you need to know how the immune system learns to recognize and eliminate microorganisms that cause infectious diseases.'
- Resources section provides links to other industry related sites:** A callout points to the 'Resources' link in the left navigation menu.
- Glossary of terms:** A callout points to the 'Glossary' link in the top navigation bar.

The diagram of the immune system shows various organs and tissues labeled: Tonsils and adenoids, Lymph nodes, Spleen, Peyer's patches, Appendix, Bone, Lymphatic vessels, and Thymus. The text box also lists: Tonsils and adenoids, Lymph nodes, Spleen, Peyer's patches, Appendix, and bone marrow.

- Course name and logo on every page
- Interactive features (mouse hovering)
- Glossary of terms
- Provides links to other related web sites

# NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

## Trench Safety Awareness

http://www.cdc.gov/niosh/docs/2006-133D/flash/index.html

**1.0 Introduction to eLearning**

The material in this eLearning module is designed to communicate information in a way that supports multiple learning styles through the use of text, pictures, interactive media, and video. It was created by filming subject-matter experts in the fields of trench rescue, protective systems engineering, and research. It was designed to help you retain the information.

**Three ways to learn the information contained in this training module.**

1. View photographs with text highlights and click interactive buttons to get a visual understanding of the topic.
2. Watch topic video clips filmed on location and narrated by subject-matter experts in their own words.
3. Read a text summary of each topic to reinforce the information.

Instructions for navigation

- Source credibility
- Site name and logo appear on every page
- Instructions for navigation
- Users apply knowledge at the end of training in a quiz format



# UNIVERSITY OF MASSACHUSETTS MEDICAL SCHOOL

## Stroke Prevention for Future Physicians

<http://www.umassmed.edu/strokestop/index.html>

The screenshot shows a web page titled "Visualizing Stroke" with a navigation bar at the top containing "Tables", "Diagrams", "Radiographic Scans", "Specimens", "Cases", "Self-Tests", and "Videos". A left sidebar lists various stroke types and related terms. The main content area includes a "Question" and "Answer" section about CT scan appearance. A pop-up window titled "NeuroAnatomy Glossary" is open, defining "Ischemia" and "Ischemic stroke".

Callouts from the image:

- Good organizational flow – user can quickly reach pages of interest to them
- Uses pop-up boxes to define terms used in the lesson
- Navigation bar on every page

- Uses pop-up boxes with definitions
- Good organizational flow
- Navigation bar on every page
- Visually appealing

Global Tobacco Control

http://globaltobaccocontrol.org

The screenshot shows a web-based training module interface. At the top, there are navigation tabs: Home, The Experts, My Trainings, Resources, Choose a Training Module, and Logout. Below this, the current path is 'My Trainings > Training Module 1: Fundamentals of Tobacco Control > Lesson 11: The Tobacco Epidemic'. The main content area is titled 'Section C: Global Burden' and includes a 'Download This Clip' button. On the left, there is a sidebar for 'Section C' featuring a profile picture of Jonathan Samet, MD, MS, and a list of video segments. The main content area displays a bar chart titled 'Global Youth Tobacco Survey (GYTS) Percentage of Students Using Any Form of Tobacco'. The chart shows percentages for various countries: India (~50%), Pakistan (~55%), Ukraine (~40%), Chile (~38%), Russian Federation (~35%), Poland (~33%), Bosnia Herzegovina (~32%), South Africa (~30%), Bolivia (~28%), United States (~25%), Bahamas (~22%), and Cuba (~20%). Below the chart, the source is cited as 'Source: adapted by CTLT from GYTS Collaborative Group. (2002)'. At the bottom of the slide, there is a control bar with play, pause, and navigation buttons, and a timer showing '00:15 / 00:34'. Annotations with red boxes and lines point to specific features: 'Content from known expert' points to the expert's profile picture; 'Source credibility' points to the source text; 'Good organizational flow' points to the sidebar menu; and 'Uses interactive features (pause, rewind, forward)' points to the control bar.

| Country            | Percentage (%) |
|--------------------|----------------|
| India              | 50             |
| Pakistan           | 55             |
| Ukraine            | 40             |
| Chile              | 38             |
| Russian Federation | 35             |
| Poland             | 33             |
| Bosnia Herzegovina | 32             |
| South Africa       | 30             |
| Bolivia            | 28             |
| United States      | 25             |
| Bahamas            | 22             |
| Cuba               | 20             |

- Content from known expert
- Source credibility
- Uses interactive features (pause, rewind, fast forward)
- Good organizational flow (quickly reach pages of interest)
- Uses audio recordings
- Visually appealing

# 12

## Acknowledgements

The authors wish to acknowledge June Smith, Rob Holtzmann, and Jonathan Moberly for their assistance in conducting the literature review and Joe Karolczak from Innovative Graphic Services, St. Louis, MO for development of the report design and layout. The authors also wish to acknowledge the practitioners who assisted in the competency development and card sorting process.



# 13

## References

1. Meissner HI, Bergner L, Marconi KM. Developing cancer control capacity in state and local public health agencies. *Public Health Rep.* Jan-Feb 1992;107(1):15-23.
2. Brownson RC, Bright FS. Chronic disease control in public health practice: looking back and moving forward. *Public Health Rep.* May-Jun 2004;119(3):230-238.
3. Steckler A, Goodman RM, Alciati MH. The impact of the National Cancer Institute's Data-based Intervention Research program on state health agencies. *Health Educ Res.* Jun 1997;12(2):199-211.
4. Brownson R, Baker, EA., Leet, TL., Gillespie, KN. *Evidence-Based Public Health.* New York: Oxford University Press; 2003.
5. Zaza S, Briss, PA., Harris, KW. eds. *The Guide to Community Preventive Services: What Works to Promote Health?* New York: Oxford University Press; 2005.
6. Cancer Control Planet. Cancer Control Planet Links Resources to Comprehensive Cancer Control. *The American Cancer Society; The Substance Abuse and Mental Health Services; The Agency for Healthcare Research and Quality.* Available at: <http://cancercontrolplanet.cancer.gov/index.html>. Accessed March 17, 2007.
7. IOM Committee for the Study of the Future of Public Health. *The Future of Public Health.* Washington DC: National Academy Press; 1988.
8. Association of State and Territorial Directors of Health Promotion and Public Health Education and the Centers for Disease Control and Prevention. *Policy and Environmental Change: New Directions for Public Health.* Atlanta, GA: ASTDHPPE and CDC; 2001.
9. Kerner J, Rimer B, Emmons K. Introduction to the special section on dissemination: dissemination research and research dissemination: how can we close the gap? *Health Psychol.* Sep 2005;24(5):443-446.
10. Weed D, Husten, C., Training in Cancer Prevention and Control. In: Greenwald P, Kramer B, Weed D, eds. *Cancer Prevention and Control.* New York: Marcel Dekker; 1995.
11. Association of State and Territorial Chronic Disease Program Directors. *Reducing the Burden of Chronic Disease: Needs of the States.* Washington DC: Public Health Foundation; 1991.
12. Campbell CR, Lomperis AM, Gillespie KN, Arrington B. Competency-based healthcare management education: the Saint Louis University experience. *J Health Adm Educ.* Spring 2006;23(2):135-168.
13. Institute of Medicine. *Who Will Keep the Public Healthy? Educating Public Health Professional for the 21st Century.* Washington DC: National Academies Press; 2003.
14. O'Donnell JF. Competencies are all the rage in education. *J Cancer Educ.* Summer 2004;19(2):74-75.
15. National Cancer Institute. *The NCI Strategic Plan for Leading the Nation. To Eliminate the Suffering and Death Due to Cancer.* Bethesda, MD: National Cancer Institute, US Department of Health and Human Services; 2006.

16. Parry S. Just what is a competency (and why should we care?). *Training*. 1998;35:58-64.
17. O'Donnell JF. A most important competency: professionalism. What is it? *J Cancer Educ*. Winter 2004;19(4):202-203.
18. Thacker SB, Brownson RC. Practicing epidemiology: how competent are we? *Public Health Rep*. 2008;123 Suppl 1:4-5.
19. Scharff DP, Rabin BA, Cook RA, Wray RJ, Brownson RC. Bridging research and practice through competency-based public health education. *J Public Health Manag Pract*. Mar-Apr 2008;14(2):131-137.
20. Brownson R, Ballew P, Kittur ND, et al. Developing competencies for training practitioners in evidence-based cancer control. *Journal of Cancer Education*. (in press).
21. Brownson RC, Diem G, Grabauskas V, et al. Training practitioners in evidence-based chronic disease prevention for global health. *Promot Educ*. 2007;14(3):159-163.
22. O'Neill M, Brownson, RC. Teaching evidence-based public health to public health practitioners. *Annals of Epidemiology*. 2005;15(7):540-544.
23. Brownson RC, Ballew P, Brown KL, et al. The effect of disseminating evidence-based interventions that promote physical activity to health departments. *Am J Public Health*. Oct 2007;97(10):1900-1907.
24. Brownson RC, Ballew P, Dieffenderfer B, et al. Evidence-based interventions to promote physical activity: what contributes to dissemination by state health departments. *Am J Prev Med*. Jul 2007;33(1 Suppl):S66-73; quiz S74-68.
25. National Cancer Institute. Using What Works: Adapting Evidence-Based Programs to Fit Your Needs. *National Cancer Institute*. Available at: [http://cancercontrol.cancer.gov/use\\_what\\_works/start.htm](http://cancercontrol.cancer.gov/use_what_works/start.htm). Accessed December 29, 2007, 2007.
26. Council on Linkages between Academia and Public Health Practice. *Core Competencies for Public Health Professional*. Washington DC: Public Health Foundation; 2001.
27. National Association of Chronic Disease Directors. Competencies for Chronic Disease Practice. Available at: [http://www.chronicdisease.org/files/public/complete\\_draft\\_Competencies\\_for\\_Chronic\\_Disease\\_Practice.pdf](http://www.chronicdisease.org/files/public/complete_draft_Competencies_for_Chronic_Disease_Practice.pdf). Accessed February 2008.
28. Gaffney G. What is card sorting? Information and Design. Available at: <http://www.infodesign.com.au/usabilityresources/design/cardsorting.asp>. Accessed June 15, 2007.
29. Maurer D, Warfel, T. Card sorting; a definitive guide. Boxes and Arrows. Available at: [http://www.bboxesandarrows.com/view/card\\_sorting\\_a\\_definitive\\_guide](http://www.bboxesandarrows.com/view/card_sorting_a_definitive_guide). Accessed June 15, 2007.
30. Robertson J. Information design using card sorting. Step Two Designs. Available at: <http://www.steptwo.com.au/papers/cardsorting/index.html>. Accessed June 15, 2007.
31. Hall R. Instructional Web Site Design Principles: A Literature Review and Synthesis. *The Virtual University Journal*. 1999;2:1-12.
32. Gresty K, Skirton, H., Evenden, A. Addressing the issue of e-learning and online genetics for health professionals. *Nursing and Health Sciences*. 2007;9(1):14-20.
33. Cook D. Web-based learning: pros, cons and controversies. *Clinical Medicine, Journal of the Royal College of Physicians*. 2007;7(1):37-42.
34. Appana S. A Review of Benefits and Limitations of Online Learning in the Context of the Student, the Instructor, and the Tenured Faculty. *International Journal on E-Learning*; Jan 2008;v7(n1):p5-22



35. Mather S. Canadian Physical Therapists Interest in Web-Based and Computer-Assisted Continuing Education. *Physical Therapy*. 2005;85(3):226-237.
36. Kovacs DK. Why develop web-based health information workshops for consumers? *Library Trends*. 2004;v53(n2):348-359.
37. Liu C-HC, Tzu-Chiang; Huang, Yueh-Min. Assessment of Effectiveness of Web-Based Training on Demand. *Interactive Learning Environments*. 2007;v15(n3):p217-235
38. Gilbert JM, Susan; Rowlet, Jennifer. e-Learning: The student experience. *British Journal of Educational Technology*. 2007;v38(n4):560-573.
39. Learn H. Web-Based Programs Work for the Lab Manager. *Health Management Technology*. 2006;27(2):70-72.
40. Goettner P. Effective E-Learning for Healthcare. *Health Management Technology*. 2000;21(12):64-72.
41. Coe RS, R. Web-Based Nuclear Testing and Training. *Nuclear Plant Journal*. January-February 2003:47-50.
42. Strazzo D. A Study of e-Learning Practices in Selected Fortune 100 Companies:1-27.
43. Bocchi J, Eastman JK, Swift CO. Retaining the Online Learner: Profile of Students in an Online MBA Program and Implications for Teaching Them. *Journal of Education for Business*. Mar/Apr 2004;79(4):245.
44. Wild RH, Griggs, K.A., Downing, T. A Framework for E-Learning as a Tool for Knowledge Management. *Industrial Management and Data Systems*. 2002;102(7):371-380.
45. Milheim WD. Strategies for the design and delivery of blended learning courses. *Educational Technology*. 2006;v46(n6):44-47.
46. Jones P, Packham, G., Miller, C., and Jones, A. An Initial Evaluation of Student Withdrawals within an e-Learning Environment: The Case of e-College Wales. *Electronic Journal of E-Learning*. 2004;2(1):113-120.
47. Fotheringham MJ, Owies D, Leslie E, Owen N. Interactive health communication in preventive medicine: Internet-based strategies in teaching and research. *Am J Prev Med*. Aug 2000;19(2):113-120.
48. Zhao F. Enhancing the quality of online higher education. *Quality Assurance in Education*. 2003;11(4):214-221.
49. Bassi L, J., Cheney S, Van Buren M. Training industry trends 1997. *Training & Development*. 1997;51(11):46.
50. Trombley B, Lee D. Web-based Learning in Corporations: who is using it and why, who is not and why not? *Journal of Educational Media*. 2002;27(3):137-146.
51. Clarke T, Hermens A. Corporate Developments and Strategic Alliances in E-Learning. *Education + Training*. 2001/01/01/ 2001;43(4-5):256.
52. Jona K. Rethinking the Design of Online Courses: unknown; 2001.
53. Zlomislic-Bartolic S, Bates, A.W. Investing in On-line Learning: Potential Benefits and Limitations. *Canadian Journal of Communication*. 1999;24(3):349-366.
54. Welsh ET, Wanberg, C.R., Brown, K.G., and M.J. Simmering. E-learning: emerging uses, empiriccal results and future directions. *International Journal of Training and Development*. 2003;7(4):245-258.
55. Killion J. Online Staff Development: Promise or Peril? *NASSP Bulletin*. 2000;84(618):38-45.
56. Volery T, and D. Lord. Critical success factors in online education. *The International Journal of Educational Management*. 2000;14(5):216-223.

57. Mazoue JG. The essentials of effective online instruction. *Campus-Wide Information Systems*. 1999;16(3):104-110.
58. Cook D, Dupras, DM. A practical guide to developing effective web-based learning. *Journal of General Internal Medicine*. 2004;19(6):698-707.
59. Mamary EM, Charles P. On-Site to On-Line: Barriers to the Use of Computers for Continuing Education. *Journal of Continuing Education in the Health Professions*. 2000/01/01/ 2000;20(3):171.
60. Jeffcoat-Bartley S, Golek, J.H. Evaluating the Cost Effectiveness of Online and Face-to-Face Instruction. *Educational Technology and Society*. 2004;7(4):167-175.
61. Fabianic D. Online Instruction and Site Assessment. *Journal of Criminal Justice Education*. Spring 2002;13(1):173.
62. Sitzmann T, Kraiger K, Stewart D, Wisher R. The Comparative Effectiveness of Web-Based and Classroom Instruction: A Meta-Analysis. *Personnel Psychology*. 2006;59(3):623.
63. Abdelraheem AY. Integrating Instructional Technology with Information Technology and its Implications for Designing Electronic Learning Systems. *International Journal of Instructional Media*. 2005;32(2):125-132.
64. Rosenbaum DB. E-Learning Beckons Busy Professionals. *ENR*. May 28, 2001;246(21):38.
65. Hsieh PY. Web-based training design for human resources topics: A case study. *Tech Trends*. 2004;v48(n2):60-68.
66. Schriver R, Giles, S. Real ROI Numbers. *Training and Development*. 1999;53(8):51-52.
67. Nanayakkara C. A Model of User Acceptance of Learning Management Systems: a study within Tertiary Institutions in New Zealand. *International Journal of Learning*.
68. Newton D, Ellis A. Effective implementation of e-learning: a case study of the Australian Army. *Journal of Workplace Learning*. 2005;17(5/6):385.
69. Ciancarelli A. Online training may become preferred method. *Purchasing*. 1998;125(9):S35-S36.
70. Cannon MM, Umble KE, Steckler A, Shay S. "We're living what we're learning": student perspectives in distance learning degree and certificate programs in public health. *J Public Health Manag Pract*. Jan 2001;7(1):49-59.
71. Kim JA. Toward an understanding of web-based subscription database acceptance. *Journal of the American Society for Information Science and Technology*. Nov 2006;57(13):1715-1728.
72. O'Leonard K. *HP Case Study: Flexible Solutions for Multi-Cultural Learners* November 2004 2004.
73. Wentling TL, Waight, C., Gallaher, J., La Fleur, J., Wang, C., & Kanfer, A. *E-Learning - A Review of the Literature*: Urbana-Champaign: University of Illinois; 2000.
74. Childs S, Blenkinsopp E, Hall A, Walton G. Effective e-learning for health professionals and students--barriers and their solutions. A systematic review of the literature--findings from the HeXL project. *Health Info Libr J*. Dec 2005;22 Suppl 2:20-32.
75. Gagnon MP, Legare F, Labrecque M, Fremont P, Cauchon M, Desmartis M. Perceived barriers to completing an e-learning program on evidence-based medicine. *Inform Prim Care*. 2007;15(2):83-91.
76. Mungania P. The Seven E-Learning Barriers Facing Employees. *E-Learning Consortium*; 2003:1-9.
77. Zibit M. The Peaks and Valleys of Online Professional Development. *eLearn*. 2004;2004(3):3.
78. Oh CH. Information communication technology and the new university: A view on eLearning. *Annals of the American Academy of Political and Social Science*. Jan 2003;585:134-153.
79. Panda SM, Sanjaya. E-Learning in a Mega Open University: Faculty Attitude, Barriers and Motivators. *Educational Media International*. 2007;v44(n4):p323-338.



80. Lifter KK, Louis; Okun, Barbara. Transformation to a web-based preservice training program: A case study. *Topics in Early Childhood Special Education*. 2005;v25(n1):15-24.
81. Giguere PM, Jennifer. Developing High Quality Web-Based Training for Adult Learners. *Educational Technology*. 2003;v43(n4):57-58.
82. Williams V. Teachnology: Web-based instruction's dual environment. *International Journal on E-Learning*; 2004;v3(n4):15-20.
83. Chamers TL, Doris. Web-based training in corporations: Organizational considerations. *International Journal of Instructional Media*. 2004;v31(n4):345-354.
84. Anderson T, Kanuka, H. On-Line Forums: New Platforms for Professional Development and Group Collaboration. *Journal of Computer Mediated Communication*. 1997;3(3).
85. O'Brien B. Online Student Retention: Can It Be Done? 2002:pp. 1479-1483.
86. Hampton-Sosa W, Koufaris M. The effect of web site perceptions on initial trust in the owner company. *International Journal of Electronic Commerce*. 2005;10(1):55-81.
87. Packham G, Jones P, Miller C, Thomas B. E-learning and Retention: Key Factors Influencing Student Withdrawal. *Education + Training*. 2004;46(6/7):335-342.
88. Buller DB, Young WF, Fisher KH, Maloy JA. The effect of endorsement by local opinion leaders and testimonials from teachers on the dissemination of a web-based smoking prevention program. *Health Educ. Res.* October 1, 2007 2007;22(5):609-618.
89. Claus JM, Erickson JL, Brennan Ramirez LK, Baker EA, Land GH. Evaluation of an Evidence-based Intervention Planning Website for Public Health Practitioners. *Issues in Evaluating Health Department Web-based Data Query Systems*. 2008.
90. Compeau D, Higgins C, Huff S. Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly*. 1999;23(2):145.
91. Hillman D. Learner-Interface Interaction in Distance Education: An Extension of Contemporary Models and Strategies for Practitioners. *American Journal of Distance Education* 1994;8(2):30-42.
92. Littlejohn A, Sclater N. Overcoming Conceptual Barrier to the Use of Internet Technology in University Education. *WebNet 98 World Conference of the WWW, Internet and Intranet Proceedings*. Orlando, Fl.: 2-6; 1998.
93. Granitz N, Greene CS. Applying E-Marketing Strategies to Online Distance Learning. *Journal of Marketing Education*. 2003;25(1):16-30.
94. Temple NJ, Kemp WC, Benson WA. Computer technology and student preferences in a nutrition course. *Open Learning*. 2006;21(1):71-77.
95. Rittschof KAG, Bryan W. Controlling limitations of cyberspace college courses: Part I - Identifying and describing issues. *International Journal of Instructional Media*. 2003;v30(n2):127-141.
96. Williams P, Nicholas, D., Gunter, B. E-learning: what the literature tells us about distance education - An overview. *ASLIB Proceedings*. 2005;57(2):109-122.
97. Yom YH. Integration of Internet-based learning and traditional face-to-face learning in an RN-BSN course in Korea. *Comput Inform Nurs*. May-Jun 2004;22(3):145-152.
98. Bury R. Achieving change through mutual development: Supported online training and the evolving roles of health and information professionals. *Health Information and Libraries Journal*. 2006;23(s1):22-31.
99. Carr S. As Distance Education Comes of Age, the Challenge is Keeping the Students. *Chronicle of Higher Education*. 2000 2000;46(23):A39-A41.

100. Peacock S, Hooper J. E-learning in physiotherapy education. *Physiotherapy*. Sep 2007;93(3):218-228.
101. Lofstrom E, Nevgi A. From strategic planning to meaningful learning: diverse perspectives on the development of web-based teaching and learning in higher education. *British Journal of Educational Technology*. Mar 2007;38(2):312-324.
102. Slotte VH, A. Putting professional development online: integrating learning as productive activity. *Journal of Workplace Learning*. 2006;18(4).
103. Moore DA, Klingborg DJ, Brenner JS, Gotz AA. Motivations for and barriers to engaging in continuing veterinary medical education. *J Am Vet Med Assoc*. Oct 1 2000;217(7):1001-1006.
104. Moyer L. Is Digital Learning Effective in the Workplace. *eLearn*. 2002;2002(5):5.
105. Watson JBR, Allison. Guiding the Independent Learner in Web-Based Training. *Educational Technology*. May-Jun 1999; v39(n3):p27-36.
106. Sherry L. Issues in Distance Learning. *International Journal of Educational Telecommunications*. 1996;1(4):337-365.
107. Peter D. Instructional design considerations for experiential web based training. *Journal of Interactive Instruction Development*; . 2004;v16(n3):9-13.
108. Dobbs K. What the online world needs now: Quality. *Training*. 2000;37(9):84.
109. Williams P, Nicholas, D., Huntington, P., Mclean, F. Surfing for health: user evaluation of a health information website. Part one: background and literature review. *Health Information and Library Journal*. 2002;19(2):98-108.
110. Polhamus B, Farel A, Stephens T. Case Study: Distance Learning in Public Health. Available at: <http://www.learningcircuits.org/2001/apr2001/farel.html>. Accessed April 16, 2008.
111. Bull SS, Phibbs S, Watson S, McFarlane M. What do young adults expect when they go online? Lessons for development of an STD/HIV and pregnancy prevention website. *Journal of Medical Systems*. Apr 2007;31(2):149-158.
112. Burton MCW, Joseph B. The Value of Web Log Data in Use-based Design and Testing. *Journal of Computer-Mediated Communication*. 2001;6(3):N/A.
113. Potts MK, Hagan CB. Going the distance: Using systems theory to design, implement, and evaluate a distance education program. *Journal of Social Work Education*. Win 2000;36(1):131-145.
114. Lee D, Changers T, Ely T. Web-based training in corporations: design issues. *International Journal of Instructional Media*. 2005;32(1):27 - 35.
115. Strijbos JW, Martens RL, Jochems WMG. Designing for interaction: Six steps to designing computer-supported group-based learning. *Computers & Education*. May 2004;42(4):403-424.
116. Al-Athari A, Zairi M. Training evaluation: an empirical study in Kuwait. *Journal of European Industrial Training*. 2002;26(5):241 - 251.
117. Badge J, Cann, AJ., Scott, J. e-Learning versus e-Teaching: Seeing the Pedagogic Wood for the Technological Trees. *Bioscience Education E-Journal*. 2005;5:5-6.
118. Santerre CR. X-Train: Teaching Professionals Remotely. *Journal of Nutrition*. 2005;135:1248-1252.
119. Nikolaeva R. Strategic Determinants of Web Site Traffic in On-Line Retailing. *International Journal of Electronic Commerce*. Summer 2005;9(4):113.
120. Osberg C. Marketing e-learning: they came, they saw, they couldn't log on. Here are some straightforward tips for fixing that common problem. First, look to your technical support team. *Training & Development*. Vol Feb 2004; 2004.
121. Burton H, Yeager J. Come Up First in Search. *Fundraising Success*. 2007;5(11):17.

122. Evans M. Analysing Google Rankings Through Search Engine Optimization Data. *Internet Research*. 2007;17(1):21-37.
123. Ryan JT. Optimize your Web site to maximize your Internet traffic. *Central Penn Business Journal*. 2007;23(42):5.
124. Cunningham S. Put Out a Web Welcome Mat. *Best's Review*. 2007;108(2):52.
125. Pringle G, Allison L, Dowe D. What is a tall poppy among web pages? *Computer Networks and ISDN Systems*. 1998;30:1-7.
126. Shafer T. SEO No-Nos. *Dealernews*. 2007;43(11):32.
127. Hipwell W. Promoting your e-learning investment. *Training & Development*. Sep 2000;54(9):18.
128. McMaster M. Online Learning From Scratch. *Sales and Marketing Management*. November 2002 2002;154(11):60-63.
129. Pollitt D. Freshfields Bruckhaus Deringer lawyers learn from time-traveling secret agents; Online course raises awareness of e-mail best practice. *Human Resource Management International Digest*. 2007;15(1):30.
130. Evans C, Gibbons NJ. The interactivity effect in multimedia learning. *Computers & Education*. 2007;49:1147-1160.
131. Yadav MS, Varadarajan R. Interactivity in the Electronic Marketplace: An Exposition of the Concept and Implications for Research. *Journal of the Academy of Marketing Science*. October 1, 2005 2005;33(4):585-603.
132. Derouin R, Fritzsche B, Salas E. E-Learning in Organizations. *Journal of Management Association*. 2005 2005;31(6):920-940.
133. Diwakar V, Ertmer PA, Nour AY. Developing interactive course Web sites for distance education and characteristics of students enrolled in distance learning courses. *J Vet Med Educ*. Winter 2003;30(4):351-357.
134. Swagerty D, Jr., Studenski S, Laird R, Rigler S. A case-oriented web-based curriculum in geriatrics for third-year medical students. *J Am Geriatr Soc*. Nov 2000;48(11):1507-1512.
135. Brothers SK. Game-based e-learning: the next level of staff training: Combining the convenience of online learning with just plain fun adds a new dimension of staff training. *Nursing Homes: Long Term Care Management*. 2007;56(3):78-80.
136. Kleinman S. Strategies for encouraging active learning, interaction, and academic integrity in online courses. *Communication Teacher*. 2005;19(1):13 - 18.
137. Loiacono E, Watson R, Goodhue D. WebQual: An Instrument for Consumer Evaluation of Web Sites. *International Journal of Electronic Commerce*. Spring 2007 2007;11(3):51-87.
138. Li D, Browne GJ, Wetherbe JC. Why Do Internet Users Stick with a Specific Web Site? A Relationship Perspective. *International Journal of Electronic Commerce*. Summer 2006;10(4):105.
139. Fieschi M, Soula G, Giorgi R, et al. Experimenting with new paradigms for medical education and the emergence of a distance learning degree using the Internet: teaching evidence-based medicine. *Med Inform Internet Med*. Mar 2002;27(1):1-11.
140. Corritore C. The Reluctant Online Professor. *eLearn*. 2007;2007(11).
141. Pollitt D. BT Wholesale pilots online coaching and mentoring. *Human Resource Management International Digest*. 2007;15(7):20.
142. Leacock T. Building a sustainable e-learning development culture. *The Learning Organization*. 2005;12(4):355-367.

143. McPherson M, Nunes MB. Organisational issues for e-learning. *The International Journal of Educational Management*. 2006;20(7):542.
144. Schank RC. Learning via multimedia computers. *Association for Computing Machinery. Communications of the ACM*. 1993;36(5):54.
145. Koochang A, Du Plessis J. Architecting usability properties in the e-learning instructional design process. *International Journal on ELearning*. 2004;3(3):38 - 44.
146. Neal L, Feldstein M. Designing Usable, Self-Paced e-Learning Courses: A Practical Guide. *eLearn* August 31, 2006 2006.
147. Brennan Ramirez LK, Bender J, Barnidge EK, Baker EA, Land GH. Evaluating an Evidence-based Physical Activity Intervention Website. *Evaluation and Program Planning*. 2006;29:269-279.
148. Pullen DL. An evaluative case study of online learning for healthcare professionals. *J Contin Educ Nurs*. Sep-Oct 2006;37(5):225-232.
149. Schank RC. *Designing World-Class E-Learning*. New York: McGraw-Hill; 2002.
150. Jha V, Duffy S. 'Ten golden rules' for designing software in medical education: results from a formative evaluation of DIALOG. *Med Teach*. Jul 2002;24(4):417-421.
151. Wong G, et al. Putting your course on the web: lessons from a case study and systematic literature review. *Medical Education*. 2003;37(11):1020-1023.
152. Price L. Lecturers' vs. students' perceptions of the accessibility of instructional materials. *Instructional Science*. Jul 2007;35(4):317-341.
153. Pederson I, Blumenthal, DS., Dever, A., McGrady, G. A web-based smoking cessation and prevention curriculum for medical students: why, how, what, and what next. *Drug and Alcohol Review*. 2006;25(1):39-47.
154. Quinn C. Seven Steps to Better E-Learning. *eLearn*. 2006;2006(12).
155. Ayer S, Smith C. Planning flexible learning to match the needs of consumers: a national survey. *J Adv Nurs*. May 1998;27(5):1034-1047.
156. Barron J. Top ten secrets of effective e-learning. *Industrial and Commercial Training*. 2006;38(7):360-364.
157. Jona K. Personal Communication. June 4, 2008
158. Bassoppo-Moyo T. Evaluating eLearning: A Front-End, Process and Post Hoc Approach. *Int'l J of Instructional Media*. 2006 2006;33(1):7-22.
159. Kirkpatrick DL. Techniques for Evaluating Training Programs. *Training and Development Journal*. 1979;33(6):78.
160. Mathieson M. Improving Organisational Performance Through Developing our People. *Industrial and Commercial Training*. 2006 2006;38(2):70-77.
161. Howe S. Did it stick? *Fleet Maintenance*. 2005;9(5):26.
162. Pollit D. Capital One university puts employees in the driving seat. *Human Resource Management International Digest*. 2006;14(5):19.