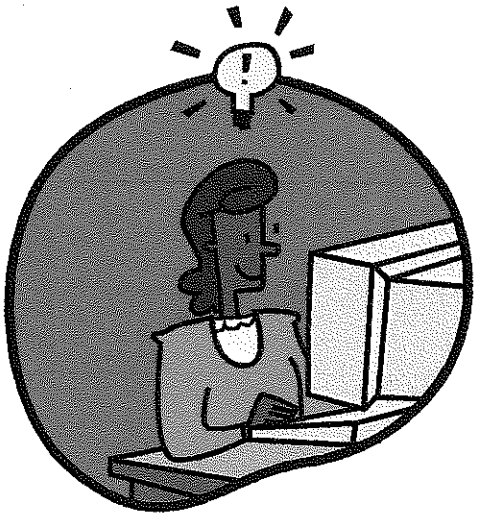
QWIC LEARN:

(Local, Efficient, Accessible, Responsive, Nutrition Education)

Moving Learning Forward in Pennsylvania

Pennsylvania WIC Program



FINAL REPORT

WIC Special Project Grant

Fiscal Year 2007

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FINAL REPORT ■ WIC Special Project Grant ■ Fiscal Year 2007

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In the grant proposal the description for a research assistant read: "under the direction of one of the IUP Team Investigators (task dependent) (who) will aid in the development of the module content, assessment instruments, assist in the identification of media enhancements for the content, and help to coordinate pilot/beta-testing of the e-Learning modules". Little did we know the extent to which Cassondra Burgess Strawser would be our 'point person', she spoke "WIC" and had extensive clinic experience. She was not just a research assistant; she was and is a full-fledged member of the team.

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Abstract

A goal of the Pennsylvania WIC (PA WIC) Special Grant 2007, QWIC LEARN, was to enhance the effectiveness of WIC nutrition services by improving staff training in the area of WIC Nutrition Assessment. The project focus was to develop and evaluate e-Learning modules to facilitate the delivery of high-quality, consistent staff training across a large geographic area in a cost-efficient manner. e-Learning was selected because of its potential for consistent, cost-effective, 'real world' training through interactive strategies (e.g., case study, multimedia, tailored instruction, with add-on/modification capability), and the ability for learners to have some control over pace, repetition, and time. The most urgent training needs were identified and four areas were selected for production. The areas selected for module development and production were: an overview of VENA (what was meant by a VENA assessment), Anthropometric Assessment, Dietary Assessment, and Biochemical – Clinical Asessment (developed only a topic outline).

The e-learning modules were designed to enhance the WIC Nutrition Assessment by empowering staff to improve their nutrition assessment, critical thinking, communication, and documentation skills. Improved understanding of VENA and the importance of the ABCDEO categories of a VENA assessment, will help staff to be more in tune with the VENA assessment process, improve their assessment skills in the ABCDEO areas, and better understand the importance of the assessment categories. The modules were designed to strengthen communication skills and critical thinking skills and move the WIC staff toward achievement of positive health outcomes for participants as a result of improved continuity of care.

The PA WIC 2007 Special Project supported the conceptualization, development, and evaluation of e-Learning modules to ensure that ALL staff (Nutritionist/Competent Professional Authority/Paraprofessional) in PA WIC have direct access to a resource to increase their knowledge of and their competency with respect to the comprehensive VENA goals. Participation in this program will assist WIC staff to improve their abilities to collect more accurate and relevant information while developing a positive rapport with participants, which will enhance the effectiveness of WIC nutrition services provided.

By design, the e-Learning modules, take the content/skills training established at the state level (competency management model where a set of knowledge- and behavior-based skills are tied to organization strategy and vision) and allow for a blending with traditional training methods and reinforcement (collaborative learning) already occurring at the local agency level. The use of competency-based training modules will make consistent training based on the VENA Guidance document and inclusive of relevant clinic examples quickly available to all staff to support VENA competency development and refinement by WIC staff.

The modules developed in this project incorporate multi-modal learning [audio, narration, screen text, visual (animated graphic, photo, video)] based on research which indicates the more modalities you employ, the greater the acquisition of knowledge.
The results are presented by goals:

Goal 1. Three modules were developed and produced. The following is a list of products:

- Content Outlines and Storyboards, including practice and evaluation questions to assess staff competency for the Introduction to VENA Module, Anthropometric Assessment Module, and Dietary Assessment Module.
- Storyboard for Biochemical and Clinical Assessments Module
- Case Study for WIC Child, including sample documentation
- Photo Specification Spreadsheet
- Digital Photographs Representing WIC Staff, Participants, and the WIC Setting
- Video Script
- Digital Video Depicting Typical WIC Appointment
- Digital Copy of Each of the Three Developed Modules: Introduction to VENA, Anthropometric Assessment, and Dietary

Goal 2: The Anthropometric Assessment and Dietary Assessment modules were evaluated for educational effectiveness by Maternal and Family Health Services, a PA WIC local agency, in March 2011.

The Introduction to VENA module was not reviewed since VENA had been implemented in PA in 2003, and a state-wide VENA training conducted in 2008. The PA WIC staff assessed the VENA module for knowledge and experience by completing the post-test only.

Both the Anthropometric and Dietary Assessment Modules were evaluating for knowledge gain using a pre-test, post-test method.

Anthropometric Assessment Module

t-test analysis results (reported as a gain in knowledge from the pre-test to the post-test had a mean knowledge score of 67.6 $\pm$ 9.4. While the score did not reach the anticipated score of 80 percent, the change in scores (4.4 points) from the pre-test to the post-test was statistically significant at the 0.05 level. The mean score on the post-test for the Anthropometric module was 72.0 $\pm$ 9.9.

Dietary Assessment Module

The Dietary module had a mean knowledge score of 85.0 $\pm$ 12.9. The mean score did reach the anticipated score of 80 percent, and the change in scores from the pre-test to the post-test was statistically significant at the 0.05 level. The mean scores on the post-test for the Dietary module was 90.1 $\pm$ 8.9. This gain of slightly over 5

points (5.1) represents a change in score documenting an excellent grasp of the Dietary component of the VENA assessment process.

Goal 3: The Anthropometric Assessment and Dietary Assessment modules were evaluated for overall satisfaction by Maternal and Family Health Services, a PA WIC local agency, in March 2011.

Overall, the Anthropometric and Dietary modules' content was considered good to very good by the majority of the WIC staff. There were technical difficulties in streaming the video to some clinics on Day 1 of the evaluation that were felt to lead to some incongruity of responses. Suggestions for improvement on the modules focused on the repetitiveness and the inability to jump past content in order to advance the video, and some staff felt the modules were too long. This feedback was used to make changes, particularly to allow the learner to have more control over the pace (skip some sections) and modifying the narration to reduce repetitiveness (particularly during the question and answer review).

Chapter 1: Introduction and Background

A goal of the 2007 Pennsylvania Women, Infants, and Children (PA WIC) Special Project Grant was to develop e-Learning modules to facilitate the delivery of high-quality, consistent staff training across a large geographic area (PA) in a cost-efficient manner. A copy of the original grant proposal is provided in Appendix A. This grant, "QWIC LEARN (**L**ocal, **E**fficient, **A**ccessible, **R**esponsive, **N**utrition Education) - Moving Learning Forward in Pennsylvania", focused on staff development via e-Learning. Training needs were prioritized and four areas supportive of Value Enhanced Nutrition Assessment (VENA) were identified. The areas selected as the most critical by PA WIC state agency staff were an Introduction to VENA (what was meant by a VENA assessment) and three assessment category training topics (Anthropometrics, Dietary, and Biochemical/Clinical). The overall aim of the project was develop e-Learning modules to enhance the WIC Nutrition Assessment by empowering staff to improve their nutrition assessment, critical thinking, communication, and documentation skills. [1]

By improving staff training in the area of WIC Nutrition Assessment [i.e., "preparing staff to conduct quality nutrition assessment and develop (art and science) competencies that will ultimately also improve nutrition education" [1]], the outcome of QWIC LEARN will improve the effectiveness of WIC nutrition services. An improvement in the assessment process will also result in greater staff effectiveness and increased staff satisfaction. Conscientious effort was made to ensure that the training modules were consistent with Revitalizing Quality Nutrition Services (RQNS) themes and initiatives and foster a better understanding of VENA and the importance of the categories of a VENA assessment: **A**nthropometric, **B**iochemical, **C**linical, **D**ietary, **E**nvironmental and Family Issues, and **O**ther Issues (ABCDEO). The approach of the modules was not only to address the ABCDEO categories but also to strengthen staff communication and critical thinking skills for improved continuity of care and positive health outcomes for participants.

The 2007 PA WIC Special Project grant supported the conceptualization, development, and evaluation of e-Learning modules to ensure that ALL staff (Nutritionist/Competent Professional Authority/Paraprofessional) in PA WIC have direct access to a resource that will increase their knowledge of and their competency with respect to the VENA. The aim is to help PA WIC staff improve their abilities to "develop positive rapport with participants, collect more accurate and relevant information, thereby enhancing the effectiveness of WIC nutrition services provided."[2]

Content/skills training established at the state level (competency management model where a set of knowledge- and behavior-based skills are tied to organization strategy and vision)[3] can be blended with traditional training methods and reinforcement (collaborative learning)[4, 5, 6] already occurring at the local agency level. Competency-based training modules will make the "captured intellectual assets" [3] quickly available to all staff and support the VENA. The modules will emphasize application of knowledge and learner performance will be evaluated on expected outcomes (i.e., competencies required). [1]

e-Learning was selected because of its potential for consistent, cost-effective, 'real world' training through interactive case study, multimedia, tailored instruction, with add-on/modification capability. Advantages of an e-Learning approach include the following characteristics: Just-in-time (asynchronous – increased accessibility to train, retrain, refresh), just-enough (instruction or information for the task-at-hand, personalized), low-cost delivery (upfront costs acknowledged, savings in the long run; ease of distribution with the benefits of tracking competency), and always up-to-date (standardized resources available with immediate updates available to all).[4, 5] In addition, e-Learning offers learners "control over pace of learning, repetition, and time".[4] Research literature indicates that "e-Learning permits greater learner interactivity and promotes efficiency, motivation, cognitive effectiveness, and flexibility of learning style."[4]

The modules developed in this project accommodated multi-modal learning [audio, narration, screen text, visual (animated graphic, photo, video)] based on research which indicates the more modalities you employ, the greater the likelihood for acquisition of knowledge. Redacted, WIC- relevant case studies and video simulations of WIC staff and participant contacts are included with the aim of improving staff competency in assessment. An e-Learning training platform will enable the state agency to more easily standardized training messages received at the local level (versus the train-the-trainer format) and (in the future) to assess individual learning and competency development through technology-driven, automated tracking.[4] A common thread among the modules is to teach "Skills First" using critical thinking as a major construct. Establishing a common set of skills and language will allow for staff development and assessment to occur more seamlessly throughout the state.

Skills First will establish consistent assessment, documentation of assessment, and evaluation and accountability of/by staff within PA WIC. Skills First is analogous to the acquisition of basic vocabulary when learning a second language. For each of the ABCDEO competency areas, each module will augment critical thinking, communication, and documentation skills development. e-Learning provides a platform to make the assessment process more consistent and should reduce the total training costs across the state over time.

Skills First necessitates the development of a Common Language which is important for critical thinking. The context specific language of the modules will reflect the mission of VENA. Using appropriate vocabulary promotes understanding and aids communication (within a clinic, across and within the state, and in the Participant-Nutritionist dyad). A common language set assists the translation of ideas between the participant and WIC staff (good communication).

Also, Skills First makes routine (becomes nondirected or automatic thinking[1]) those skills necessary for an accurate and precise assessment. Staff can focus on probing questions (clear, concise purposeful thinking) to personalize the assessment. A key to successful critical thinking is being able to recognize how and where the answers fit with the outcomes desired. This is the context of the participant's "life" within WIC (risk,

[1] Refers to Halpern's[6] critical thinking – not hierarchy but categorization. Halpern, p. 6.

education needs or goals, food package, referrals, etc) and gives more depth to the meaning of the word transferable.

A well developed skill set improves the probability that the proposed training result will become a part of the assessment process and makes solutions viable from the participant's perspective. It builds credibility for WIC and improves the likelihood that better health outcomes can be achieved. This increases the credibility of the WIC staff, which spills over to the system, the community referrals, and so on. It will move PA WIC participants to a central role in the decision process that should help them to a healthier disease prevention-oriented lifestyle (Figure 1).

In summary, the availability of sound training for staff development leads to competent staff who are essential to "deliver high quality nutrition services to participants"[2 (p. 21)] The QWIC LEARN staff training system will consist of interactive, multi-media e-Learning units. Central to the project mission is the delivery of an interactive staff training system to facilitate and reinforce the implementation of VENA within PA WIC. The VENA-friendly, staff training e-Learning system may include consideration of the following:

- Improvement of the WIC Nutrition Assessment process in PA WIC through the comprehensive and consistent implementation of VENA.
- Cost- and time-effectiveness in terms of efficiency, accessibility, trackability, and transferability
- Helping to fulfill the directives in the RQNS: Memorandum, the Nutrition Services Standards, VENA Guidance, and the Challenges Facing the WIC Program[7] (Table 1) related to staff competencies in the area of Nutrition Assessment.
- Needs of PA WIC as identified by state agency personnel, local agency directors, nutrition education coordinators, and nutritionists/staff from Year 1 of the SPG FY2005,[8] as well as VENA Guidance and e-Learning literature (Table 2).
- A structured training system for gaining new skills and greater success on the job (participants who are empowered through knowledge and involvement). Includes a exploring a chance for staff promotion based on skill acquisition and job success and also using skills development as a way to increase job satisfaction and improve retention rates.

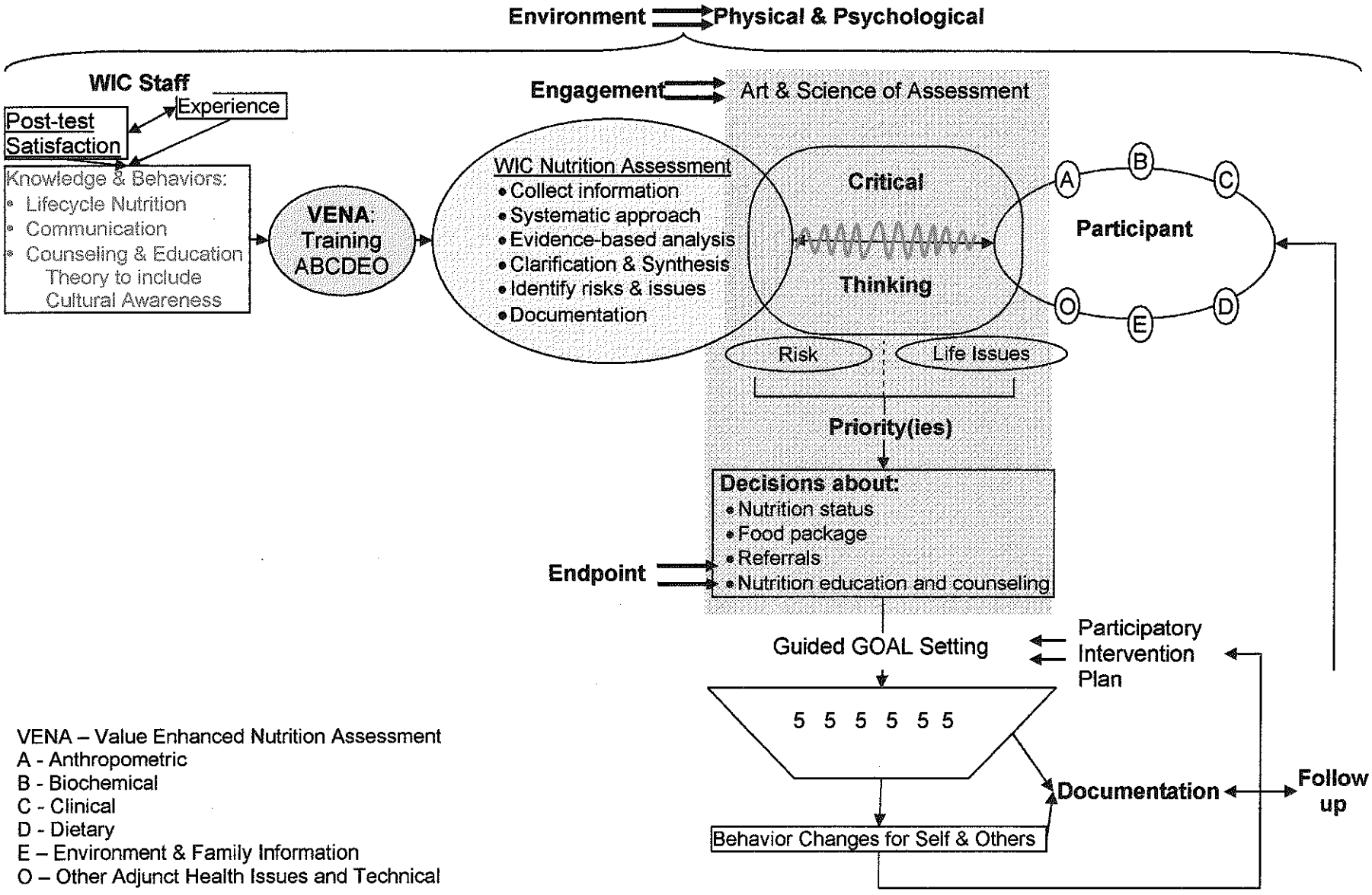

Figure 1. Best practices model for WIC nutrition services

Table 1. Staff training via e-Learning: Addressing challenges facing the WIC program by facilitating and reinforcing VENA implementation.

Challenge Facing the WIC Program[7]	***Staff Training via e-Learning Characteristic or Attribute***
Assessing the effect of nutrition services	Inherent is the ability to identify more specific staff competency strengths and short-comings; Ability to track staff achievement rates across a more stringent, standardized and consistent criterion.
Improving WIC's ability to respond to emerging health issues	Once the e-Learning format delivery system is established, it will be adaptable to accommodate any topic area (e.g., communication, breastfeeding promotion). Staff training time commitment and burden will be reduced (e.g., reduced travel time, less clinic down time) while achieving the desired and more consistent end result.
Strengthen its nutrition education component	Improving the accuracy and efficiency in WIC Nutrition Assessment will improve the data and information used to determine, tailor, and provide nutrition education services.
Adopt a more behavioral approach in nutrition counseling	e-Learning modules will be developed using behavior change for staff as a primary outcome.
Be more participant-oriented	Using the interactive features of e-Learning, modules will be designed to promote a nutrition assessment process and staff competency that will be participant-centered and individualized; collaborative and interactive; and may foster a positive rapport between staff and participants which should aid in the collection of more accurate and relevant information
Focus on healthy behaviors in life	Well designed e-Learning allows for broader distribution of a consistent assessment process across the system to deliver a consistent health outcomes message that has behaviorally-based goals.

Table 2. Staff training characteristics identified as important by constituencies.

Category	VENA[1]	2006 PA WIC VENA Self-Assessment	USDA-SPG-2005 Year 1 Results	Concept Supported in e-Learning Literature
State-Level Driven	X	X	X	X
Effective (competency-based)	X	X	X	X[a]
Thorough & Consistent	X	X	X	X
Accessible	X	X	X	X
Time Efficient	X	X	X	X
Concrete		X	X	X
User-friendly		X	X	X
Specific & Applicable to Job		X	X	X

[1] VENA Guidance

[a] also denotes the capability of e-Learning to track staff competence, providing a documentation trail and accountability measure.

Chapter 2
Project Purpose, Rationale, and Theoretical Framework

The purpose of the PA WIC 2007 Special Project Grant was:

1. To enhance the effectiveness and consistency of WIC Nutrition Services in the PA WIC setting by:

   "preparing staff to conduct quality nutrition assessment and develop (art and science) competencies that will ultimately also improve nutrition education", VENA Guidance.

2. To develop a series of e-Learning (highly effective, blended media) modules focused on staff skill in conducting VENA.

To enhance the effectiveness and consistency of WIC Nutrition Services in the PA WIC setting.

The enhancement of nutrition services within WIC known as VENA was jointly developed by the Food and Nutrition Services (FNS) and the National WIC Association (NWA). It was a response to the 2002 Institute of Medicine (IOM) report which recommended that all women and children ages two to five who met WIC eligibility based on income, category, and residency status "should also be presumed to meet the requirements of nutrition risk through the category of dietary risk based on failure to meet Dietary Guidelines". (1, p.3) FNS responded to the IOM report and its recommendations by developing a two pronged approach: (1) Policy Memorandum 98-9 Revision 8, which revised and established new risk criteria, and (2) Development of VENA: written guidance on comprehensive assessment to be used across all WIC programs to ensure the consistency and integrity of the assessment process. This policy and the VENA Guidance were designed to help WIC maintain its position as one of the premier health public programs.

A WIC Nutrition Assessment is the cornerstone of the program. It represents the body of knowledge upon which nutrition services, food package selection, and referrals are determined. As defined in the VENA Guidance document, a quality assessment:

- improves the usefulness of the participant information,
- serves as the sound basis for assigning risk codes,
- allows for the establishment of a reasonable nutrition care plan with actionable goals to reduce identified risk
- moves the participant toward more positive behaviors and habits
- includes the participant in the entire process (participant-centered)

The benefits to VENA from this type of quality assessment include:

1. maximizing health outcomes through improved nutrition assessment,
2. moving PA WIC nutrition services toward a more participant-centered system.

Without consistent interpretation of policies, establishment of standardized procedures, adequate training, and assessment of staff competencies using periodic review, the effectiveness of VENA is limited. The most carefully conceived and comprehensively developed policies which are well written are only as effective as the end users' familiarity with and conscientiousness about their use. This means that the policies need to be translated into comprehensive and consistent staff training. And with the training component comes a need to identify a means of evaluating staff competency in performing nutrition assessments. VENA and the identification of key competencies required PA WIC to move in the direction of establishing a consistent statewide competency-based training system for staff and evaluating the impact of this training. (excerpted from the PA WIC VENA Self-Evaluation, December 2006).

The e-Learning modules are designed to establish a training system to strengthen the PA WIC assessment process to more fully embody the VENA principles. This project aims to move WIC to a more individualized and personalized participant-centered health outcomes based program, and so it is necessary to refocus the assessment process. The process needs to be more consistent and comprehensive so that the nutritionists can understand the "why" of the assessment information and then can tailor the nutrition services. This training plan integrates the ABCDEO information with the nutrition assessment to produce better nutrition services.

Even though the PA WIC VENA self assessment had identified the need to identify a means of evaluating staff competency in performing nutrition assessments, there was the need to train the staff to the VENA assessment process. Staff training in PA WIC was largely left to the local agency (LA) staff, and current protocols ranged from observation alone (shadowing), to a CPA orientation manual with progression through supervised and then independent counseling, all the way to a "model clinic" facility. Training sometimes focused on activities and processes that occur within the clinic setting, but did not always include the component of increasing the staff's content knowledge, communication skills, or critical thinking ability. Evaluation is often only incorporated in periodic staff reviews or clinic staff meetings. In order to determine whether the e-Learning modules were effective for training staff to a consistent process, a formal evaluation protocol was developed for each of the e-Learning modules.

Philosophically, PA WIC local agency staff exhibit a clear understanding of the scope and purpose of the WIC assessment process. As reported at a 2008 regional VENA training, 19 out of 24 PA WIC local agency staff believes the purpose of a WIC assessment is to identify health status or determine WIC eligibility and tailor services to individual participant needs. While in theory this conception of data collection and analysis seems like a complete process; the reality is that the interview component of the assessment is the most variable. The competency of staff to interpret anthropometric data, blood work values, and dietary quality is also highly variable. Even though the state agency staff is able to identify inconsistencies in assessment across the state, the concept of VENA has been widely accepted. WIC nutritionists/staff across PA desire training from the state that is consistent and focused on the specifics of VENA and they want the training to be relevant to their day-to-day tasks (SPG FY2005, Year 1 data).

To develop a series of e-Learning (highly effective, blended media) modules focused on staff skill in conducting VENA.

"VENA is the first step in quality nutrition services. That is, in order to provide appropriate and personalized nutrition intervention, it is necessary to first conduct a nutrition assessment."[1 (p. 8)] Assessment "requires the use of a systematic approach to collect, evaluate, and make use of the information that is elicited from the participant"[1 (p. 11)] and this implies staff must employ critical thinking. The staff training should also employ a practical clinic-friendly approach to the assessment process. The best approach for the training was one which integrates the teaching of concepts, processes, and competencies needed for the assessment process and it should incorporate the use of demonstrable critical thinking and communication skills.

"Critical thinking is the use of those cognitive skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned, and goal directed – the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions when the thinker is using skills that are thoughtful and effective for the particular context."[6 (p. 5)] This is what we expect of nutritionists in a WIC setting. This defines their job functions with respect to the participant[1 (p.13)] as those where they:

1. systematically collect relevant information (data).
2. clarify and synthesize data collected (establishes relevance through critical thinking).
3. identify pertinent risk or risks and other related issues.
4. document the assessment – communication and continuity of care.
5. follow-up.

The selection of this skills approach for the e-Learning modules is specifically designed to:

1. bring consistent VENA assessments to PA WIC.
2. be a more efficient method of staff training across a state with several economic, logistical and geographic constraints.
3. serve as a more efficient mode of training "new hires," a "brush-up format"for people who have been in the field for several years.
4. serve as a method for other personnel (i.e., paraprofessionals) to gain new competencies and skills that would make for more efficient allocation of staff resources within the clinics where staff have variability with schedules and training is an issue.

Bringing consistent VENA assessments to PA WIC

The skills approach for the modules was based on the empirical evidence that thinking can be improved. Halpern (1996) states that the evaluation of "thinking courses"... "provide substantial evidence for the conclusion that (it) is possible to use education to improve the ability to think critically, especially when instruction is specifically designed to encourage the transfer of these skills to different situations and different domains of knowledge." By establishing a critical thinking approach for the skills-based training modules, it is anticipated that the "critical thinking" process will then become the mode of thinking for a WIC assessment. This kind of thinking will then permeate or filter down into the outcomes of an appropriate assessment; i.e.,

better judgments beget improved nutrition services with appropriate food package tailoring, improved nutrition education care plans, and meaningful referrals.

The nuances and richness of the information gathered during the assessment process is what blends the science (e.g., appropriate and valid methods to collect information, systematic approach to information gathering, evidence-based information analysis, and documentation) with the art (e.g., participant focus, staff competencies, and interviewing and communication techniques) and makes the assessment process both a human one and a comprehensive one. It also makes the assessment process consistent when the information is gathered in a consistent manner by the CPA/nutritionist. This does not imply that an assessment script is used but that educated professionals, trained to a consistent process will collect more cogent information during the assessment process. A more comprehensive assessment means better services to participants.

e-Learning as a training protocol

Consistency within the assessment process requires that the nutritionists use a systematic approach and are encouraged and trained to use a consistent group of skills. To fulfill the goal of more consistent staff training state wide, PA elected to use e-Learning modules. The selection of e-Learning as the system for the delivery of training within PA was due to several factors related to characteristics of e-Learning systems. e-Learning has the potential for consistent, cost-effective, 'real world' training through interactive case study, blended media, tailored instruction with add-on/modification capability. The strengths of this training format are that it:

- delivers training 'just-in-time' (i.e., asynchronous which increase the accessibility of the modules for training, retraining and refreshing).
- uses 'just enough' information (i.e., instruction or information for the task-at-hand).
- is a relatively low-cost delivery system (i.e., upfront costs may be high, savings are accrued over the long-term).
- ability to use standardized resources and updates are available to everyone using the trainings).
- emphasizes learning over teaching
- independent of time and place
- self-paced
- customized
- competency based
- uniform
- cost effective [12,13]

In addition, e-Learning offers learners "control over pace of learning, repetition and time". Research literature indicates that "e-Learning permits greater learner interactivity and promotes efficiency, motivation, cognitive effectiveness, and flexibility of learning style." A recent article published by Belluck[14] (2011) in Science focuses in on learning for its usefulness. The authors state that, "I think that learning is all about retrieving, all about reconstructing our knowledge. I think that we're tapping into something fundamental about how the mind works when we talk about retrieval". Marcia Linn, an education professor at the University of California, Berkeley

believes that "students who took the recall tests may recognize some gaps in their knowledge and they might revisit the ideas in the back of their mind or the front of their mind... they can 'retrieve it and organize the knowledge that they have in a way that makes sense to them.'[1]

The benefit of the use of e-Learning in a WIC setting is that the VENA assessment is comprised of information from the ABCDEO and the nutritionist must "make sense of the information." Using critical thinking skills to turn the information gathered into understanding then allows the nutritionist to work with the participants to produce a positive behavior change. This process is what Belluck[14] and her group describe as retrieval of information to use all the information and ideas from the e-Learning modules to come-up with feasible solutions to workplace problems. Since an e-Learning module allows for repetition and self-paced learning, the nutritionist may gather information at their own pace and practice the skills and information acquired in a case study format or others ways that reinforce the translation from the learning environment to the clinic. In the clinic there are also other nutritionists who can support, encourage and problem solve with the learner. There are also staff trainings and a Nutrition Education Coordinator who works with staff on assessment issues. This multi-modal approach will help the nutritionist apply the information gained from the e-Learning modules to assessment issues in the clinic.

To truly know if the nutritionist is able to problem solve in the clinic in a more efficacious manner, the e-Learning format and the module content needs to be evaluated. On-line learning has become increasingly popular and the growth of technology in many areas has increased dramatically over the last 20 years. There is data to support the effectiveness of online courses and as an acceptable format for many learners with respect to satisfaction and motivation.

Be a more efficient method of staff training across a state with several economic, geographic, and logistical constraints.

Economic constraints

Another consideration which prompted the selection of e-Learning as the training system was that it is a more efficient method of staff training across a state with several economic, geographical and logistical constraints. Improving training at the local agency level has been the heart of staff development but because of the US economic downturn with its increased numbers of unemployed this has raised several challenges. The US unemployment rates for the years 2007-2010 were 4.6, 5.8, 9.3, and 9.6, respectively[17]. In 2007- 2010, PA's unemployment rates were 4.2,4.6, 6.8, and 8.8, respectively. (January 2011 rates were 8.3).

One of the economic impacts of high unemployment rates is that services are requested at increasing rates and this trickles down to WIC services. In PA the participant numbers have steadily risen from 251,159 per month in 2008 to 260,879 in 2009 to 262,270 in 2010[19] This increased number of participants puts economic pressure on a system already stressed.

The economic climate in the US and PA and the increasing numbers of participants who need to be served should have a corresponding increase in the number of CPA/Nutritionists within the state who can respond to this increased participant load. At the state level there are only 26 positions with 23 currently filled[19]. However, these positions are not all involved with

CPA/Nutritionist training; and it is the CPA/Nutritionists at the LA level who have the daily contact with participants. PA WIC has only a few state employees who it can dedicate to facilitate employee training at the local agency level. Of the six master's level nutritionists, one is the Acting Director of PA WIC and one is the data manager. The job demands of these two positions make them unavailable for local agency training. Consquently, there are only four state staff available to train all the local agency staff responsible for training nutritionists in the state. Adding to the challenge, one of the state agency staff members potentially available for training, functions nearly 100% as the state's breastfeeding coordinator[19].

Geography and Logistics

The Commonwealth of Pennsylvania is the 2nd largest of three Middle Atlantic States. When comparing PA with the United States it ranks as the 33rd in size. The state has 44,888 square miles of land and 420 square miles of inland water. It is 307 miles wide and 169 miles north to south. It is noted for being topographically diverse. The topographical features of PA (Figure 2) include the mountains and five major river systems with their extended tributaries. These natural forms mean that travel within PA is at the very least difficult and sometimes prohibitively long. Training by the state staff can require too many hours out of the office and travel costs for training purposes become prohibitively high. Regardless of whether the trainers go out from Harrisburg (the capital and home city for the state WIC offices) or whether the nutritionists and other staff gather at a large venue convenient for the local agencies; there are extra costs incurred by the PA WIC for training.

The costly and lengthy travel times are exacerbated by the geographic position of the major cities in PA (Figure 3). The state is anchored by Philadelphia in the southeastern corner of the state and Pittsburgh in the southwestern end. Between the two cities are three mountain ranges, the Pocono, the Appalachian, and the Alleghany and five major rivers with their tributaries. These rivers meander through the state and play a major in the drainage of water from the land. In the eastern part of the state the Susquehanna River and its tributaries as well as the Delaware River flow southeastward to the Atlantic Ocean. In the western part of the state the Allegheny and the Monongahela rivers join to form the Ohio River in downtown Pittsburgh with the Beaver, Clarion, and Youghiogheny rivers being part of this system. But regardless of where you go in the state the mountains have to be crossed and the rivers "forged". These features have a significant impact on travel time and routing for training purposes.[20]

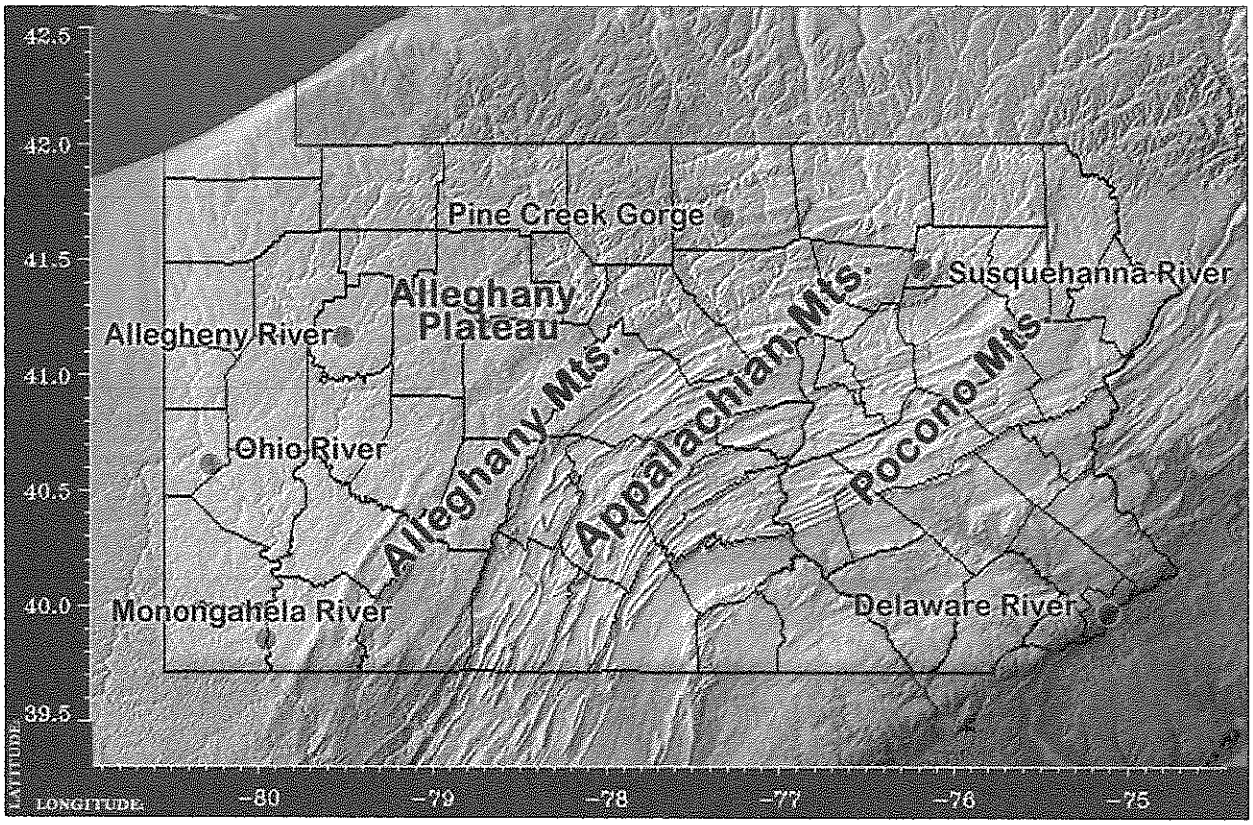

Figure 2. Topographic map of Pennsylvania with mountains and major rivers identified.

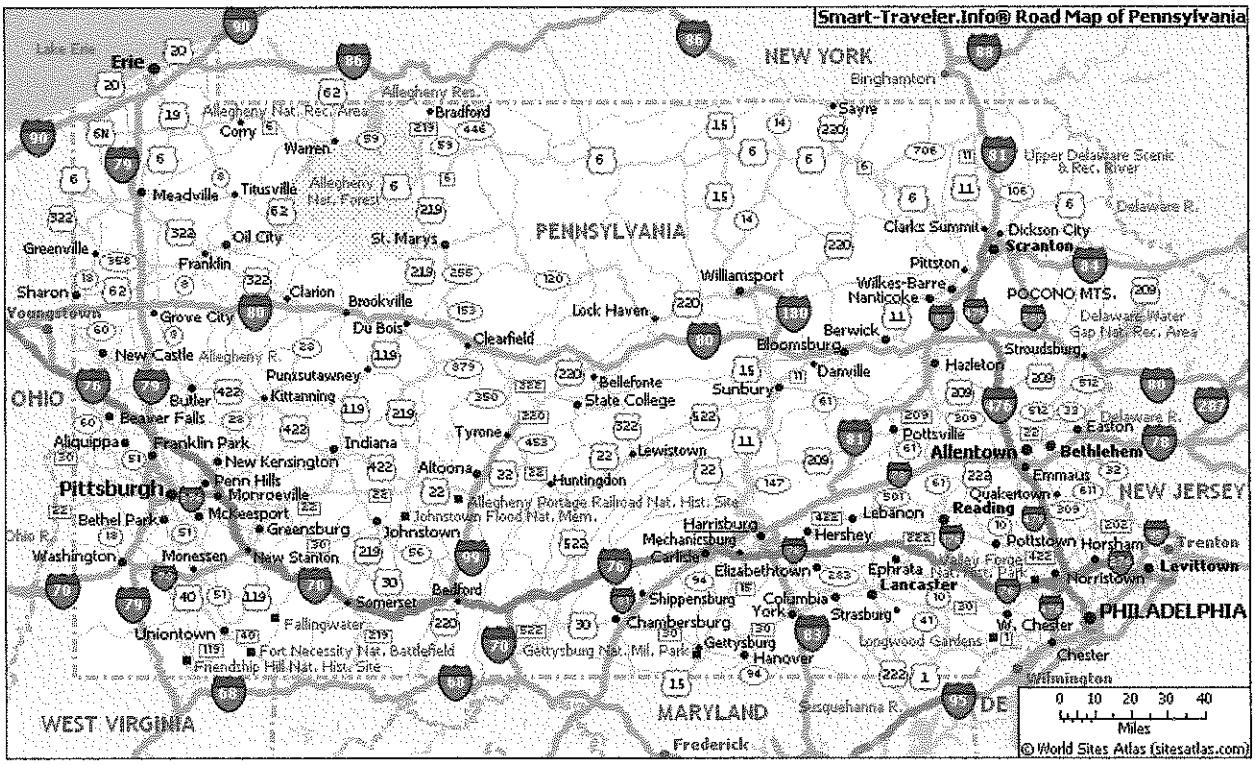

Figure 3. Map of Pennsylvania with major cities and interstates noted.

Another issue is the geographic position of the major cities. The major cities in PA are not from a geographic perspective evenly dispersed throughout the state (Figure 3)[21]. The distance from Philadelphia to Pittsburgh is 300 miles and the state is only 307 miles wide. The other major cities (Table 3) are distributed either on the eastern edge or the western edge of the state with the exception of the state capital, Harrisburg which is more centrally located. The center of the state, north of the PA Turnpike, west of Interstate 81 and east of Interstate 79 has essentially no major cities (Table 3 and Figure 3)[22,23] and has the lowest population density (Figure 4). The separation of the cities increases the travel time needed to go to local agencies in this less densely populated, yet vast area and conduct trainings. It is not cost effective to train in these areas because the number of staff for the training is small in comparison to trainings that can be held in the more densely populated larger cities.

Table 3. Population of major cities in Pennsylvania

Rank	City	Population – (Census Year)
1	Philadelphia	1,526,006 (2010 Census)
2	Pittsburgh	305,704 (2010 Census)
3	Allentown	118,032 (2010 Census)
4	Erie	101,786 (2010 Census)
5	Reading	88,082 (2010 Census)
6	Scranton	72,485 (2000 Census)
7	Bethlehem	71,329 (2000 Census)
8	Lancaster	55,381 (2000 Census)
9	Altoona	49,523 (2007 count)
10	Harrisburg	47,196 (2000 Census)
11	Wilkes-Barre	43,123 (2000 Census)
12	York	40,862 (2000 Census)

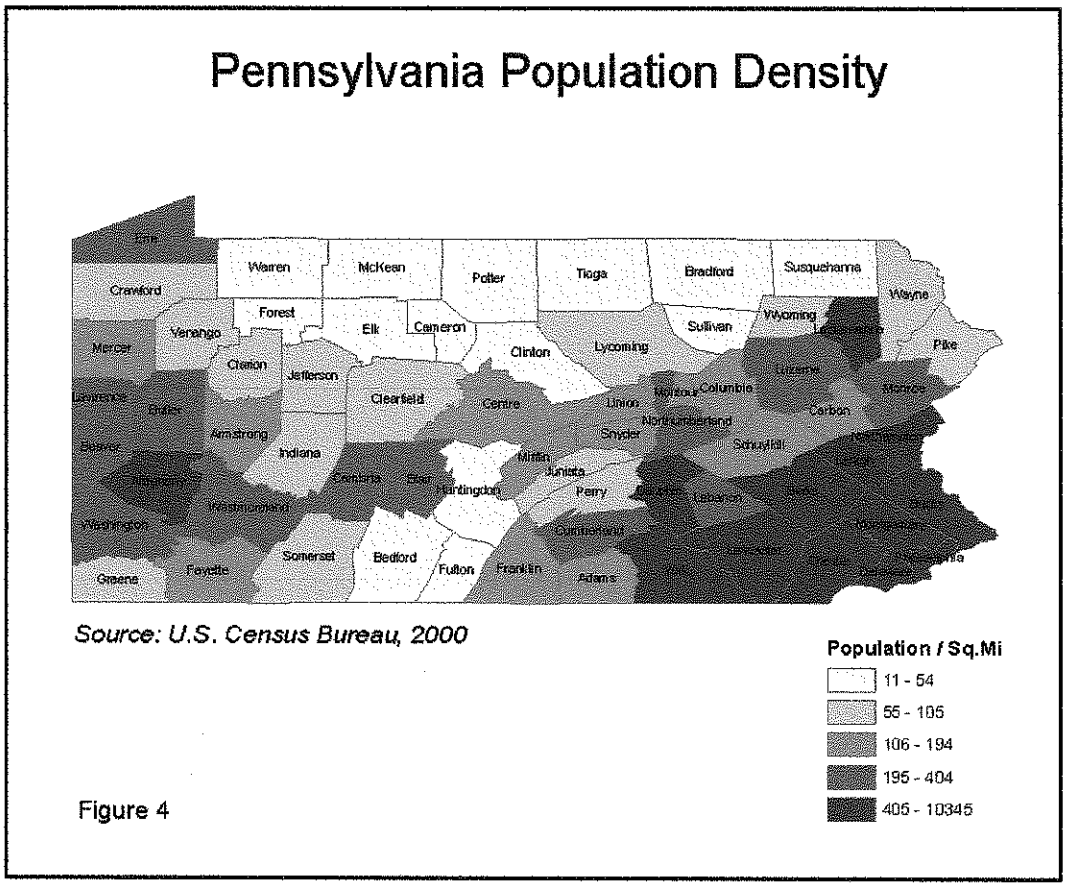

Figure 4. Population density of Pennsylvania

Transportation infrastructure

Face-to-face training has its challenges. The logistics of getting trainer and trainees in the same location are only part of the obstacles that need to be overcome to produce a successful training session. Face-to-face training relies on the environment created by a vibrant trainer with effective working technology and the "trainees" being an engaged vested group of individuals who need the information being provided. In PA WIC face-to-face training has been the norm. The challenges of delivering this type of training given staffing and geographic/topographic obstacles has become "a problem in need of a solution".

The problem, at least part of the problem, is not whether face-to-face training is effective, but can we still conduct training this way under the current economic and transportation limitations. While there are many limitations, one of the single most limiting factors is the state of disrepair of the PA transportation infrastructure.

A list of the infrastructure grades from the American Society of Civil Engineers for PA's transportation infrastructure is alarming. The list includes the following:

- Bridges: C+. PA has 22,280 bridges with 27% considered structurally deficient and 17% are deemed functionally obsolete.
- Dams and Levees: C-. Vastly improved since PA DEP 1970's program for dam safety was established. However, "39% of the "high hazard" dams – dams whose failure would cause probable loss of human life and substantial property damage - are considered deficient"
- Drinking Water: D+. PA water systems are working but aging.
- Navigable Waterways: D+. There is no strategy for replacing the infrastructure of the aging waterways in PA.
- Roads: D-. PA highway network is the 5th largest in the nation for the number of state owned roads. The network has 40,000 state and 76,000 local roads. International Roughness Index statistics show that 38% of PA's roads are in fair to poor condition. The PA interstate system is 1,754 miles of roadways and carries double the national average of truck traffic.[24]

e-Learning as a Training Solution for Pennsylvania

Improved nutrition services in WIC was a concept that reached fruition, in part, under the leadership of the VENA workgroup. Shirley H. Sword, Interim Director of PA WIC was a member of that workgroup. Her vision and leadership drove the conceptualization of an e-Learning training program to bring consistency to staff training in PA. Consistent training in the ABCDEO of VENA, will enable WIC staff to become more competent professionals who conduct more comprehensive assessments which will result in better nutrition services for the WIC participants in PA. e-Learning was selected as the method of delivery for the trainings developed with this grant project. The potential exists for e-Learning to be a more efficient, cost-effective, consistent mode of training in PA.

Summary

The merits of electronic media to provide consistent, just-in-time information conveniently and at a relatively low cost combined with both staffing and geographical challenges facing PA WIC, makes e-Learning an attractive modality to develop and evaluate to promote VENA. Use of a 'Skills First' approach to integrate both ABCDEO concepts with opportunities for improvement of critical thinking and communication skills for WIC staff is central to the development of the training modules. Quality nutrition services and promoting positive health outcomes for WIC participants relies on staff competency development in the art and science of VENA. Four components essential to training that change practices are: knowledge, modeling or demonstration, low-risk practice, and follow-up support.[9] State agency developed e-Learning will support staff competency by improving knowledge and critical thinking skills using case studies that incorporate modeling or demonstration. When e-Learning is paired with practice, follow-up and support at the local agency/clinic level, Local, Efficient, Accessible, Responsive Nutrition Education will move learning forward for WIC staff.

Chapter 3 Methods and Implementation

Overall Purpose:

To develop and evaluate e-Learning modules to support WIC staff development in the area of VENA.

As outlined in the grant proposal, the goals for the project were:

- Goal 1: "To Enhance Staff Competency and Support Implementation of VENA through the Development, Production, and Implementation Trials of e-Learning Modules.
- Goal 2: "To Evaluate Staff Competency Before and After Completion of e-Learning Modules.
- Goal 3: "To Evaluate Satisfaction with an e-Learning Format for Staff Training.

The Goals of this project were cyclical, interrelated, and reinforced the focus of the project to support implementation of VENA through staff training (Figure 5). In the original grant proposal, tasks were delegated to project team members/groups based on expertise (Appendix A, Task Table). The project teams were in regular contact via periodic face-to-face organizational meetings, telephone conferences, and email communication.

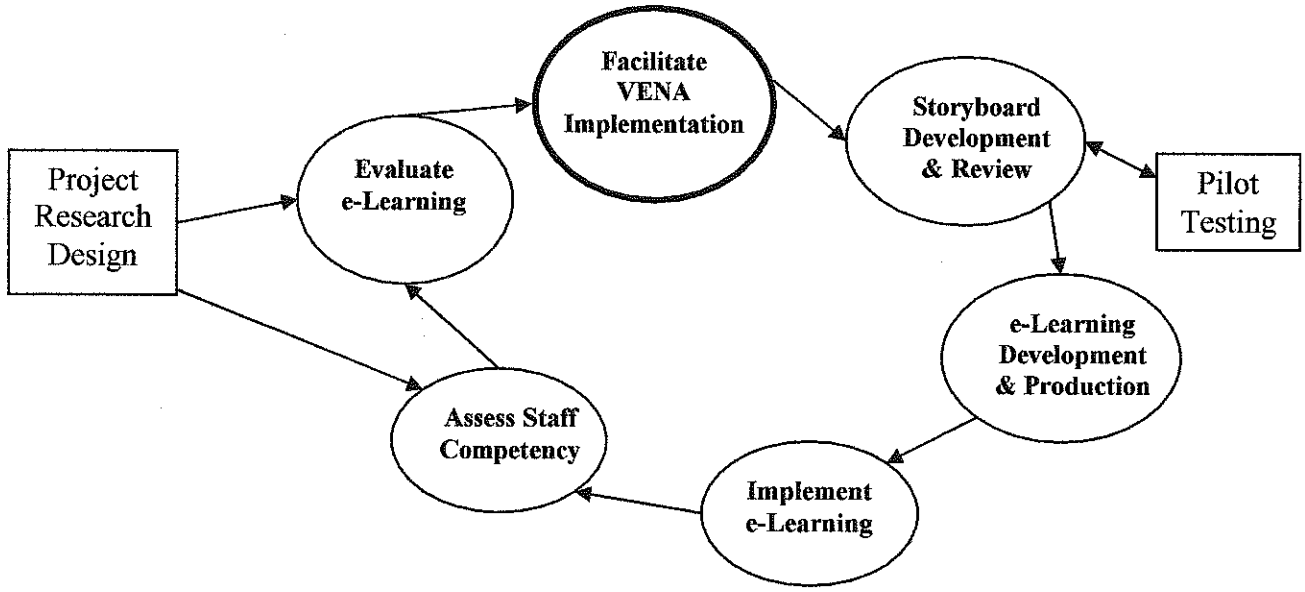

Figure 5. Cyclical nature of interrelated goals for e-Learning Module Development and Testing

Proposed versus Actual Methodology:

Several constraints prevented the methodology proposed in the grant application from being carried out fully. Consultation with grant officers and evaluation experts at the Food and Nutrition Service/USDA office at the May 2010 Special Project Grant meeting aided in decisions regarding the evaluation of the e-Learning modules. Table 4 presents the proposed and actual methodology for each goal.

Table 4. Comparison of Proposed versus Actual Methodology for Each Project Goal

Proposed Methodology	Actual Methodology
Goal 1. Facilitate VENA Assessment Training	
Step 1. Identify Staff Needs via the following:	
a. 2006 PA WIC VENA self-evaluation	As stated in Projected Methodology
b. Via clinic observation and monitoring visits (findings of State Agency personnel or via Local Agency Director audits)	As stated in Projected Methodology
c. Staff surveys and questionnaires administered through PA WIC SPG FY2005 (state of being)	As stated in Projected Methodology
Step 2. Integrate learning domains for modules based on development and practice of critical thinking skills. The following areas (steps of VENA b-f) were included in the module design. a. Define vocabulary. b. Collect relevant information (data) c. Clarify and synthesize data collected d. Identify pertinent risk(s) and other issues e. Document assessment for continuity and communication f. Follow-up	As stated in Projected Methodology
Step 3. IUP and JPL Teams will work closely with one another and with the PA WIC Project Director to ensure consistency with VENA and meet the needs of PA WIC.	As stated in Projected Methodology
Step 4. JPL will produce the e-Learning modules. Production, based on storyboards developed, of three modules (Introduction to VENA, Anthropometrics, and Dietary). The Biochemical/Clinical module will be completed to the storyboard phase only and not produced.	As stated in Projected Methodology

Table 4. Comparison of Proposed versus Actual Methodology for Each Project Goal (continued)

Proposed Methodology	Actual Methodology
Goal 1. Facilitate VENA Assessment Training	
Step 5. e-Learning modules will be pilot (beta)-tested with a small group of PA WIC Nutritionists prior to opening access of the modules to a limited but larger group of PA WIC Nutritionists.	The Introduction to VENA module was pre-tested as a PowerPoint presentation only and not as an e-Learning module due to budget limitations.
Step 6. Feedback from nutritionists will be used to refine and retool the modules	Original budget from JPL did not include enough to revise modules extensively once they were developed. So it was determined that any adjustments needed to be made prior to production, during the development phase.
Step 7. e-Learning modules will be used to train approximately 30 WIC staff (Nutritionists/CPAs/para-professionals) randomly selected across the state.	1. Economic and contractual constraints prevented PA WIC's from obtaining a Learning Management System (LMS) to host the modules. Procurement for an LMS was not part of the scope of this Special Project Grant. 2. Production of modules was such that extensive changes were not financially feasible. 3. The decision was made to complete the modules and evaluate them with a "volunteer agency". Sample was a convenience sample due to unavailability of LMS. All subjects were volunteers from one PA WIC local agency. • Introduction to VENA module = 48 subjects • Anthropometrics module = 28 subjects • Dietary module = 20 subjects

Table 4. Comparison of Proposed versus Actual Methodology for Each Project Goal (continued)

Goal 2. Assess Staff Competency	
Step 1. For each module, staff competencies using integrated testing will be measured on: (a) analysis of pre- and post-test scores (b) % of staff who are competent based on post-test score, and (c) retention or stability of competence based on 2-month follow-up post-test scores. (d) a staff satisfaction survey regarding content and the use of e-Learning was administered (e) Control group size (n=25-30) will take the tests only.	Step 1. Objectives 1a and b. Completed. Objectives 1c. Not completed. Due to the lack of a secure LMS and lags in the development and production schedules for the modules this objective was not met. Objective 1d. Completed. Objective 1e. No control group. 1. Pre and post test data was collected and comparisons made.
Step 2. Performance statistics such as number of errors, point(s) at which remediation pathways should be instituted based on learner response, pre- versus post-test comparisons	Step 2. Based on conditions established as part of the grant funding, remediation pathways were not part of this grant.
Goal 3. Evaluate e-Learning as a Training Method	
Evaluation of staff satisfaction with e-Learning as a training modality	As stated in Projected Methodology

Procedures Used to Fulfill Achievement of Each Goal:

Training needs for VENA were identified through a variety of mechanisms:

- 2006 PA WIC VENA self-evaluation report
- Clinic observation and monitoring visits (findings of State Agency personnel or via local agency self audits)
- Staff surveys and questionnaires administered through PA WIC FY2005 SPG ("State of Being").
- Insights gained from state-wide face-to-face meetings to orient staff to VENA (July, 2008)

The following is a brief description of the undertakings for each goal of the project.

Goal 1: Develop e-Learning Modules to Facilitate VENA

Facilitate VENA Implementation:

To address the challenges of VENA implementation in PA WIC, Goal 1 aims to develop and produce a set of interactive, multi-media staff training modules on an e-Learning platform. e-Learning will assist PA WIC in the implementation of a VENA-friendly, consistent assessment process. Until the full set of VENA competency modules are completed, e-Learning will co-exist with existing training modes. All modules are developed for compatibility with the VENA Guidance document and standardized assessment procedures, where applicable.

Development of the e-Learning Modules:

The development of the modules was completed in priority order, identified by the State Agency (most critical = first done). The modules that were both written and produced into an e-Learning format were: (1) an Introduction to VENA module, (2) an Anthropometric Assessment module, and (3) a Dietary Assessment module. In addition, preliminary work was done for the development of a fourth module whereby the Biochemical and Clinical assessment category areas were collapsed into one module and content was written (but not produced).

Development of each module did not describe mechanics of 'how to' do things, but focused on illustrating how VENA principles are applied in the different categories of assessment in a WIC assessment. In each module, the integration of staff competencies with the steps of VENA centered on the development and practice of critical thinking skills, and examples within the assessment category were used to illustrate VENA in a framework that is familiar to and recognizable by WIC staff. Modules were designed for learners to demonstrate the ability (80% minimum score) to: (a) Define vocabulary, (b) Collect relevant information (data), (c) Clarify and synthesize data collected, (d) Identify pertinent risk(s) and other issues, (e) Document the assessment for continuity and communication, and (f) Follow-up. Wherever possible, existing materials such as those developed by Rochester Institute of Technology (RIT) or those available on WICWorks were reviewed, utilized and/or adapted.

The IUP and JPL Teams worked closely with one another and with Shirley Sword to ensure that the modules were consistent with VENA and met the needs of PA WIC. Several meetings and regular conference call and email correspondence allowed for the creative development of instructionally sound content and multimedia/video scripts for each e-Learning module. Two primary documents were written for each module: (1) a Content Outline, and (2) a Storyboard.

The Content Outline:

A tremendous amount of time and effort was dedicated to constructing a sound content outline for each module. Development of the content outline required collaboration between all grant teams [IUP, JPL, PA WIC (Shirley Sword)] so that

key learning objectives could be determined and appropriate content identified that would support effective and efficient staff competency development. Each module had specific goals and objectives that focused on the primary components of each assessment category and how the staff competencies relate to the assessment process, specifically illustrated by examples specific to the assessment category. Of course, the focus of the introductory module was different, but served as the model for the organization and content of the subsequently developed modules.

The content outlines and key points documents established a purpose, organization, and focus for a given module. They served as a foundation upon which the storyboard for each module was then written. Content outlines were written by the IUP team in consultation with Shirley Sword (PA WIC) and then reviewed, edited, and discussed with JPL. Components of each content outline included: major sections, estimated time for each topic, learning objectives, key/teaching points, evaluation questions, and draft of screen numbers to identify how content would be displayed in the e-Learning module.

Copies of the Content Outlines and Key Points Documents written as part of this grant for each module produced are provided in Appendix B.

The Content Storyboard:

The utility of the storyboard was to expand the content outline in terms of detail and also to specify how the content would be conveyed to the learner. JPL provided the IUP team with a template to use to create the storyboard for each module. Copies of the storyboards for each module are provided in Appendix C. To begin the storyboarding process, the initial effort was to move information from the content outline to create individual slides or frames of information. Each slide or frame defined what the learner would experience on the viewing screen at any given time. The storyboard is a critical component to help developers understand the content, flow, and instructions for the layout and design elements for the module. A storyboard is necessary to depict each frame or slide in the module; generally speaking, each row of the storyboard represents one frame and details where the frame fits under the content outline headers, what the text should be on the slide, what the narration should be that corresponds with the slide, what the visual assets will be, and any special coding that will need to be done for that frame. In the case of test questions, narration for both correct and incorrect answers was also specified. The storyboarding process is incredibly labor intensive and tedious. It is the single document that unifies the efforts of the many contributors to the module development: content experts (IUP team and PA WIC), numerous instructional designers and technical staff at JPL, and hired professional talent (e.g., narrators, actors).

Two additional documents were necessary to facilitate incorporation of a case study that was common to all three modules and aided in staff competency development, particularly critical thinking. These additional documents were: (1) case study documentation for a fictitious

WIC participant, "Angie", and (2) a video script and video storyboard to illustrate dialogue occurring during the appointment between the WIC nutritionist and "Angie's Mom".

Case Study Documentation:

The case study documentation provided Anthropometric, Biochemical, Clinical, Dietary, Environmental, and Other (ABCDEO) assessment information about "Angie" for the Initial Certification (2.5 years old); Follow-up (2 years 9 months); Recertification (3 years), and present day (3.5 years) WIC appointments. The format for the case study documentation was based on a template created by the PA WIC 2005 Special Project Grant: Guided Goal Setting. In addition, actual growth charts were included as part of the participant (Angie) record. Copies of the case study documentation are provided in Appendix D.

Video Script and Video Storyboard:

Although video was budgeted only for the Dietary Assessment module, it was both feasible and advisable to try to develop a video script that could encompass key instructional areas relevant to both the Anthropometric and Dietary modules. This decision required that the Anthropometric and Dietary Assessment module storyboards be developed simultaneously, which resulted in production delays for both modules. To aid in writing the video script, the IUP research team and PA WIC collaborated to audio-record a simulated, typical conversation that takes place during a WIC appointment. The audio-recording was transcribed and then edited and modified to address the learning objectives for each of the modules. Because of the high cost of the video shoot, adequate planning was imperative since it would not be feasible to shoot the video a second time. Using the transcription, the IUP team independently analyzed the script for representation of concepts across the ABCDEO categories. Sample analysis and correspondence is provided in Appendix E. This qualitative analysis identified opportunities for use of the video as part of any ABCDE or O module. Not only was it important to be sure that all ABCDEO categories were accounted for, it was also necessary to make sure that the script told a story yet was written in such a way that short segments of the video could be split and used independently as part of a given module and still make sense. A copy of the original WIC appointment simulation transcription is provided in Appendix F along with the video storyboard that ultimately defined the frames, the use of various portions of the video script, and visual asset suggestions.

In order to develop cohesive and integrated e-Learning modules a great deal of time and attention to detail was required. The modules were developed to be able to both stand alone as well as to fit seamlessly together to promote understanding of the complexities of the ABCDEO categories and their interrelationship. However, the intent is for the learner to do the modules in a scripted sequence. Content outlines, storyboards, case study documentation, and video script/spreadsheets were largely written simultaneously. This insured continuous cross-checking to ensure that learning objectives were being addressed, content outlines and resulting storyboards were compatible, interview scripts complemented and extended

storyboard content, examples seemed 'real world', holes in the module were identified and gaps closed with improved narration, and that a sense of continuity among and between modules was maintained, etc. In addition, the use of conservative, timeless, and general language and examples was essential to maximize the sustainability and transferability of the final e-Learning module products.

Production of the e-Learning Modules:

Prior to final production by JPL, the Introduction to VENA content was beta-tested with PA WIC clinic nutritionists. It was time and cost prohibitive to produce an e-Learning module for pilot testing. Instead, in November 2008 the Introduction to VENA module was pilot tested by the Delaware County WIC office staff using a PowerPoint presentation with voice-over narration. A summary of the results is provided in Appendix G. Using pre-test, post-test results, any part of the module that was limited in its ability to bring the staff to desired competency levels was modified.

Time and budget constraints necessitated that JPL's production effort be intent on creating each e-Learning module in such a way that minimal editing and revision would be needed. Therefore, as already discussed, a substantial investment of effort to produce highly detailed, quality storyboards became even more paramount. The numerous iterations of storyboards was a testament to the learning necessary by the IUP and PA WIC team members on how much detailed thinking was necessary to develop a quality product.

JPL's state of the art media production and editing facilities and the expertise of their instructional design and development staff played a significant role. In addition to the actual production work, JPL's instructional design specialist and Project Leader contributed significantly to educating us about the intricacies of development and production in an e-Learning environment. The partnership with JPL on this project was absolutely necessary and clearly guided a planning process focused on an instructionally sound and high quality end product. SCORM programming was utilized in production for maximum transferability.

Three e-Learning modules to support VENA implementation were fully produced:

- Introduction to VENA: approximately 45 minutes
- Anthropometrics Assessment: approximately 70 minutes
- Dietary Assessment: approximately 60 minutes

As previously discussed, due to the interrelationship of content and production of video, the Anthropometrics and Dietary modules were under production at the same time.

Actual production for the e-Learning module screens was guided by the Content Storyboard (provided in Appendix C). Video production was guided by the Video Script Storyboard (provided in Appendix F). Still photographs taken specifically for this project were guided by the Photograph Instruction Spreadsheet (example provided in Appendix H).

e-Learning Content/Screen Production:

Using the Content Storyboard, screen production for the e-Learning modules was completed by JPL. Sound effects and graphic design, including creation of unique images and use of flash development and animation to promote interactivity, were identified and/or created by JPL.

Photo Shoot Production:

The use of visual assets is a valuable piece of the e-Learning experience. In many instances, having the right graphic at the right moment within the module can help reinforce key messages, or resonate with a learner who learns optimally via visual stimuli. Where possible stock photography was selected and purchased for insertion into the module frames. Photos are preferred over sketches or cartoon type graphics typically seen in clip art. However, it is difficult to find photos that accurately depict a WIC clinic setting or WIC participants in stock photo collections, and even on the USDA website. The IUP research team obtained appropriate releases and took photographs of WIC staff and participants at the Adagio WIC Office in Indiana, PA. Some of these images were used as visual assets; however, many lacked the professional quality in terms of lighting, composition and resolution. After requesting any photos that PA WIC local agencies may have to share, the decision was made that the most efficient and productive way to obtain the needed visual assets was to have a professional photographer capture the necessary images. This photo shoot was organized by Shirley Sword and JPL and held in a Harrisburg area WIC clinic (Hamilton Health Center Walnut Street office). PA WIC staff and Hamilton Health Center staff and their children were photographed. The imagery captured at the photo shoot yielded professional, high resolution photos that were used throughout the e-Learning modules and also for other publications under development at the PA WIC state office.

Video Production:

Shirley Sword worked very closely with JPL to make decisions regarding a video shoot that would yield a high quality, professionally produced video in one shooting session that would also produce still images for the projection of the modules. Professional actors were hired by JPL. The script for the video production was developed by IUP and PA WIC, with input from JPL. Shirley Sword and the IUP team participated in the selection of the professional talent by describing desired physical attributes for the actors, and looking at photographs of the candidates. JPL conducted casting sessions and talent coordination. JPL coordinated hiring and payment of professional actors, selection of props, wardrobe and makeup, set design, lighting, sound recording, effects production, video encoding, digital video editing, quality assurance testing, and DVD duplication.

Implementation of the e-Learning Modules

Goal 2: Assess Staff Competency and Goal 3: Evaluate Staff Satisfaction with e-Learning

As outlined in Table 4, several modifications to the evaluation methodology were needed due to time, budget, and the unavailability of a LMS.

For the produced modules, evaluation involved a volunteer group of local agency staff. The local agency selected (Maternal and Family Health Services, or MFHS), is a large agency with a large staff number who regularly use online systems (e.g., webinars) for staff communication and training purposes. Staff members participating in the evaluation of the e-Learning modules were recruited from 13 counties (26 clinics) and also included staff from the administration office.

Ultimately 48 staff participated in the e-Learning module review: the Anthropometric Assessment module was evaluated by 28 staff and the Dietary Assessment module was evaluated by 20 staff. Staff competency was measured based on:

- analysis of pre- and post-test scores on the modules,
- % of staff who are competent based on post-test score (criteria set at 80%), and
- staff satisfaction regarding content and method of delivery using e-Learning.

Knowledge assessment instruments were based on a table of specifications to ensure content validity of test items and correspondence to module learning objectives. A pre-test, post-test survey design was used to test for the educational effectiveness of and satisfaction with the modules by assessing staff knowledge prior to and immediately after the training. Surveys were administered via paper-and-pencil because an LMS for automatic recording was not available.

Prior to the training dates for the Anthropometric and Dietary modules (March 2011), packets were mailed to each clinic participating from MFHS. A copy of the packets, including instructions to participants on procedures for completing the surveys is provided in Appendix I organized by module title. Surveys were anonymously returned using postage paid envelopes. No identifying information was collected on the surveys.

The MFHS agency director was trained via conference call on procedures on the implementation of the modules for staff training and administration of the surveys. MFHS offered overtime pay for those employees eligible and willing to participate in testing of the e-Learning modules. Staff who participated either viewed the Anthropometric Assessment module OR the Dietary Assessment module. Table 5 represents the agenda for the training day.

Table 5: Agenda for Testing of the e-Learning Modules

Activity	Description
1	Welcome and overview of training; collection of pre-training surveys for the Introduction to VENA module (this module was not viewed, but surveys were administered to assess staff knowledge on VENA.
2	Completion of the e-Learning module pre-test survey for either Anthropometric or Dietary Assessment
3	Participation via webinar format in either the Anthropometric or Dietary Assessment e-Learning module. During the module staff completed the embedded Practice Questions and recorded their answers on the Practice Question paper-and-pencil survey.
4	Completion of the e-Learning module post-test survey for either Anthropometric or Dietary Assessment
5	Completion of the e-Learning module satisfaction survey for either Anthropometric or Dietary Assessment

Although this agency had substantial experience conducting webinar-based trainings, on the day of the first training, significant technological difficulties occurred because of the JPL server. Despite what was thought to be adequate planning and trouble-shooting, the standardized training protocol at some clinics had to be abandoned and staff completed the module independently rather than with the rest of the agency via the webinar system. Ultimately instead of accessing the modules via the JPL server, a file was provided to MFHS so that they could stream the module through their system. In retrospect this is what should have been done in the first place but JPL was reluctant to have copies of the not yet finalized modules in circulation.

Quantitative analysis was run on the surveys. Frequency distributions were run to check for data entry errors, outliers, and distribution shapes. Means and standard deviations were run to examine central tendency and spread. T-test statistics were used to analyze pre-test, post-test differences. A summary of the content evaluation and satisfaction analysis results are provided in Chapter 4.

Chapter 4: Outcomes

Development and Production of e-Learning Modules to Enhance Staff Competency and Support Implementation of VENA (Goal 1)

Three modules were developed and produced.

List of Products:

- Content Outlines and Storyboards, including practice and evaluation questions to assess staff competency for the Introduction to VENA Module, Anthropometric Assessment Module, and Dietary Assessment Module.
- Content Outline and Storyboard for Biochemical and Clinical Assessments Module
- Case Study for WIC Child, including sample documentation
- Photo Specification Spreadsheet
- Digital Photographs Representing WIC Staff, Participants, and the WIC Setting
- Video Script
- Digital Video Depicting Typical WIC Appointment
- Digital Copy of Each of the Three Produced Modules: Introduction to VENA, Anthropometric Assessment, and Dietary Assessment (CDs provided in Appendix J).

Implementation and Evaluation of e-Learning Modules for Educational Effectiveness (Goal 2)

The outcomes for the project are presented as simple accomplishments of the goals with data tables following the statement.

The Anthropometric Assessment and Dietary Assessment modules were evaluated by Maternal and Family Health Services (MFHS), a PA WIC local agency, in March 2011.

Due to time limitations of the MFHS staff, the Introduction to VENA module was not reviewed. This decision was made since VENA had been implemented in PA in 2003, and a state-wide VENA training was conducted in 2008. It was decided that PA WIC staff should have the VENA assessment process knowledge and experience to successfully complete the post-test.

Anthropometric Assessment Module

Table 6 presents t-test analysis results as a gain in knowledge from the pre-test to the post-test. The Anthropometric module had a mean knowledge score of 67.6 $\pm$ 9.4. While the score did not reach the anticipated score of 80 percent, the change in scores (4.4 points) from the pre-test to the post-test was statistically significant at the 0.05 level. The mean scores on the post-test for the Anthropometric module was 72.0 $\pm$ 9.9.

Table 6. Anthropometric Assessment Module - Content Assessment
Percentage Correct Before and After Viewing, Dependent Samples t-test

Test	n	Mean	S.D.	Range	r	t	p	d
Before (Pre)	28	67.6	9.4	50 - 83	.69	3.07	.005	.46
After (Post)	28	72.0	9.9	42 - 92				

Dietary Assessment Module

Table 7 reports the t-test results as a gain in knowledge from the pre-test to the post-test. The Dietary module had a mean knowledge score of 85.0 $\pm$ 12.9. While the mean score did reach the anticipated score of 80 percent, the change in scores from the pre-test to the post-test was statistically significant at the 0.05 level. The mean scores on the post-test for the Dietary module was 90.1 $\pm$ 8.9. This gain of slightly over 5 points (5.1) represents a change in score documenting an excellent grasp of the Dietary component of the VENA assessment process.

Table 7. Dietary Assessment Module - Content Assessment
Percentage Correct Before and After Viewing, Dependent Samples t-test

Test	n	Mean	S.D.	Range	r	t	p	d
Before (Pre)	20	85.0	12.9	42 -100	.65	2.67	.015	.47
After (Post)	20	90.1	8.9	75 -100				

Implementation and Evaluation of e-Learning Modules to Assess Staff Satisfaction with e-Learning and the Modules Overall (Goal 3)

Overall, the Anthropometric and Dietary modules' content was considered good to very good by the majority of the WIC staff, as shown in Tables 8 and 9, respectively.

There was some incongruence among response categories that warranted investigation and resulted in modifications to the e-Learning modules. In particular, while the amount of information, degree of difficulty of content, and pace of presentation was rated as 'just right', the length of presentation ratings were split between too long and just right. The satisfaction evaluation was likely strongly influenced by the significant technical difficulty experienced by MFHS when they tried to stream the modules online for their staff to review. Day 1 of the evaluation had to be abandoned by many clinics because of the technical problems in streaming the modules. Feedback focused on the requirement to listen to all narration in order to move forward in the module as an area that needed to be changed or shortened. Appendix K provides the summary table used by JPL to modify the modules after the evaluation was complete by MCFS.

Table 8. Anthropometric Assessment Module - Satisfaction Evaluation: Percentage of Responses for Each Category by 28 Responders

Job Status:	Staff	Para-professional	CPA	Nutritionist/CPA	Manager	No Response
			32	60	4	4

Sex:	Male	Female
	11	89

Years at local agency: 29% under 2 years / 7% 2-5 years / 14% 6-10 years / 50% over 10 years

	Excellent	Good	Fair	Poor	Just Plain Rotten	Missing
	E	**G**	**F**	**P**	**R**	**M**
1. **Content relevant** to my learning needs.	32	54	11	3		
2. **Clarity of content presentation** (including new terms).	29	64	7			
3. **Clarity of learning objectives** (what you should learn).	29	68	3			
4. **Progression of content** from beginning to end of module.	18	57	7		14	4
5. **Overall organization of content and practice questions**.	14	68	14	4		
6. **Clarity of module expectations** (what was expected of you).	14	68	14			4
7. **Relevance of pictures and graphics** to aid learning.	25	64	4	7		
8. **Clarity of voice** / narration.	46	50		4		
9. **Helpfulness of the Practice Questions** and feedback during module.			25	50	25	

10. **Amount of Information** Presented was:	**Too Little**	**Just Right**	**Too Much**	**Missing**
	4	**82**	**10**	**4**
11. **Degree of Difficulty of Content** was:	**Too Easy**	**Just Right**	**Too Hard**	
	7	**89**	**4**	
12. **Length of the presentation** was:	**Too Short**	**Just Right**	**Too Long**	
		46	**54**	
13.**Pace** that Information was presented:	**Too Slow**	**Just Right**	**Too Fast**	
	21	**71**	**21**	
14.**Number of Practice Questions** was:	**Too Few**	**Just Right**	**Too Many**	
	4	**71**	**25**	
15.Module is one that I would **recommend** to others:		**Maybe**	**Definitely**	**Probably Not**
		29	**46**	**25**

General:	**Excellent**	**Good**	**Average**	**Fair**	**Poor**	**Missing**
	7	**50**	**18**	**21**		**4**

Table 9. Dietary Assessment Module – Satisfaction Evaluation: Percentage of Responses for Each Category by 20 Responders

Job Status:	Staff	Para-professional	CPA	Nutritionist/CPA	Manager
			15	80	5

Sex:	Male	Female
	15	85

Years at local agency: 40% under 2 years / 35% 2-5 years / 20% 6-10 years / 5% over 10 years

Excellent Good Fair Poor Just Plain Rotten

	E	G	F	P	R
10. **Content relevant** to my learning needs.	40	35	25		
11. **Clarity of content presentation** (including new terms).	25	65	15		
12. **Clarity of learning objectives** (what you should learn).	30	60	10		
13. **Progression of content** from beginning to end of module.	25	50	15	10	
14. **Overall organization of content and practice questions.**	35	35	25	5	
15. **Clarity of module expectations** (what was expected of you).	25	60	5	5	5
16. **Relevance of pictures and graphics** to aid learning.	35	50	10	5	
17. **Clarity of voice** / narration.	50	35	10	5	
18. **Helpfulness of the Practice Questions** and feedback during module.	35	40	15	10	

10. **Amount of Information** Presented was:	**Too Little**	**Just Right**	**Too Much**
		60	40
11. **Degree of Difficulty of Content** was:	**Too Easy**	**Just Right**	**Too Hard**
	10	85	5
12. **Length of the presentation** was:	**Too Short**	**Just Right**	**Too Long**
		25	75
13.**Pace** that Information was presented:	**Too Slow**	**Just Right**	**Too Fast**
	30	65	5
14.**Number of Practice Questions** was:	**Too Few**	**Just Right**	**Too Many**
	5	80	15
15.Module is one that I would **recommend** to others:	**Maybe**	**Definitely**	**Probably Not**
	50	30	20

General:	**Excellent**	**Good**	**Average**	**Fair**	**Poor**	**No Response**
	10	50	20	5		15

Chapter 5: Sustainability and Transferability

Sustainability:

This grant was not designed to develop modules for all ABCDEO categories of the VENA Assessment Process. The original intent was to develop and produce e-Learning modules and evaluation instruments for an introductory module and two of the VENA assessment categories: Anthropometrics, and Dietary, with development to occur for the Biochemical/Clinical categories.

Building and evaluating the appropriate platform for module development would set the groundwork for future endeavors toward a comprehensive system of e-Learning modules. While the next logical step is to produce the Biochemical/Clinical module and develop and produce the Environmental/Other module, the greater knowledge gained from this project can be applied to development of any future e-Learning topics. A process and template has been designed and the knowledge of the level of attention needed to create an effective training module will be shared with internal staff and incorporated into any future training, including topics such as Guided Goal Setting, services to high risk participants, breastfeeding promotion and support, effective documentation, etc. The topics are too numerous to count or even predict at this point, but PA WIC staff are eager for trainings developed by the State Agency, and the State Agency is aware of the need for such training materials.[8]

Future modules could be funded through Operational Adjustment grant funding, or incorporated into the normal WIC operating budget. Dollars normally spent on staffing and travel to conduct multiple regional trainings could be applied toward development of future modules which could reach the entire local agency staff within a shorter amount of time with limited impact on operation hours of clinics.

Transferability

The products developed through this grant will help to fulfill a documented need for staff training that is VENA-friendly; therefore usable and/or adaptable by all WIC agencies across the nation. The modules will be usable as a stand-alone educational tool in CD format, as well as "ready for import" to an LMS, or other existing systems. While Pennsylvania has not been successful in securing an LMS to house these modules, initial conversations have occurred with our SPG partners from Iowa to investigate available options. Upon approval by USDA on the modules produced from this grant, PA WIC will seek out opportunities to host or distribute these modules in a variety of formats, including WIC Works or through CDs. Also noteworthy is that the Introduction to VENA module has been successfully used to provide insight to Dietetic Interns from Penn State University and Indiana University of Pennsylvania as they learn more about WIC. Initial response from the interns has been positive with respect to providing a better understanding of the level of professionalism required in a career with the WIC Program.

The e-Learning modules were developed using standard technology/software platform(s). Every effort was made to maximize the compatibility and usability of products/modules developed

across many computer systems to facilitate the widespread distribution and use of these materials. Sharable Content Object Reference Model (SCORM) specifications which prescribe the manner in which LMS systems handle e-Learning products were used. SCORM-conformant specifications are a well accepted industry standard within the e-Learning community. SCORM standardizes a method to launch and track learning experiences, and define the intended behavior and logic of complex learning experiences. SCORM allows complex learning experiences that go far beyond what can be done with simple hyperlinked web content. SCORM conformant material standardizes how LMS systems track learners. Importantly, the design of the modules will foster processes that emphasize critical thinking and communication skills, a transferable benefit with regard to decision points inclusive of and outside of nutrition assessment.

An added bonus to this project has been the extensive bank of professionally shot photographs of WIC staff in a WIC clinic setting. Releases have been secured from all staff and individuals who were photographed, with the express understanding that their images may be used for future WIC materials. These images can be made available to USDA and any other state seeking out such visual assets.

Additionally, this grant includes the production of research reports and presentations at professional conferences to disseminate interim and final findings. The project is being conducted by a team that includes faculty at a state university, a professional e-Learning production company and State WIC staff who are knowledgeable about to the needs of the state for training. The state staff is also knowledgeable with respect to continued implementation of VENA compliant training that is based on federal and state WIC mandates.

Chapter 6: Strengths, Limitations, and Lessons Learned

Project Strengths:

A primary strength of this project is the extent of collaboration between PA WIC (including state agency staff and testing of the modules with WIC staff with varying levels of experience), JPL, and IUP (including two research team members who are registered dietitians and also have WIC experience). Additional strengths of the project include that the modules use real-life examples, realistic documentation, a common case study across modules, and video clips for illustration of the VENA process and counseling techniques. The advantages and potential of e-Learning as a training modality are numerous. Advantages include: staff being able to complete the modules on their own time versus having to close down the clinic for face-to-face or group training; standardization of content and flow of information (versus the train-the-trainer format which can result in inconsistent training across the state, especially when concepts are complex and competency-based); and the potential to document and track staff competency development.

Project Limitations:

The limitations of the project center on two areas: budget and time limitations that impacted the development and production of modules as well as the extent to which the modules were evaluated. Budget had the unexpected effect of significantly limiting the type of pilot testing that could be done on module content and also the extent to which the modules could be revised after they were evaluated with WIC staff. Time limitations compromised development and production schedules because of a number of different factors, including the implementation of the new Food Package Rules which consumed State Agency resources, intensity of the work, changes in work roles for key personnel, and health issues for team members. The delays in development and production admittedly had a negative impact on our ability to evaluate. Time limitations necessitated the use of a convenience sample of WIC staff and modification of the research methodology for the evaluation of the e-Learning modules. While this is unfortunate, the fact is that because of how costly it was to produce the modules, very little modification could have been done even if there were significant findings after evaluation and feedback from WIC staff. Because production is labor intense and expensive, it was not feasible to involve WIC staff in evaluation of the modules during production. In addition, there were technological issues experienced that detracted from the WIC staff experience with the modules. These difficulties likely affected the results, particularly in staff response to e-Learning as a training method. Not having an LMS in place to support distribution of the modules to WIC staff limited evaluation and accessibility.

Lessons Learned:

This project reinforced the importance of good communication. The development phase of each of the modules necessitated a very high level of collaboration and interdependence among PA WIC, JPL, and IUP. At times bringing together the minds and efforts of individuals working at a government entity, a for-profit corporation, and an educational institution was extremely challenging. Individual work styles, combined with the 'cultural expectation', work flow

patterns, supervisory systems, and approval mechanisms of each entity (i.e., government, corporate, education) required that we seek to understand operations and timelines at each of our places of work. Most valuable was the knowledge and skills that each of our respective groups had to learn from one another to develop, produce, and evaluate the e-Learning modules. Another significant lesson learned is that you simply cannot underestimate the time required and the budget required to create high quality, effective e-Learning modules.

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