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Educating Globally in Medical Imaging in Latin America and Caribbean via Webinars

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This is to certify that the doctoral study by

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Abstract

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Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Professional development courses that focus on increasing knowledge and improving skill sets are an integral part of a medical imager's career. This study was a qualitative formative evaluation with purposeful sampling of participants in a professional development webinar course offered to medical imaging professionals in 35 Latin American and Caribbean countries. The goal of this study was to aid the agency with identifying areas in which the efficacy of the program implementation and delivery could improve. The conceptual framework model, interest-problem-based learning (INTEREST-PBL) model, and Malcolm Knowles's theory on adult learning were used to ground this project. The research questions focused on the effectiveness of the implementation of the webinars, and the identification of areas of strengths and weaknesses. Data were collected from 7 participants using semi structured interviews and online questionnaires and was analyzed through coding and thematic analysis. Findings suggested that the absence of a formative evaluation during the early stages of implementation and deployment had an impact on the efficacy of the webinar courses. Differentiated learning strategies with clearly defined goals as well as a mechanism for immediate and continued feedback need to be inserted into the webinar design. This study contributes to social change by postulating the use of an evaluation model and pedagogical tools that can assess educational programs for medical imagers that integrate global health policies, technical standards training, and the coordination and collaboration of healthcare partnerships, thus, improving their performance in the delivery of medical imaging examinations while increasing access to quality radiological examinations.

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Dedication

This work is dedicated to my daughter, Marciela Regina. Know that Mommy loves you no matter what and that you are always my first thought. I hope this makes you proud of me.

"If you are always trying to be normal you will never know how amazing you can be." -Maya Angelou

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Thank you, God. I could not have done any of this without You. You are to be extolled to the highest. I will continue to praise Your holy name. *Ad majorem Dei gloriam*: for the greater Glory of God. To my chair, Dr. Nancy Walters, thank you for seeing me through to the end. I appreciate your insightfulness. To Dr. Mary Ramirez, thank you for your input and patience throughout my writing process. To my initial chair, Dr. Carol Spaulding, thank you. To Dr. Rollen Fowler, thank you for your input.

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"To live a creative life, we must lose our fear of being wrong." -Joseph Chilton Pearce

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Section 1: The Problem

The Local Problem

The purpose of this project study was to conduct a formative program evaluation of professional development courses offered via webinars to medical imaging professionals in 35 Latin American and Caribbean countries. My goal for this program evaluation was to assist an international governmental agency in conjunction with local medical imaging professionals, educators, physicians, ministers of health, and international public health agencies to understand and improve the effectiveness of the webinar professional development course program offered in selected underdeveloped geographic regions.

In this project, I focused on a formative evaluation that addressed the quality of the program content, implementation, and delivery of the webinar course. As I investigated the webinar training program, I utilized the elements of formative evaluation that included justification, evidence, resources, participant satisfaction, accountability, and logic models as outlined by McKenzie, Neiger, & Thackeray, 201. In addition, I developed, identified, and described a conceptual education framework model that incorporated problem-based learning and principles of adult learning theory. This model aided in the formative evaluation process.

Section 1 includes a description of the problem. Topics include the introduction, definition of the problem, rationale, definitions, significance, guiding/research questions, review of the literature, implications, and summary. Section 2 includes a description of the methodology that I used to perform the formative evaluation. Section 3 includes

information regarding, the evaluation process, introduces the reference literature used to guide the research, gives an overview of the webinar course program, and describes ways in which this evaluation can be replicated for future use. Section 4 is an overview of the project itself (Appendix A).

Background

The director of the international public agency that was the site of this study (the agency) expressed support for a formative evaluation. The following problems with regard to the webinar professional development training courses included the lack of the following: a formative program evaluation, outcome assessment, and knowledge regarding the overall effectiveness of the program relative to improving knowledge and practical skills. According to the director of the agency, no evaluation of the webinar program had occurred since its implementation in June 2012. The focus of this study was to address the quality of the webinar program relative to implementation, delivery, and content.

According to the World Health Organization (World Health Organization [WHO], 2011), approximately two thirds of the population of the world has little to no access to life-saving radiology services. In developing and underprivileged communities, serious health disparities exist in the availability of medical imaging care, and services, and the shortage of personnel to perform the procedures (Pan American Health Organization [PAHO], 2014, WHO, 2011, 2008). Populations in remote or under-resourced settings separated from modern technology bear an increased burden of morbidity and mortality. The WHO (2011) indicated that between 3.5 and 4.7 billion individuals worldwide live in

radiologic-scarce zones (RSZ), meaning that limited access to radiology services is evident. Limited access refers to the lack of imaging services or the nonexistence of trained medical imaging professionals. The absence of access to medical imaging services is a major problem in Latin American and Caribbean countries. Cultural beliefs regarding medical care are strong within the Latin American and Caribbean communities. The government on this geographical region provides minimal financial support to train medical personnel as well. Therefore, the access to medical imaging services is further compromised and as such has a direct impact on any international public health outreach programs (George, Duran & Norris, 2014; WHO, 2008).

Definition of the Problem

The problem that I addressed in this study was the lack of a formative evaluation of the webinar course program implemented and executed regarding decreasing the lack of qualified, trained imaging professionals in Latin America and the Caribbean. The agency developed and implemented a series of webinar professional development training courses, based on assessments performed in the respective countries by volunteer instructors during site visits. However, since the program's inception, there has been no formal evaluation of the program, and evaluation is an important step in determining the effectiveness of professional development programs. Caldwell (2014) indicated that because the need for training in developing countries differs from the need in developed countries, the availability of educational opportunities designed to maintain and increase competence is imperative. Initially, volunteer instructors during site visits addressed the absence the delivery of care and education among the local medical imaging

professionals in developing or underdeveloped countries; the subsequent webinar courses were available based on direct input from the medical imaging professionals and radiologists in the Latin American and Caribbean countries. The professionals utilized a problem-centered design. However, throughout the life cycle of the webinar course program, no formative or summative evaluation was available. The absence of an evaluation was the identified problem that this study addressed.

I examined the agency's strategic plan to determine if there existed a stated mission, purpose, and placement of the course program to understand its significance within the agency. The design, implementation, and delivery of the webinar-based professional development training courses occurred without evaluation of the process. However, after a thorough inspection of the document, I could not find any mention of the webinar course program. This lack of mention suggested that the agency had no printed documentation of the goals and objectives for the program or the webinar course trainings did not exist or were evolving. According to Hall, Freeman & Roulston (2014) a formative evaluation can explain the actual implementation process and can identify the problems in the professional development training and process planning stages (Hall, Freeman, & Roulston, 2014).

When designing educational or professional development programs, evaluation is an integral part of the implementation process. Professional development training is necessary because integrating learning and assessment offers program developers and instructors a method for seeking and accumulating feedback regarding the curriculum or the material in the program (Bok et al., 2013). As professional development training

programs begin to incorporate specific practices in adult education, a sustainable program focuses on developing the competencies and skills employers desire while integrating new teaching and learning practices that involve blending and collaborative approaches (Litoiu, 2014). An effective program evaluation offers insights for program leaders to decide if a program fails or succeeds in meeting established goals, and if the design of the program improves a project (Zarcadoolas, Pleasant, & Greer, 2006).

As learning strategies change from traditional methods and incorporate technology (e.g., webinars), the ability to assess, evaluate, and provide feedback shapes the manner and method in which a program evaluation occurs (Vonderwell & Boboc, 2013). According to Hulscher, Laurant, and Grol (2002), formative evaluation allows "researchers and implementers to (a) describe the intervention in detail, (b) evaluate and measure actual exposure to the intervention, and (c) describe the experience of those exposed concurrently" (p. 40). The key quality of formative evaluation is its focus on the dynamic context within which change is taking place and its ability to provide valuable evidence regarding the nature of implementation and the significance of modifications. A formative evaluation was necessary to determine if the program for this study was effective in its implementation and delivery stages.

Rationale

Evidence of the Problem at the Local Level

The webinar course program occurred in 2012 via the agency and included no formative or summative evaluation. A total of nine webinar courses were available beginning in June 2012 to medical imaging professionals in various Latin American and

Caribbean countries. According to the executive director of the agency, the design and implementation of the webinar course program was part of the global public health initiative and the agency's intervention on education and training in diagnostic imaging. For public health intervention programs to be successful, assessment of implementation must occur regularly. However, without a formative study of the implementation procedures and intervention strategies, public health programs often fail to show behavioral and health impact (Boyd & Windsor, 2003).

The goal of formative evaluation is to gather data as the program unfolds and provide the program developers with data to make improvements if needed (Shawer, 2013; Shenge, 2014. With the webinar training programs, a formative evaluation allowed the program developers to improve the program as well as aided in gathering data that can be used, if needed, to determine the impact of the professional developing training web courses as they are being offered (Mazal & Steelman, 2014). The agency agreed that improvement would be the focus of this formative program evaluation. As such, I gathered data for this project from the stakeholders.

Evidence of the Problem from the Professional Literature

A program evaluation occurs at any time in its life cycle. However, formative evaluations typically occur during the early stages of a program's implementation and are performed as a means of determining what happens to participants, communities, environments, etc. at the conclusion of the program phase (Wall, n.d.). Wall also noted that evaluation is not a one-time event but rather a continuous activity that should be an integral and integrated part of a program's activities. A carefully designed and executed

evaluation can and should provide important and relevant information for a program to assist with identifying areas for improvement and areas of effectiveness in execution. The Veterans Health Administration Quality Enhancement Research Initiative projects defined and illustrated how developmental, implementation-focused, progress-focused, and interpretive evaluations help demonstrate the importance of formative evaluation. These evaluations create growing understanding of how to integrate research findings in practice. The goal of the evaluations is to improve the quality and delivery of clinical care (Stetler et al., 2006).

In this project study, I evaluated the agency's efforts to aid the field of medical imaging and global radiology professional development training via the use and integration of a webinar course program. I used a qualitative formative evaluative approach because this was the best practice methodology for a study in which feedback would go to the stakeholders regarding the effectiveness of the program. Measures determine if the implementation was effective and whether the intended effects occurred as viewed through the eyes of the stakeholders (Geonnotti, Peikes, Wang, & Smith, 2013).

Access to care means access to services, and access to trained, qualified, and competent individuals who perform the related services (Caldwell, 2014). As early as 2006, the WHO projected that demographic and epidemiological changes could have a global impact on the availability of qualified allied health professionals. There would be a need to create a modern and skilled health care workforce (Fradd, 2006). In medically underserved communities, the availability of medical services is frequently associated

with poor-quality procedures, unnecessary exposure to radiation, and a shortage of human resources. The global health issues that occur when there is a lack of access to care in resource-limited countries prompted various nongovernmental organizations (NGOs) to seek collaboration opportunities to provide training to community health workers and peer educators (Wallace, 2007).

The professional development training webinar courses were evaluated in the context within which they were implemented: to provide a service that would bridge the educational gap between what was previously learned and what is needed to improve practical application. Mollura and Lungren (2014) provided perspectives from multiple authors concerning radiology in global health efforts. Mazal and Steelman (2014) stated that international outreach organizations work toward increasing access to medical imaging services where there is a growing demand for appropriately trained imaging professionals. Their work was relevant to this study because they examined the question of whether a focus on the didactic education of local technologists could be successful based on the level of preparation that goes into selecting, developing, and implementing the educational content. For the basis of this project study, I gave attention to the work by Mollura and Lungren (2014); I referred to this work often to support the development of my conceptual educational model. Mollura and Lungren's (2014) work was an important reference because of its relevance to global radiology, professional development training, and curriculum development.

Volunteer technologists involved with a radiology outreach program make initial decisions on the content of the educational interventions to be evaluated and the type of

assessments used to measure the effectiveness of the intervention (Mazal & Steelman, 2014). After volunteer technologists conduct the initial observation, they identify gaps in the delivery of care and education among the local medical imaging professionals and further assess curricular documents, via either observation or direct communication. The volunteer technologists utilized the American Society of Radiologic Technologist (ASRT) curricula documents to determine the effectiveness of the intervention.

The ASRT curriculum documents outline a common body of knowledge that is essential for all entry-level technologists in various imaging modalities. However, instructors who volunteer in Latin America and the Caribbean generally modify and specify instructional methods within this document that will be omitted for international outreach purposes and to accommodate the professional development needs of the respective country in the overall assessment report that is received regarding radiology readiness (Mazal & Steelman, 2014). In addition, if the health officials within a country so desire, they request training in topics that they think are more in alignment with the needs of the people of the country. For the delivery of the webinar courses, these steps were useful, and the authorities of the radiology outreach program delivered web-based courses that addressed various medical imaging concerns and requests (Mazal & Steelman, 2014).

The scarcity of qualified personnel locally available to operate medical imaging equipment reflects a major global problem that the WHO identified in 2006 regarding skilled workforce talent. To address the potential global education problem, such as the lack of qualified personnel and the absence of diagnostic radiography and radiation

therapy technologists in each developing country, the International Society of Radiographer and Radiologic Technologists (ISRRT) along with other international and national professional societies developed guidelines for educating entry-level staff in professional practice in medical radiation sciences in developing countries. These guidelines served as the framework for developing professional standards of education in diagnostic radiography and radiation therapy by identifying the roles, fields of knowledge, and attributes that underlie competent professional performance (ISRRT, 2014; Mazal & Steelman, 2014). These guidelines also served as one means of assessing current programs.

Diagnostic imaging plays an important role not only in identifying pathology and tracking the progression of a disease and also in preventing disease through screening. Health technology, including imaging, is one of the six essential building blocks for all health systems (Caldwell, 2014; Shah, 2014). Shah (2014) indicated that one half to two thirds of people in the world lacking adequate access to basic medical imaging technology is a public health concern. Medical imaging is a useful course for diagnostic, preventative, therapeutic, and curative medicine (WHO, 2015).

Diagnostic medical imaging is also crucial for public health. It involves the use of different modalities to image the human body for diagnostic and treatment purposes and therefore has an important role in improving the health of all population groups (WHO, 2011). Access to these services depends on factors ranging from availability and affordability to quantity, quality, and ease of use (Shah, 2014). Where there is a lack of

access to medical imaging procedures, there is also a lack of resources in both trained and qualified staff and imaging devices (Shah, 2014).

The WHO's *World Health Statistics* reports and the Global Health Observatory data repository collect data that measure access to services in developed and developing countries (Shah, 2014). According to Mazal and Steelman (2014), as international outreach organizations continue to work toward increasing access to medical imaging services in resource-limited settings, there is also a growing demand for appropriately trained imaging professionals. Thus, the lack of access to medical imaging services directly links to the lack of access to qualified and trained individuals who can operate the technology.

The lack of an evaluation process for the webinar training program in this study had the potential to undermine the levels of access because the issue of adequately trained personnel has global ramifications. Issues regarding public health concerns, lack of access to technology, critical talent, and professional development training manifest when inadequately trained personnel are tasked with the performance of a task that they are not knowledgeable about performing (Mazal & Steelman, 2014). The dynamic efforts associated with professional development training and lifelong learning communities are important. Mazal and Steelman (2014) asserted that professional development training and lifelong learning support the idea that there is a continuum to advancement in medical imaging services.

The unequal levels of educational instruction, curricula, and resources that are available to technologists in the developed world versus the developing world have the

potential to be disrupted when evaluation of professional development programs is lacking. The educational foundation of technologists trained in the United States includes a shared knowledge background in anatomy and physiology, chemistry, physics, and mathematics. The educational foundation of technologists trained outside of the United States embodies concepts of sustainability and the ability to maintain knowledge regarding equipment maintenance and operation, skills, and other resources that support communities' health care needs (Lungren, Nguyen, Kohli, & Tahvildari, 2014; Mazal & Steelman, 2014).

Determining how to enhance training and education in radiologic technology in developing countries requires the use of volunteer technologist educators from developed countries (Mazal & Steelman, 2004); the United States and Japan, for example, can provide training and education in radiologic technology in developing countries. The lack of a strong educational basis in the foundational science areas impacts service delivery severely. For example, teaching patient positioning, radiation biology, and physics to individuals with a background in imaging is challenging enough, but teaching these concepts to individuals without the foundational sciences background is even more difficult (Mazal & Steelman, 2014).

Limited access to medical imaging services in developing nations is also an indication of the need for these services, coupled with highly skilled individuals who perform these services (Mollura et al., 2010). In response to this demand, professional organizations such as the ASRT, ISRRT, and the WHO are developing workshops, educational programs, and on-demand, internet-based learning opportunities in

collaboration with international health agencies and medical universities to meet the needs of developing countries. International radiology outreach teams have taken an active role in increasing access to medical imaging services in resource-limited settings around the world (Mollura et al., 2010; Olds, 2013). The lack of trained medical imaging professionals and the need to provide global health access and training have become evident in under resourced and under developed societies in which global health is a major concern. In addition, the scarcity of qualified personnel to operate medical imaging equipment in Latin American countries and the Caribbean is indicative of the growing demand for trained imaging professionals and the documented critical shortage of health professionals in these areas (Mazal & Steelman, 2014; Murray, Wenger, & Downes, 2010).

As the medical imaging population is increasingly becoming aware of its global stance, in diagnosis and treatment of illness, the duty to outreach to countries faced with little to no access to health care services is also growing (WHO, 2006, 2011). According to Lungren et al. (2014), organizations and institutions in the United States send approximately 6,000 international short-term missions annually to provide either health care services or education in resource-poor countries. In addition, there is increasingly disparate access to opportunities for high-quality medical imaging education (Lungren et al., 2014). One way to provide accessible, quality medical care is to provide educational and training opportunities to individuals tasked with providing specific services (Shawer, 2013; Tucker.et al., 2014; UNESCO, 2015).

Medical imaging is one of the six building blocks the WHO identifies as necessary to improve the health of individuals and populations (Shah, 2014; WHO, 2011). According to Mazal and Steelman (2014), there are challenges to developing and implementing lesson plans with content that is required to meet the training needs of technologists in resource-limited settings. The authors determined that the education and professional development of medical imaging professionals in the developed world has evolved and reflects a level of training that for individuals entering the profession is comprehensive and competent based. In contrast, some developing countries such as those in Latin American and the Caribbean nations have not established national standards for radiography education and do not have formal recognition of the profession (Mazal & Steelman, 2014).

Providing educational and professional development training programs in these countries as well as other developing nations can be a challenge. One of the purposes of this study was to investigate the development and implementation process in the context in which the webinar courses were established so that the educational and training gaps that exist in Latin American countries and the Caribbean could be bridged (Gunderman, Kang, Fraley, & Williamson, 2001; Lungren et al., 2014). This qualitative formative evaluation focuses specifically on assessing the webinar program in terms of the training and educational perspectives of adult learners.

The collaborative learning experience in training imaging professionals is quite often stressed with regard to courses in which volunteer technologists engage local technologists. For example, time limits are often a mitigating circumstance regarding

learning even when a comprehensive educational experience is feasible (Martino & Odle, 2008: Mazal & Steelman, 2014). For this very reason, the collaborative learning experience is combined with various approaches that utilize self-directed as well as problem-based learning experiences to enhance curriculum delivery methods (Martino & Odle, 2008; Mazal & Steelman, 2014).

Although volunteer technologists could be involved directly in assessing local learners, they might not be well received in their educational outreach efforts because of lack of cultural sensitivity and professional background. For the most part, many individuals in resource-limited areas are serving in the medical imaging capacity because of the country's need to fill personnel shortages. For this reason, it is imperative that designed courses be neither intrusive nor threatening while fulfilling an individuals' career advancement goals (Mazal & Steelman, 2014).

I used elements of Malcolm Knowles's adult learning theory as related to the andragogy model. This model includes the learner's self-concept, experiences, readiness to learn, orientation to learning, and motivation. Barrow's description of problem-based learning also was a part of the conceptual framework for this study (Knowles, Holton, & Swanson, 2011; Savery & Duffy, 2001)).

Definition of Terms

American Registry of Radiologic Technologists: A professional society that promotes high standards of patient care by recognizing qualified individuals in medical imaging, intervention, and radiation therapy via certifying exams and credentials (ARRT, 2015).

American Society of Radiologic Technologists: Another professional association of people working in medical imaging and radiation therapy who are involved with curriculum development, grassroots advocacy, and continuing professional development training (ASRT, 2015).

Didactic: Instruction by lectures and classes (face to face, hybrid, or online) (Gunderman et al., 2001; Taber & Thomas, 1997)

e-Learning: Electronic learning (e-Learning) is a nontraditional method that uses technology for learning. It allows for posting instructional materials online as well as using the internet to facilitate learning and interactions between students and instructors (Abrusch, Marienhagen, Böckers, & Gerhardt-Szép, 2015; Hirumi, 2013).

Image acquisition: The act of retrieving an image from plate or film cassette (Bushong, 2012)

Interest: "Interest is a learner's driving force to be engaged, encouraged or motivated to participate in a particular course of study" (Patton, 2015, 195).

International Society of Radiographers and Radiologic Technologists: The international liaison organization for medical radiation technology (ISRRT, 2015).

Medical imaging: The use of ionizing and nonionizing radiation technologies to view the human body in order to diagnose, monitor, or treat medical conditions (Haidekker, 2013)

Modality: For this study, different areas of imaging (Mosby, 2009)

Needs assessment: Needs assessment is "the process of determining the importance of a task" (Patton, 2002, 336).

Patient position: The arrangement of a person's head, trunk or limbs, skeletal anatomy, or body in order to take an x-ray (Mosby, 2009)

Problem-based learning: PBL is an instructional approach that organizes curricula around loosely structured problems that students attempt to solve by using knowledge and skills from several disciplines or subject areas Savery & Duffy, 2001).

Process/formative evaluation: Any combination of measurements obtained and judgments made before or during the implementation of materials, methods, activities, or programs to control, assure, or improve the quality of performance or delivery (Green & Lewis, 1986; McKenzie et al., 2009).

Radiography: Radiography is a process that uses x-ray techniques to view the internal parts of the body (U.S. Food and Drug Administration, 2014).

Radiologic sciences: The art and study of the use and maintenance of radiologic equipment, as well as the various modalities that produce quality imaging for therapeutic, research, or diagnostic purposes (Bushong, 2012)

RAD-AID International: An organization that started in 2008 at Johns Hopkins Medical Center as a result of the need for more radiology and imaging technology in resource-limited regions and communities. RAD-AID's mission is to help bring radiology services to developing countries and to educate those communities in order to end global health disparities (RAD-AID, n. d., para 3-4).

Radiation biology: The study of the biological effects of ionizing radiation on living systems (Bushong, 2012)

Radiation physics: The scientific discipline of applying physics to the use of ionizing radiation in therapy and in diagnostic radiology (Bushong, 2012)

Radiology-scarce zone: Any area in need of radiology services (WHO, 2011)

Significance of the Study

This study is important in that it provides an initial evaluation of distance educational and professional development courses offered in the global medical imaging community via webinars. The study is also important because it disseminates information regarding the need to educate medical imaging professionals in under-resourced geographic regions (Shah, 2014). This qualitative, formative evaluation of the webinar course program implementation and delivery process utilized evidenced-based data and identified a number of issues required to modulate program effectiveness and enhance professional development training and process planning.

Research Questions

In this project study, I evaluated the effectiveness of the webinar courses' implementation offered by an international agency in the field of medical imaging using a logic model; the overall goal was to provide the agency with data and a framework logic model to use in conducting future evaluations. The purpose of a formative evaluation was to examine various aspects of this ongoing program in the early stage of its life cycle and to make changes in its implementation as the program evolved, and I documented what transpired in the program since its inception (Wall, n.d.). The groundwork for the in-depth analysis and development of the formative evaluation of the global medical imaging webinar course program entailed interviews with program administrators

regarding the effectiveness and relevance of the webinar courses and feedback from questionnaires instructors received from participant learners. To conduct this evaluation study, I addressed two guiding questions and nine sub-questions from the perspectives of the stakeholders (instructors, learners, and administrators):

RQ1: How effectively is the webinar course program being implemented?

a. Is the webinar course program being implemented as it was designed?
b. Is the webinar course program meeting the program stakeholders' (administrators, instructors, participants) goals?
c. Are sufficient resources available for instructors to deliver the course materials and information?
d. Do the instructors go through training before they deliver the webinars?
e. Are sufficient resources available for participants to utilize course materials and information?
f. Is training available for participants on how to utilize course materials and information?

RQ2: What components of the webinar course program are working as intended?

a. Do the participants understand the webinar course program concepts?
b. Do the participants or instructors have any misconceptions about the webinar course program? If yes, what are they?
c. Have any negative outcomes surfaced since the implementation of the webinar course?

d. Have any positive outcomes surfaced since the implementation of the webinar course?

Review of the Literature

Conceptual Framework

The conceptual framework that grounded this study was problem-based adult learning. Medical educators addressed the exponential expansion of medical knowledge by formalizing problem-based learning in the 1950s and 1960s (Barrows & Tamblyn, 1980; Boud, 1985). Problem-based learning is an intertwining of theory and practice with an emphasis on the individual's responsibility for independent learning. In problem-based learning, teams help to confront problems and develop viable solutions while allowing for individual self-identification of learning gaps. In addition, within a team-based learning environment, learning is active, using relevant problems and situations that allow for group interactions (Green, 2014; Hrynchak & Batty, 2012; Savin-Baden & Howell, 2004).

Problem-based learning, adult learning, and the work of Mazal and Steelman (2014) provided insights that helped me with forming the conceptual framework model that I designed. I addressed the concepts of the model, regarding interest, needs assessment, resources, and reporting, in the literature review, as well as, Malcolm Knowles's concepts of adult learning as they relate to interest and needs. The literature review supports the conceptual framework model that I developed as it relates to program evaluation.

The following paragraphs describe the components of my conceptual model, INTEREST-PBL (Figure 1). I chose INTEREST as the acronym because it reflects why adults strive to improve their professional skills in medical imaging. In addition, INTEREST also integrates some of the rudimentary steps undertaken by educators who accepted the challenge to develop curricula and teaching materials that are interesting, appropriate, and in alignment with the needs of medical imaging professionals in resource-limited and developing countries. The acronym INTEREST refers to the following concepts:

- I (Interest): What topics are the participant learners interested in learning more about? What areas of interest are most important to the country's stakeholders?
- N (Needs assessment): What are the skill levels of the participant learners? What areas of improvement or development are the stakeholders most concerned with addressing? What is the time frame for participant learner instruction? Are there available resources?
- T (Technical development): Do the participants or stakeholders possess adequate, reliable technology that will aid in educating participants?
- E (Educate): Transfer of knowledge is now the focus and goal.
- R (Resources): Before, during, and after instruction, will there be resources available to the participants to aid in the delivery of care?
- E (Evaluate): Stakeholders evaluate the instruction after a course.
- S (Summarize): Analyze the evaluation or assessment
- T (Tell others your progress): Report the evaluation results.

All areas of INTEREST reflect the main point, which is the global education of individuals in medical imaging. However, for the scope of my study, I focused on interest, need, technical development, and resources for data collection and analysis purposes.

Problem-based learning. According to Barrows and Tamblyn (1980), problem-based learning (PBL) is characterized by (a) complex, real-world situations with no one right answer; (b) students working in teams to confront problems, identify learning gaps, and develop viable solutions; (c) gaining new information via self-directed learning; (d) staff members who facilitate learning; and (e) problems leading to the development of clinical problem-solving capabilities. PBL has evolved beyond this standard definition, however; it has expanded into a more flexible and fluid learning methodology that promotes active learning and can be classified as a multifaceted learning theory (Savin-Baden & Howell, 2004). Initially, PBL proposed that learning occurs by using problem scenarios to encourage students to engage themselves in the learning process through small groups, exploring problems and solutions (Savin-Baden & Howell, 2004).

PBL also stimulates learning and the evolution of interdisciplinary collaboration in nonthreatening environments. The social environments created and fostered as the result of knowledge acquisition are critical to developing and understanding of individual learning. In a technology-based learning environment, PBL activities that promote engagement and stimulation are vital for supporting professional development (Savery & Duffy, 2001).

As an educator in the field of medical imaging, for me, PBL involves the use of materials, scenarios, case studies, and simulation among other resources to assist the instructor in presenting not only how a problem has occurred or potentially might occur but what a learner can do to solve or fix the problem (Fowler & Wilford, 2015; McInerney & Baird, 2015). PBL is hands on and engaging. When PBL is used it not only address knowledge from the learner's point of view but it also reflects that changes that occurring as a result of the learner's quest for knowledge. PBL requires that students and instructors work together in a collaborative manner; learners bring their unique skills set and knowledge to the table to resolve a common problem. PBL not only requires the use and development of critical thinking skills but also allows a creative and reflective approach for learning to occur through problem solving (Kowalczyk, 2012; Savery & Duffy, 2001; Savin-Baden, 2006;).

Adult learning theory. Malcolm Knowles's (1970) theory of adult learning provides key theoretical framework elements that supported my formative program evaluation process. Knowles theorized that adults learn and develop their professional skills based on the following assumptions: (a) adult learners are self-motivated, (b) adult learners are responsible for their own learning, (c) adult learners need to know why they need to learn something, and (d) adult learners' experiences are not only important but also relevant in the learning process (Knowles et al., 2011).

Knowles's (1970) theory promotes self-direction and independence in the adult learner (Darden, 2014). The four assumptions serve as a roadmap in describing terms and concepts as they pertain to adult learning. The adult learning model assumes that adult

learners possess self-motivation, self-discipline, and self-determination. In addition, Knowles's theory supports the ideals of adult learners' being responsible for their own learning and having not only the ability but the desire to control their learning (Darden, 2014).

Ultimately, Knowles's adult learning model defines that adults need to know why they need to learn something before undertaking the task of learning; they feel responsible for their own decisions. The experiences adult learners have in the learning process are important in helping them to reach their goals. Hence, when adult learners are engaged in the learning process they demonstrate their commitment and their orientation to learning is relevant (Knowles et al., 2011).

Knowles's (1970) theory of adult learning also emphasizes the value of the learning process while utilizing approaches that are both collaborative and problem based. Exploring the quality of learning as it pertains to professional development courses offered in nontraditional educational settings is an alternative method used to reach beyond borders and expand the knowledge of medical imaging professionals globally. By developing and implementing alternative educational strategies for delivering information and educational materials, medical imaging educators can provide a foundation for answering important questions that might continue to be unknown (Knowles et al., 2011).

Knowles et al. (2011) explained that learning involves change, and for the adult learner, change often accompanies a desire to acquire new knowledge in an area that is of personal interest. Adult learning begins at this primary stage of inquiry or exploration. It

is at the initial point of realization that learning begins, which is a direct correlation with the first assumption of Knowles's theory, which is the need to know.

In the field of medical imaging, promoting, developing, and delivering material in a learning environment that meets the needs of the learner is important. Medical imaging is not unique in the sense that most professionals teach students, educate patients and their families, and educate other staff members at some point in their careers (Hand, 2006). For the most part, however, learning is spontaneous; it is simply a part of one's way of living. As such, learning becomes a part of an individual's persona. The phenomenon in which learning takes places is the impetus that drives individuals to seek knowledge for the sake of knowledge (Hand, 2006).

Knowles (1970) influenced the clinical world in that he addressed motivation as a key factor in the development of the adult learner. For Knowles, motivation is one of the driving forces as to why an adult seeks to teach (Clapper, 2010; Knowles et al., 2011). There are fundamental attributes and components of the instructional process to accomplish initially in providing professional development training courses; in particular, the process should provide a means by which learners become aware of significant experiences. A potential discovery of research in the field of adult learning in medical imaging professional development potentially is that an adult learner's experiences could prompt a self-evaluation, which would translate into holistic experiences, and it is in this realm that adult education takes place. Knowles et al. (2011) explained that experience, student needs, interest, and subject matter are relevant to home, community, and

employment. These are the building blocks for designed, implemented, and delivered professional development courses.

Conceptual Model: INTEREST-PBL

The theory of problem-based adult learning grounds this study. I designed this conceptual model using two theories along with integrating my interpretation of Mazal and Steelman's (2014) information on global professional development in under-resourced regions. The model is a graphical depiction of the areas described in detail in the following sections. I offer supporting arguments from the literature, that I reviewed, for each conceptual area that reflects its importance in this study.

The conceptual model provides a visual interpretation of how I conducted my research for this project. The study here begins with a framework and ends with a report of outcomes, and the framework I utilized included an analysis of the collected data; the key areas of programmatic evaluation are highlighted. My conceptual framework model, presented in Figure 1, guided, framed, and presented the proposed research design. The following sections explore the pertinent literature in the field of medical imaging education and formative programmatic evaluation, using the model as the guide.

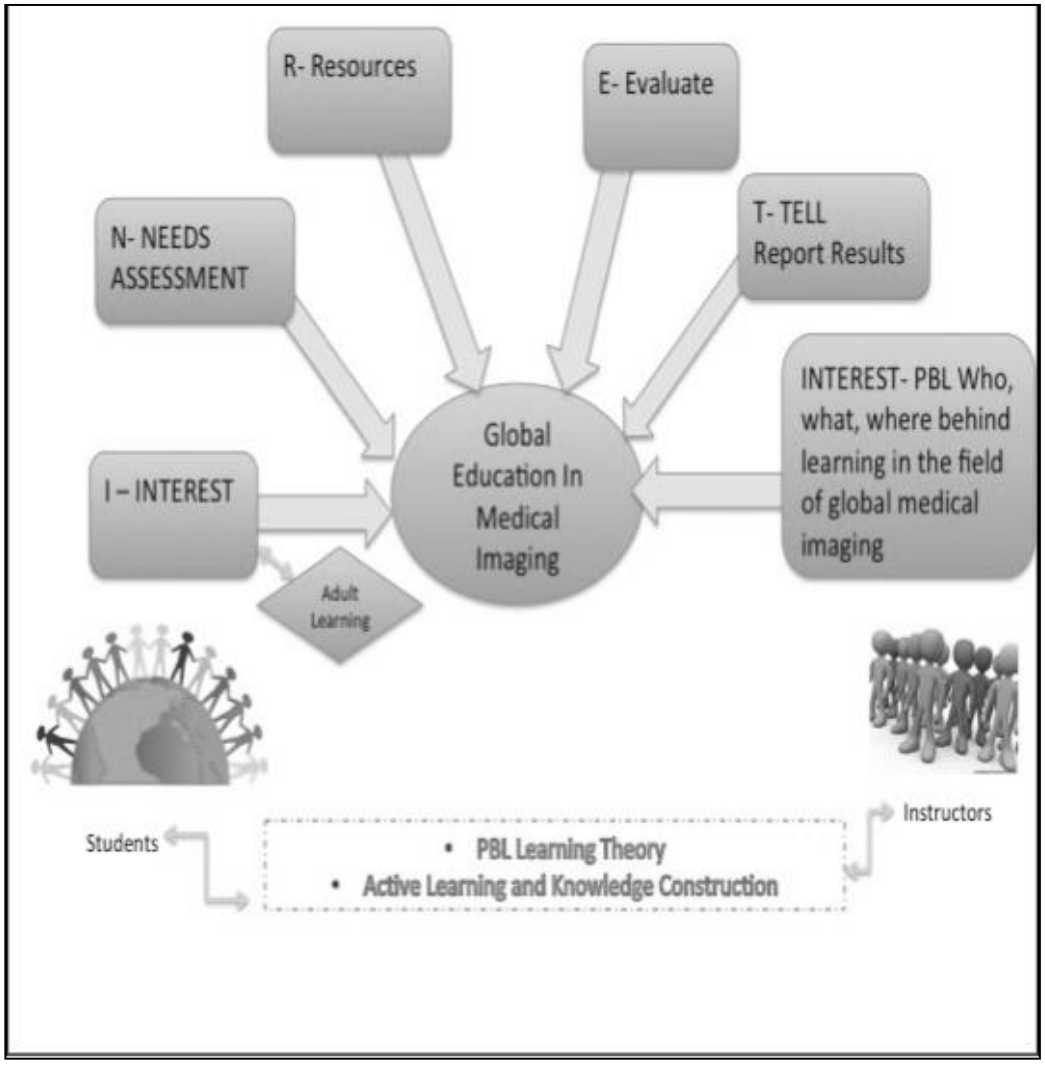

Figure 1: INTEREST-PBL conceptual model. Adapted from *The modern practice of adult education: Andragogy versus pedagogy*, by M.S. Knowles, 1970, New York: Associated Press and *Problem based learning: An approach to medical education* by H. Barrows & R. Tamblyn, New York: Springer.

In Knowles's (1970) adult learning theory, a learner's desire to participate in a course is an integral part of a needs assessment. This concept relates to what Knowles defined as the motivation behind why an adult learner seeks to learn (Knowles et al.,

2011). This concept is also what Mazal and Steelman (2014) alluded to in their work regarding the driving forces behind international learners' desire to take part in learning programs. A program could seem threatening when instructors and individuals from outside regions introduce and attempt to implement standardized methods for performance. Yet a program can be rewarding if learners see value regarding the potential for career advancement once they complete a course.

The concept of interest, in turn, leads to the next concept in the conceptual model, which is needs assessment. Conducting a needs assessment provides essential data for learners, the instructors, and program administrators. A needs assessment also aids in determining what type of course students should complete (Cekada, 2010). Exploring the availability of resources and the importance of each type, quantity, and quality of resources is a component in program evaluation that I addressed in my study; however, for the purposes of this study, resources included only human resources and available web-based learning technology. For human resources, I explored critical talents, skill sets, and what these elements meat to the delivery of the courses and the accessibility of educators, and technology. The term human resources also referred to individuals' skill sets (Cekada, 2010). I discussed what resources were available to the stakeholder, relative to what was necessary to develop and enhance skills as required for the professional development training courses.

The concept in the model that I explored next is evaluation, and evaluation was important because this was the purpose of this study. Using standards established in radiologic technology education programs in the United States, I employed a visual

program evaluation logic model, as well as the principles behind the theoretical framework of problem-based learning, as a source of guidance (Allen, Donhan, & Bernhardt, 2011; Boud, 1985; Clouston, Westcott, & Whitcombe, 2010; Savery & Duffy, 2001). The literature that I reviewed grounded the purposes of formative programmatic evaluation. I ended the literature review on INTEREST by presenting results, which allowed me to view the courses in proper context and allowed for suggestions regarding improvements needed. In the conclusion of the literature review, I grounded the conceptual model's concepts by integrating adult learning theory and problem-based learning with a review of literature that was appropriate for professional development training programs (Altin, Tebest, Kautz-Freimuth, Redaelli, & Tock, 2014; McInerney & Baird, 2015; Spaulding, 2014).

Review of the Broader Problem

Using the libraries of Walden University and California State University, Northridge, I conducted a literature search in medical imaging and radiologic technology with a focus on topics related to eLearning, professional development training, problem-based learning, and formative program evaluation. Research regarding formative evaluation and its practical use yielded 28 studies in a key word search. However, the search produced only six studies on evaluating medical imaging or radiologic technology programs (Patton, 2015). I then restricted the review restricted to focusing on the use of formative eLearning and professional development training evaluations. Specifically, I used the following key terms: *program evaluation*, *formative evaluation*, *training programs*, *radiologic technology education*, *radiologic sciences*, *professional*

development, *health promotion and implementation*, *adult learning principles*, and *problem-based learning in medical education*.

Additionally, the search included only peer-reviewed journal articles, dissertations, and books published between 2009 and 2016 within the following databases: Academic Search Complete, CINAHL, Education Research Complete, ERIC, EBSCO, PubMed, and ProQuest. I then performed an additional search to find literature from 2012 to 2016 related to the conceptual framework model, including *interest*, *needs assessment*, *resources*, and *reporting in formative evaluations*. I included books on global health imaging, designing, implementing, and evaluating health promotion programs, program evaluation, qualitative research methods, problem-based learning, and adult learning theory in the literature review, and they provided valuable background and contextual information. All salient information and sources regarding the use of electronic learning and technology in the field of global medical imaging education published within the time period of 2009 to 2016 located in this search is in this literature review.

Radiologic Technology Education Program Evaluation

Radiologic technology educational programs in the United States, accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT), are required to perform and submit peer-review self-study program evaluations (2014). For programs to receive JRCERT accreditation, program directors not only have to undertake the arduous task of performing an extensive self-study, they also have to participate in a site visit by their peers.

The peer reviewers examine documents; assess program operations, procedures, and processes; assess staff accountability measures; and provide feedback on the documents the program directors provide. During site visits, the peer reviewers inspect the learning environment and interview students, faculty, administrators, and community members to holistically evaluate the program according to the established standards. Participation in this process is not mandatory, and programs elect to receive JRCERT accreditation (JRCERT, 2014), although it should be noted that program directors in the United States who do seek JRCERT accreditation have to use the JRCERT standards to establish and maintain the curricula of their programs (Bugg, 1997; JRCERT, 2014; Martino & Odle, 2008; Saunders-Russell, 2016).

Radiologic science program directors do not have to make public any of their evaluation documents. However, directors of JRCERT-accredited programs have to monitor their performance measures and make public the results of the measures. Data required include documentation of board pass rates, employment, retention, and graduation; the availability of resources is also a part of the documentation (JRCERT, 2014). Publishing performance measures and results serves as a way of not only being transparent but at the same time also promoting good will in the community (JRCERT, 2014).

Although it would have been ideal to include a program evaluation in the literature review, program evaluation documents are confidential and are not available for public inspection or reviews. The processes and the standards by which program directors perform their self-study program evaluations, however, are open for public inspection

and review. This aspect of the evaluation process for this project study is in the area of program evaluation in the field of medical imaging. Programs that are awarded JRCERT accreditation have met or exceeded the established standards and promote excellence in education (JRCERT, 2014; Saunders-Russell, 2016).

JRCERT (2014) established standards to assist program directors with maintaining and meeting program missions and goals. Six standards address the following objectives: (a) integrity, (b) resources, (c) curriculum and academic practices, (d) health and safety, (e) assessment, and (f) institutional/programmatic data. These standards require program directors to articulate program purposes and to show that the program has human, physical, and financial resources to accomplish those purposes. The program directors also use the standards to document the effectiveness of the program and to demonstrate that it can continue to meet accreditation standards via self-study and peer site visit evaluations (JRCERT, 2014; Saunders-Russell, 2016).

Accreditation is a voluntary process. Applicants submit a request for a peer site visit at least one year prior to the scheduled visit, and within six months of the application request, the program director submits for external peer review the self-study of the program. The self-study is a report that includes the established standards as a measure to guide the review and to serve as a protocol for program staff to reflect on the program curriculum and student outcomes. Afterward, the site visit occurs and reports follow that the visitation committee and disseminate to the applicant programs. The reports include documentation outlining any strengths or weaknesses the reviewers noted during the review of the self-study documents and the site visit. Based on the findings from the

reviews, the reviewers make recommendations. The governing body then makes the decision and informs the program of its accreditation status (Jimenez, Borras, Fleitas, 2006; JRCERT, 2014; Saunders-Russell, 2016). Figure 2 outlines the JRCERT accreditation cycle.

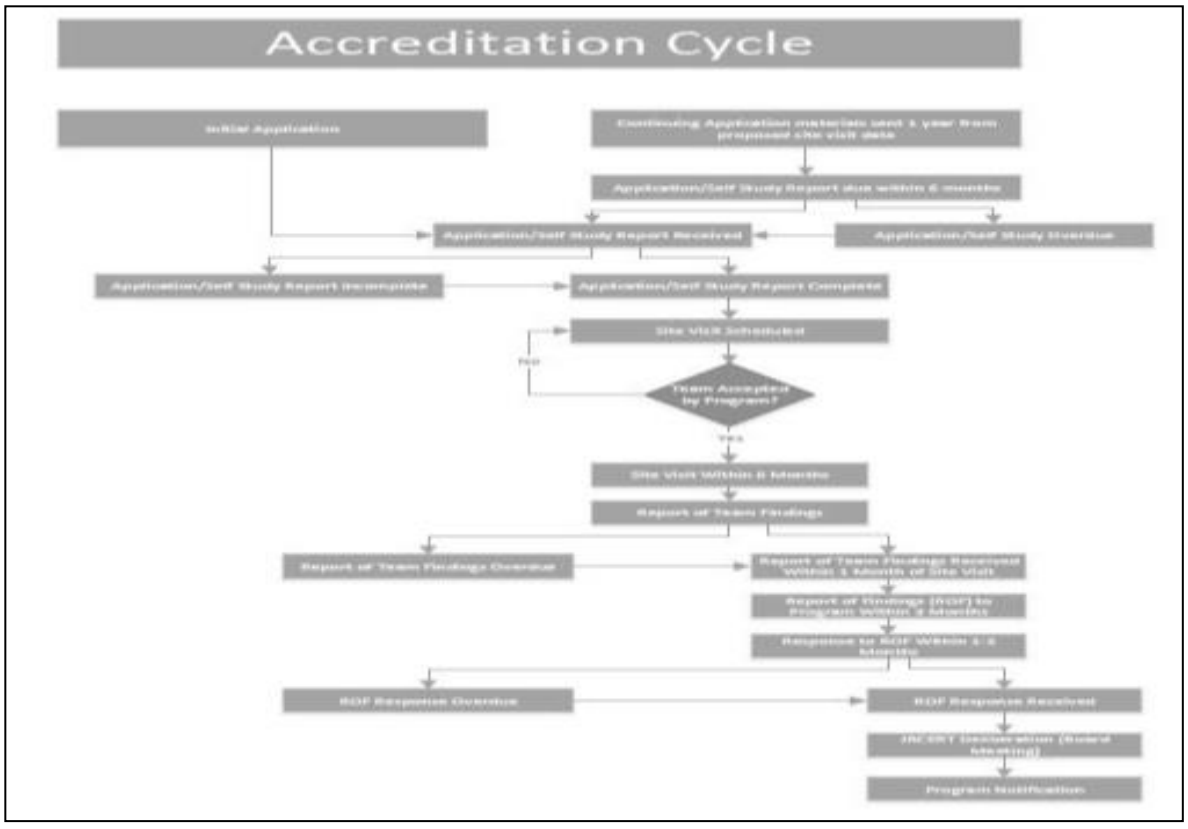

Figure 2: Joint Review Committee in Education in Radiologic Technology accreditation process cycle. Reprinted with permission by JRCERT (2014)

This process of programmatic evaluation, both self-guided and peer guided, was important for specific reasons. The process was important because the coordinators of the international program desired to have the program accredited in the same manner as the programs in the United States. In addition, program evaluation is one element that defines the accreditation process (Saunders-Russell, 2016; Shawer, 2013); when a

program director makes the decision to seek accreditation, the director makes the decision to undertake the task of exposing documents, processes, and procedures of the program for scrutiny in an effort to improve the effectiveness and outcomes of the program (Bugg, 1997; JRCERT, 2014). The use of the JRCERT standards to guide the evaluation process is a required part of the evaluation process. These standards serve as the preeminent guide for documenting and articulating the overall strengths, weaknesses, opportunities, and threats that a program might encounter within a specific period (JRCERT, 2014). Thus, a program director exposes a program to critical analytical review as well as approval and disparagement during the accreditation process.

As such, program evaluation and accreditation can be similar processes. However, a difference is that whereas an accreditation process is more comprehensive, covering all aspects of the institution in which the program resides, the program evaluation focuses on one program within the institution (Jimenez, Borras, & Fleitas, 2006; JRCERT, 2014; Saunders-Russell, 2016). Its purpose then provides the foundation for distinguishing the effective elements within the educational paradigm. As it relates to this evaluation study, my evaluation examined the effective elements of within the field of radiologic sciences education. Determining the strengths and weaknesses of the program formed the basis for establishing sound educational programs in the field of medical imaging. By performing and conducting research in the field of program evaluation, in which established industry standards and external peer site visit evaluations serve as best practices, the possibility of improving the educational experiences of the learners was possible (Bogdan & Biklen,

2011; Cockbain, Blyth, Bovill, Morss, 2009; Shenge, 2014). Further research within this area could only enhance the future of the field and continue to demonstrate relevance.

Needs Assessment in Educational and Training Program Evaluation

Knowledge and identified and prioritized skills are necessary (McKenzie et al., 2009). This process refers to a needs assessment, and it is the most critical step in planning, implementing, and evaluating a program (Cekada, 2010; Glazebrook, Chater, & Graham, 2001; Saunders-Russell, 2016). A needs assessment provides objective data necessary to establish program priorities as well as provides a baseline for evaluating a program (Cekada, 2010). Needs assessments serve as roadmaps for the direction programs will follow in their design and implementation (Glazebrook et al., 2001). For the purposes of this project study, I discussed literature that reflected the importance of performing a needs assessment in training programs.

A needs assessment conducted prior to establishing a training program often reveals what type of program design is necessary (Cekada, 2010). In addition, the process of collecting data to determine what type of training is needed could help organizations to establish and deliver the proper courses (Cekada, 2010). Conducting a needs assessment could ensure that training programs offered is not over- or underdeveloped and that key concepts are the focus of the learning experience. It is understood that not all problems can be solved within any one training program but that by implementing training toward improving the level of knowledge that exists, progress toward a goal can be assured (Cekada, 2010; Nuebrander, 2012; Saunders-Russell, 2016).

When thinking of how needs assessment is essential in diagnostic imaging training, it is necessary to explain the purpose of diagnostic imaging to establish an understanding of the focus of the evaluation. Diagnostic imaging plays an important role not only in identifying pathology and tracking the progression of a disease but also in preventing disease by its use as a screening tool (Haidekker, 2013; Kowalczyk, 2012; Mazal & Steelman, 2014; Saunders-Russell, 2016).

A report from the WHO (2011) reflected a lack of access to medical imaging technology and the lack of access to critical talent. Understanding the purposes of a program, with regard to results from needs assessment, is helpful in guiding the evaluation process. Evaluation allows for constructing and defining the goals and direction of a program (Saunders-Russell, 2016). According to Frye and Hemmer (2012), in any medical educational program, the evaluation retrieves data based on trainees' or participants' assessments so that program administrators can make sound and evidentiary decisions regarding the content, delivery, and intent of the program. The data collected from participants then contribute to the overall review, analysis, and judgment of the program evaluation for monitoring and improving the quality and effectiveness of the program (Frye & Hemmer, 2012). Essentially, what program administrators attempt to identify through evaluations, with regard to interest or needs, are the program's sources of variation or outcomes that are desirable and undesirable (Saunders-Russell, 2016).

An educational program is not static but rather dynamic, and the evaluation process should reflect this (Frye & Hemmer, 2012; Saunders-Russell, 2016). A needs assessment indicates what program planners can expect; it is a systematic, planned

collection of knowledge that can provide valuable information regarding the interest, attitude, perceptions, and motivations of individuals or groups within a given socioeconomic environment (McKenzie et al., 2009; Saunders-Russell, 2016). In other words, a needs assessment relates to what interests or motivates an individual or groups to seek training in a particular subject. It can also pinpoint areas of a program that need strengthening, continuing, or eliminating. With this type of acquired knowledge, effective program planning, implementing, and evaluating can be performed (Saunders-Russell, 2016).

In formative evaluations, a needs assessment can aid an instructor in determining if students are acquiring knowledge and if the intended course goals are being met (McKenzie et al., 2009; Saunders-Russell, 2016). The same needs assessment can help program developers identify whether standards have been exceeded or met or if they need improvement. Needs assessments can identify disconnections between what is taught and what is tested or omissions in course content, instructors' preparation for teaching specific concepts and skills, or instructional resources and learning materials (Saunders-Russell, 2016).

In an online learning environment, performing a needs assessment is even more important. In the online environment, adaptations to instruction and learning occur. The complexity of instruction in the 21st century requires curricula meet the needs of the workforce, give attention to strategies that balance traditional versus innovative assessment strategies, and provide more accurate representations of student gains in terms of knowledge and skills. A needs assessment performed in this context identifies,

analyzes, and prioritizes the needs of the intended population (McKenzie et al., 2009; Saunders-Russell, 2016; Vonderwell & Boboc, 2013).

Needs assessments promote active learning by providing the guidance program developers desire to forge a close match between the areas of needs participants identify and the knowledge, concepts, and skills the training program offers (Saunders-Russell, 2016; Vonderwell & Boboc, 2013;). Active learning in this evaluation study accommodated participants' different learning styles, preferences, needs, and interests. Simultaneously, self-assessment, peer assessment, collaborative work, and project-based learning became the focus of instruction. Needs assessment, therefore, ultimately promotes interest. Needs and interest are two very important factors in evaluating programs in relation to appropriateness, content delivery, and learner satisfaction (Saunders-Russell, 2016; Vonderwell & Boboc, 2013).

Resources. RAD-AID (2015), an international organization, indicated that a focal point of health disparity that can break the chain in providing health care can occur when there is a gap in radiology resources. In addition, RAD-AID reported that radiology resources involve several aspects, including human resources, examinations, and equipment (Azene, 2014; Saunders-Russell, 2016). For the purposes of this project study, the focus of resources was limited to human resources and what is required to deliver the webinar courses as far as technology and educational materials are concerned. For example, a research study that focused on the supply and demand of radiographers in Lithuania was conducted in 2012 (Vanckaviciene, Starkiene, & Macijauskiene, 2014). The aim of that study was to analyze the need and demand for radiographers and to

provide a prognosis for the time period of 2012–2030.

The study revealed a gap forming between the need for human resources in relation to the need for services, equipment, and examinations. Findings from the study predicted a shortfall of radiographers during the 18 years analyzed, with a significant expected shortfall to be reached by 2030 (Vanckaviciene et al., 2014). The researchers looked at several factors in making these determinations such as student acceptance, entrance, retention, and attrition rates, annual mortality rates, retirement rates, population demands by age and gender, and needs for outpatient services. These needs included computed tomography and magnetic resonance imaging. What this study supplied was tantamount in the form of data, which supported the increasing demand to supply resources for the future workforce. Areas considered as viable and plausible solutions to address the impending gap were identified in education (Vanckaviciene et al., 2014).

In medical education, the challenge continues to be to develop, implement, and evaluate strategies for incorporating the use of e-technologies and e-Learning into the medical curriculum in developing countries. E-learning refers to the use of internet technologies to enhance knowledge and performance. The use of e-Learning in medical education has increased; therefore, research in this area since 2000 has focused on the efficacy and effectiveness of this educational intervention (Ruiz, Minter, & Leipzig, 2006). Literature on human resources in developing countries regarding medical imaging has been limited (Saunders-Russell, 2016). Attention to curriculum development for medical schools is increasing regarding radiology and medical imaging.

Webb, Naeger, McNulty, and Straus (2015) conducted a needs assessment study that focused on standardized medical imaging curricula. Medical school deans and chairs reported that there is a need for more overall radiology content. The results of the study indicated that there is only one published medical school radiology curriculum available via the Alliance of Medical Educators in Radiology. The study authors concluded that there is a need for additional content, and additional instructional materials, but there are very few resources available to guide educators in content delivery. However, what Webb et al. (2015) identified as an area for consideration for improvement was establishing a standard curriculum for instruction in radiology to combat the lack of available resources.

In 2015, UNESCO identified the need to develop a skilled workforce in low-resource countries in the areas of technical and vocational education and training and outlined a method for transforming unskilled workforces into skilled ones. In addition to identifying the need to train and educate, UNESCO also noted that technology advances play an integral role in the sustainability and economic growth of underdeveloped, low-resource countries. UNESCO recognized that education and the creation of a highly skilled workforce could lead to the development of sustainable communities. In order to develop sustainable communities, education should include critical thinking, problem solving, and decision-making attributes, which can be acquired through participating in one's education and integrating technology in the learning process (UNESCO, 2015). Given the complex nature of radiologic technology and the need to develop and maintain a skilled and competent workforce, the sustainability of an educational and training

program in the field of medical imaging is demonstrative of the importance of sustainability (Mollura et al., 2010).

Program Evaluation

Program evaluation should provide data covering the topics of interest and needs. Resources should be included so that evaluation of the content is attainable and deliverable (Frye & Hemmer, 2012). In addition, program evaluation encourages one to examine the operations of a program, its activities, and the staff members who conduct the program activities. This process of evaluation demonstrates whether or not a program followed its own implementation protocols (CDC, 2011). In medical education, program evaluation is essential. Understanding theoretical and conceptual models pertaining to and relating to common evaluation models is essential to informed evaluation choices in any medical education program (Frye & Hemmer, 2012).

The primary purpose of performing a formative program evaluation is to look for potential changes that could improve the overall effectiveness of the program. According to Frye and Hemmer (2012), the educational aim that dictates a program evaluation should include both intended and unintended changes associated with the program. An educational program itself is rarely static, so an evaluation plan must be designed to feed information back into the program to guide continuing developments (Frye & Hemmer, 2012). Thus, the program evaluation becomes an integral part of the educational change process (Frye & Hemmer, 2012).

Formative or process evaluation can be used to explain why programs succeed or fail and to indicate whether there are characteristics or mechanisms involved in

implementing the program that potentially mediate or moderate outcome (Patton, 2015; Wilson et al., 2009). It is important to evaluate the implementation process in a training program. Formative evaluations can provide data as part of ongoing monitoring and quality assessment to maximize program performance. An open-minded approach to program evaluation is required to foster and develop the concepts associated with educational change and programmatic development. This open-minded approach is essential to improving medical educational programs in place (Frye & Hemmer, 2012).

In a review of traditional and new thinking approaches to implementation research, Stetler et al. (2006) described how the Department of Veteran Affairs integrated formative evaluation into its implementation program design. Evaluations of training programs serve as a means to ensure that the originally designed intervention is being conducted in a manner that is consistent with the intended goals and plan. In action-oriented improvement programs, for instance, summative data are important but may not be sufficient for analyzing data to determine if a chosen strategy worked within the scope of a programmatic change.

Despite the importance of performing formative evaluations in a timely manner, outcome analyses frequently are conducted without assessments of program implementation (Stetler et al., 2006). According to Wilson et al. (2009), this occurrence often is referred to as the *black box* approach to evaluation. This approach means that the outcomes of a program occurred without an examination of its internal operation. With this type of evaluation practice, there persists a sense of ambiguity regarding the meaning and scope of the process. For example, even in reference to naming the type of

evaluation, including process evaluation, formative evaluation, and formative research, evidence reflects a lack of a cohesive reference point.

Reporting. The final stage of an evaluation is reporting the results and findings (Patton, 2015). When conducting a formative evaluation for possible program improvement, a written report may not always be the result; the results could be an oral report to the organization as well. Truncated results could be available, given in an outline form, or even presented as an executive summary, if cost constraints are present. In addition, the manner in which the results are reported can relate to the personal nature of the relationship between the evaluator and the organization (Patton, 2002). In whatever manner the results derive, the results are most likely to reflect the nature of the relationship between the evaluator and the subject audience and the results of analyzing the data that were collected (Patton, 2002).

Program evaluation should cover relevant topics related to resources, technology, and evaluation methods (. The researcher's ultimate goal should be reporting the results to the communities of interest and stakeholders. According to Dal Poz et al. (2015), there is a growing demand for program developers in developing countries to construct and implement programs for managing and planning human resources in health.

This study demonstrated the importance of reporting evaluation results. To begin with, an identification of the crisis in the global health workforce prompted the study (Mazal & Steelman, 2014; Olds, 2014; WHO, 2011). This crisis was characterized by a shortage of professionals, inadequate skills mix, and an unequal distribution of professionals. PAHO and the Institute of Social Medicine, State University of Rio de

Janeiro conducted an evaluation of programs in 15 Latin American and Caribbean countries: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama in Central America, the Dominican Republic in the Caribbean, Chile, Colombia, Ecuador, and Peru in the Andean subregion, and Argentina, Paraguay, and Uruguay in the South Cone.

Developing collaborative strategies in the Americas included (a) gathering information about developing human resources for health programs; (b) supporting decision-making in the formulation, implementation, or modification of health policies; and (c) expanding and maintaining a workforce able to support primary health care (Dal Poz et al., 2015; Olds, 2014; Shawer, 2013). The joint PAHO and Institute of Social Medicine, and State University of Rio de Janeiro programmatic evaluation reflected an effort of both academic research and the development and application of an advocacy tool. The evaluation process itself reflected the challenges the two organizations faced, as well as allowing for the exchange and dissemination of practices, interventions, and programs available in the region (Dal Poz et al., 2015; Shawer, 2013). The program evaluation that was produced and reported to the public provided insight as a shared lesson that reflected the importance of carefully planning program implementations and interventions (Dal Poz et al., 2015; Olds, 2014). Program evaluations at this level demonstrate the importance of being able to not only assess the resources but also to determine the importance of identifying resources and reporting evaluation methods.

Educating medical imagers in Latin American and Caribbean countries was the impetus behind the development and implementation of the webinar courses that were the

target of this formative evaluation. Developing sound and effective educational programs that focus on the global dissemination of knowledge could ameliorate the problem regarding the absence of formative evaluations of courses (Azene, 2014; Culp, 2014; Lungren et al., 2014; Mazal & Steelman, 2014; Olds, 2014). Providing the courses as part of professional development is one way to address the lack of qualified competent workers. Developing webinar courses in collaboration with universities and international agencies is another means of addressing this public health concern.

Potentially developing a standardized method for evaluating global webinar courses could also address the problem that this project study addressed. A formative program evaluation could possibly provide the agency a process for measuring and determining outcomes and goals. Medical imaging is one of the many allied health professions that requires competence in the performance of profession-specific tasks (ARRT,2016; JRCERT, 2014). As such, it was important to be able to not only determine if a medical imager had attained the necessary skill level with which to perform this task but to also be able to continue to develop and improve on the particular skill set over time. For this formative program evaluation study to be useful, it needed to close the gap between the delivery of courses via webinars and the desired outcomes by focusing on specific elements, including justification, evidence, resources, participant satisfaction, and accountability, during the evaluation process. A formative evaluation could provide stakeholders with the data needed to close the gap between participants' knowledge and performance levels and the desired program outcomes (Hancock & Brundage, 2010).

Implications

Several implications for possible directions relate to this formative program evaluation of the webinar courses offered by the international agency. To begin with, the evaluation had the potential to provide the agency with valuable insight into establishing formal goals and objectives for the webinar course program. In addition, this study provided a blueprint to guide future evaluation activities. The potential to make presentations, to write short articles, to provide lectures on global imaging curriculum development, to offer webinar professional development courses, and to conduct formative evaluation on a global spectrum were avenues available via the conduction and completion of this project study. In addition, this study had the potential to assist other individuals interested in addressing global imaging issues and concerns to advance research in this area.

Once I completed the study, the findings were available to strengthen projects geared toward developing a standardized global imaging professional development evaluation process that addresses the utilization of webinar technology. Findings are useful for increasing research involvement in the field of global imaging education via an evaluation report, a curriculum plan, or even a position paper for policy recommendations.

Summary

The focus of this study was to address the effectiveness as well as the quality of a webinar program relative to content, implementation, and delivery. Literature regarding formative evaluation and the importance of its performance is presented in Section 1 in

order to provide a foundation and context for this study. A conceptual framework model designed and based on Knowles's (1970) adult learning theory, problem-based learning, the work of Mazal and Steelman (2014), and the concepts of needs assessment, evaluation, resources, and reporting in the areas of formative evaluation were useful in identifying evidence to support and frame the formative evaluation in professional development webinar courses for medical imaging. The desired outcomes of this work were to:

- Provide background on developing and implementing the webinar courses to the international agency stakeholders and provide evidence in support of the courses
- Answer the guiding research questions using data collection and analysis
- Describe the context in which the courses were designed and explain how this related to the formative evaluation
- Support via a literature review the concepts related to the framework and conceptual model that were used in the research design and methodology

Section 2: The Methodology

Introduction

An evaluation is best defined as "the systematic investigation of the value, importance, or significance of something or someone along defined dimensions" (Yarborough, Shulha, Hopson, & Caruthers, 2011, p. 287). Although an evaluation can take place during any point in the life cycle of a program, a formative evaluation's purpose is to determine if program implementation occurred according to plan, whether benefits of the program reached the participants, and whether the participants had an opportunity to provide feedback and input. Beyond the scope of this study, it was unknown how the agency used the reported information. However, the purpose of this doctoral study was to provide the agency with an external peer review of its program to support and develop future evaluations.

Research Design and Approach

Qualitative inquiry is about capturing, appreciating, and making sense of diverse perspectives (Patton, 2015). In June 2012, this international agency embarked on an ongoing project to improve and increase the performance of medical imaging personnel in Latin American and Caribbean countries during radiologic examinations. For this particular project, the agency embarked on a global learning platform that involved development and implementing professional development courses to address gaps identified in the training and performance of medical imaging personnel after on-site radiology readiness assessments (Azene, 2014). The purpose of this doctoral study was to

evaluate the agency's efforts and determine the effectiveness of the implementation and delivery of the webinar courses in the field of medical imaging.

A formative evaluation using a qualitative design was the best method for this project study because it allowed for the stakeholders to provide input into whether or not the implementation of the webinar courses program met the specific goals and outcomes of the sponsoring agency. A qualitative study research design works best when a researcher attempts to understand how participants' experiences influence a program in addition to understanding the impact of the research problems and research questions (Andres, 2012; Creswell, 2012). I also used a case study strategy of inquiry based on exploring in depth a program, event, activity, or process bounded by time and activity as part of the research design (Creswell, 2009). Via the use of both a formative evaluation and a case study research design, I could conduct the evaluation while the program was in progress as well as use a small number of participants for data collection.

Qualitative research can be in the form of a case study (Merriam & Tisdell, 2016). A qualitative case study is an in-depth description and analysis of a bounded system. It is an empirical inquiry that investigates a contemporary phenomenon within its real-life context (Merriam & Tisdell, 2016). This research undertaking was a qualitative study that focused on examining the effectiveness of a program's implementation within a specific group; therefore, the use of any other method to perform this study would have been inadequate. A qualitative, formative program evaluation allowed for the ongoing collection of data used to improve the program at any given point in time; the agency used the evaluation feedback received to elicit changes in practice (Alkin, 2013; Bowen,

2009). In addition, a qualitative design was also the best method to use because it provided the agency with immediate feedback to frame future program evaluations because no evaluation of any kind had occurred since the initial program implementation (Hall et al., 2014). Critical questions regarding the feasibility of implementation strategies, real-time implementation, participants' responses, and flexibility were necessary in order to provide formative feedback that could elicit change (Merriam & Tisdell, 2016; Stetler et al, 2006).

The best method to conduct this qualitative research design study required the use of a flexible path for data collection that allowed for findings and recommendations to be formulated that tied indirectly to any formal goals or objectives (Spaulding, 2008). The data derived from in-depth semi-structured interviews with program administrators and online open-ended questionnaire responses from webinar participant learners and webinar instructors who followed this exact path.

I created the interview questions as well as the questionnaire items using the guiding research questions and sub-questions as my guide. I structured the questions around the categories in my INTEREST–PBL conceptual framework model and Knowles's adult learning theory. I then transcribed and simultaneously analyzed the data via a thematic coding process and compiled the data in a visual presentation for dissemination to the stakeholders.

Participants

The purpose of formative evaluation is to "improve a policy or program as it is being implemented," and the purpose of action research is to "understand and solve a

specific problem as quickly as possible" (Patton, 2015, p. 248). A researcher must state with clarity the purpose and the primary audience for an intended study because no single study can provide all the answers to the various questions that research addresses. For my project study, the audience was very specific, medical imaging professionals from at least 35 Latin American and Caribbean countries who participated in webinar courses offered by the agency. Participants were either program administrators, instructors, or students. As such, my sample selection strategy for this case study was purposeful sampling.

Seven participants completed either an interview or a questionnaire. The minimum predetermined desired number was 15 participants; however, as the data collection portion of the study progressed, acquiring a minimum of 15 purposefully sampled participants became difficult and the data that were being collected were beginning to be redundant. As the collection of data unfolded, the approach of this research study reflected that of a case study. A bounded system, the webinar course program, became the focal point for study (Merriam & Tisdell, 2016). However, because it was predetermined that a minimum number of participants needed to be involved in this study, snowball sampling was then added in an effort to increase the pool of participants, although this was abandoned. The snowball strategy involved asking key participants to refer other participants to engage in the study (Merriam & Tisdell, 2016).

In Latin American cultures, for a research study to be successful, it is important that participants develop and have a personal relationship with the researcher. Given the short time frame and the requirement to maintain participant confidentiality, efforts to increase the participant pool outside of those mentioned were not explored (George,

Duran, & Norris, 2014). Purposeful sampling is a strategy that focuses on intent as opposed to representation or randomness (Patton, 1990). Given the nature and level of the technological resources available in the under-resourced countries; establishing personal relationship; and the political climate due to the presidential election in the United States, I deemed seven purposefully sampled participants sufficient for the data collection.

The use of purposeful sampling to gather information was the best method for participant selection because it allowed for selecting participants who were information rich and could provide the most significant background data on the study topic in the given time period (Lodico, Spaulding, & Voegtle, 2010; Merriam & Tisdell, 2015). In addition, this participant sampling method was the most useful for gathering information pertinent to the effectiveness of the webinar course program's implementation (McNamara, 2009.). In purposeful sampling, the size of the sample results from utilizing informational considerations (Merriam & Tisdell, 2016; Patton, 2015).

I analyzed the interviews and questionnaires simultaneously during the data collection stage. Interviewing is one of the preferred methods of data analysis in qualitative research (Merriam & Tisdell, 2016). While a predetermined minimum number of participants was desired, the information received from the seven participants resulted in overlap and was redundant. Thus, I made the decision to conclude the data collection and analysis with just the seven participants because common themes emerged with regard to question responses, and redundancy was established (Merriam & Tisdell, 2016).

The intent of qualitative research is to obtain an in-depth understanding of either a concept or activity (Centers for Disease Control [CDC], 2011; Mack, Woodsong,

MacQueen, Guest, & Namey, 2005; Merriam & Tisdell, 2016; Patton, 2015). The overall purpose of my study was to determine the effectiveness of the program's implementation based on the perspectives of its stakeholders, and thus, a small sample from which data could be collected and summarized was most appropriate and was standard for a case study research design. This action was determined based on the understanding that a formative assessment on effectiveness and the use of a small sample size were useful in gathering feedback regarding implementing the program (Boston, 2002; Hagstrom, 2006).

In the end, I was able to secure consent and responses from two program administrators, three participant students, and two instructors. This study was a formative evaluation, and the purpose of the study was to examine the effectiveness of the implementation process; therefore, the input from seven participants at this stage had to suffice. With a small sample size, data saturation was reached by collecting and analyzing the data simultaneously. Sandelowski (1995) pointed out that "Determining adequate sample size in qualitative research is ultimately a matter of judgement and experience" and that researchers need to evaluate the quality of the information collected in light of its uses, and the research method, sampling, and analytical strategy employed.

The scope of this project was to examine the effectiveness of the implementation process and not of the webinar courses themselves. Purposeful random sampling is a preferred design in qualitative research because it is representative of concerned populations, but it was impossible to ask for random participants for this study. To be able to capture participants from a cultural background, purposeful sampling was best; it

gave credibility to a qualitative formative evaluation focused on the effectiveness of the implementation (Merriam & Tisdell, 2016; Patton, 2015). Purposeful sampling in this study was useful because it accommodated the small sample size, enabled me to avoid controversy about potential selection bias, and allowed me to conduct the study in the time frame allotted and within the scope of the limited research resources.

In qualitative research, a misconception about sampling is that numbers are unimportant in ensuring adequacy (Patton, 2015; Sandelowski, 1995). What is of importance to this project study was that the unit of analysis that characterized the study was a bounded system, as Merriam and Tisdell (2016) described. Purposeful sampling yielded the target group of this study by identifying who took part in the webinar program. The audience and focus for this study were very intentional, and therefore, using random selection to generate a list of participants would not have provided the information I needed for the study because the participants who had the knowledge I needed for the evaluation could have been omitted. Instead, Patton (2015) stated that purposefully selecting the participants enables researchers to select those individuals who are rich in knowledge and experience about the subject under study.

After obtaining IRB approval from Walden University and approval from the bioethics committee of the agency, I solicited for the interviews five participants who had administrative duties and titles; I was able to secure consent and actively interview two participants with administrative duties related to this particular project. I recorded the interviews using Zoom, a video and web conferencing service, and employed a dominant approach to protecting respondent confidentiality and anonymity. The dominant approach

required that I collect, analyze, and report on data without compromising the identities of the respondents and by not disclosing information that potentially could allow someone to identify the agency or any of its participants (Kaiser, 2009; Sieber, 1992).

In qualitative research, the goal of collecting and presenting data without compromising or causing harm to participants is important and is upheld by the Belmont report (Office for Human Research Protections, 1979), which places emphasis on beneficence. According to Baez (2002),

> The convention of confidentiality is the dominant approach way in which a researcher ensures complete confidentiality for every participant as well as the way a researcher protects research participants from harm. The aim of the convention of confidentiality in this study was to build trust and rapport amongst study participants, maintain high ethical standards, and preserve the integrity of the research process (p.4).

I asked the director of the agency to assist me in contacting the participants in the webinar courses and inviting them to participate in this study. Using Survey Monkey and its email collector function ensured participants' anonymity and confidentiality; the email collector function allowed for providing a link for respondents to reply. The designed questionnaires asked participants to respond anonymously and contained a disclosure statement that if the participants did decide to respond, their responses would be anonymous. This information was also presented in detail on the informed consent form (Appendix C).

The agency established relationships with the ministries of health and persons involved directly in the educational development of the participants; information that identified participants did not appear in the documents to ensure anonymity. As part of the administration participant pool, I sought input from two key administrators, the program director, and the agency director. These two individuals had primary functions regarding program budgets, development, and implementation and were able to provide valuable data regarding the goals of the agency. I was unable to obtain input from three other administrators in the agency because, no one else had a role in the development, implementation, and decision- making process for the webinar courses. The two participants I was able to secure to participate had a vested interest in the results of this study because they could gain insights about the strengths and weaknesses within the program content and implementation process.

I was also able to secure three participants who volunteered to either teach webinar courses or present the on-site workshops, including completing a questionnaire or an online interview. In addition, I secured input from at least two participants from the agency's 35 member countries; these participants had completed the webinar courses. I was able to collect data from each group, albeit small, that generated answers to my guiding research questions. Table 1 provides a profile of the participants.

Table 1

Profile of Participants

Participants	Position	Type of Organization
P1	Administrator	Affiliated NGO
P2	Administrator	Affiliated NGO
P3	Medical Imaging Professional	Latin American and Caribbean
P4	Medical Imaging Professional	Latin American and Caribbean
P5	Medical Imaging Professional	Latin American and Caribbean
P6	Instructor	Affiliated NGO
P7	Instructor	Affiliated NGO

Again, only after gaining approval from the IRB of Walden University and approval from the bioethics committee of the agency, I sent emails to the intended participants inviting them to participate in the study. The email included my introduction, explained the purpose of the study, and outlined how participants could contact me to ask questions regarding participating or discontinuing their participation. The email also provided the prospective participants information about how to contact Walden University and the bioethics committee of the agency.

The email explained any potential dangers of participating in this study as well as explained that participation in this study was voluntary, confidential, and anonymous. The email also disclosed that I acted as a volunteer instructor for one of the webinar courses, Trauma Radiography, and would eliminate any student who was in my class. The email further explained that I was not an employee of the agency and that the reason for this study was to complete the requirements for my doctoral degree in adult education. I informed participants that there was no monetary compensation for this

study, that no funding from any governmental agencies applied to this study, and that the study was strictly for increasing the knowledge base in the field of global medical imaging professional development education. I was not an employee of the agency; therefore, I did not have access to the participant lists, program documentation, or contact information. As such, it was imperative for my data collection and analysis process that I engage assistance from the agency administration to obtain a list of participants to contact.

Criteria for Selecting Participants

The administrators of the international agency began in 2012 to offer professional development webinar courses to medical imaging professionals in 35 Latin American and Caribbean countries. The program administrators were beneficial in assisting me with initiating contact with participants because the participant population for this study was very specific. The administrators maintained a database that included participant and instructor contact information including email addresses. The administrators were able to share this information with me once I achieved approval from the Walden University IRB and the bioethics committee of the agency. Conducting research with individuals in Latin American and Caribbean countries required establishing personal relationships in conjunction with the agency and the program administrators. Therefore, individuals who participated in the webinar courses either as an instructor or learner received letters of invitation to participate in this study, and I engaged with the potential candidate pool via an email initiated by the administrator of the program.

Gaining Access to Participants

The program administrators initially had to ask the various ministers of health if it would be possible to initiate contact with participant learners prior to my sending emails to the potential participant pool; therefore, I had to wait for response from the agency. After I received approval, the agency administrators informed me that I could begin the process of contacting via email the participant learners. Gaining access to the instructors was easier because the list of potential instructor participants reflected that the instructors were from the United States, and many were part of educational programs located in the United States. I solicited participation for interviews from administrators with the international agency via emails and telephone correspondence.

Once I received a response from the administrators, I forwarded the informed consent email for completion. After receiving consent from the administrators, I scheduled individual interview dates and times. The audio-recorded interviews were possible through the use of Zoom web conferencing. I transcribed the interview recordings and forwarded them to the appropriate person for member checking and approval. Regarding the online questionnaires, potential participants and instructors received emailed invitations to participate in the study, and the email invitation included the informed consent information. I sent out email invitations every two weeks for two months to both groups. Four participants responded, with only three completing the questionnaire in its entirety, and four instructors consented to participate; however, only two responded to all items on the questionnaire. The overall response rate for completing the online questionnaires was 28%, and the overall response rate for the entire study was

33%. Given this low response rate and the time frame necessary to complete this study, and in an effort to secure as much data as possible, I sent a final email to the list of participants with an additional request that they forward the email to other individuals who attended the webinars. The final email request asked for individuals to please consider participating in the study. After this final attempt yielded no additional responses, I closed the online surveys so I could begin data analysis. Although the response rate for the overall study was low, given that the nature of this study was to evaluate an implementation process for effectiveness, the information I received from the responses was valuable for addressing questions regarding quality.

Compliance with Requirements of the Agency for Use of Human Research Subjects

Protecting the participants entailed a thorough process of steps. I first had to complete an application with the agency's bioethics committee. The function of this committee was to ensure that participants were treated in the most ethical manner possible. The requirement of the agency was that an interdisciplinary group of professionals review all research proposals, select observer entities, and employ a Secretariat housed by the regional program of bioethics. This review process ensured that any research with human subjects would measure their responses to specific interventions ethically so that results could potentially be beneficial to society. This review process was also to ensure that the research study would include sound methodologies in accord with beneficence, justice, and respect for persons. Additionally, I completed the National Institute of Health training within the past six months to ensure compliance.

Data Collection

Justification for Qualitative Design

I conducted qualitative interviews and used questionnaires because a qualitative design was best for answering the research questions regarding the effectiveness of the program's implementation. In Latin American and Caribbean cultures, conducting research requires developing personal relationships (Aperian Global, 2017; George, et al., 2014). If individuals do not trust the researcher, collecting data is difficult (Aperian Global, 2017; Kingsley, Phillips, Townsend, & Henderson-Wilson, 2010; Shenton, 2004). Personal introductions as well as encouragement were necessary from the program administrator in order for participants to agree to participate because my study required input on the effectiveness of the implementation process. I attempted to obtain as many participants for the study as possible. The snowballing approach to sampling increased the response rate. I contacted 21 potential participants, administrators, instructors, and learners, and seven agreed to participate in the study, a response rate of 33%. A qualitative case study research design was most beneficial for this type of study because it allowed me to build relationships and use various formats such as internet interviews and online questionnaires.

I conducted the evaluation with a focus on disseminating effective principles, and capturing contextual interpretations and adaptations while assessing the effects and consequences of the program (Patton, 2015; Spaulding, 2014). This type of qualitative evaluation inquiry was most appropriate for this type of project; the process generated principles-based adaptations from data collected from interviews, observations, and case

study documentation (Patton, 2015). Qualitative inquiry utilized a personal perspective as part of the data collection process (Mason, 2010). Additionally, it provided a holistic overview of the data analysis process while serving as an indicator for an outcomes-based evaluation (Patton, 2015). This type of inquiry is one of the useful, best practice standards because it enabled me to study whether the implementation of a program and its later operational design produced desired outcomes. It is, however, important to note that when a programmatic evaluation is performed, and there is no information regarding how the program was implemented, the information regarding observed outcomes seldom provides a course of action for the decision makers (Mertens & Wilson, 2012; Patton, 2015).

In my study, the problem was the professional development program's lack of any form of evaluative assessment measures, and this absence of assessment contributed to ambiguity in implementation. However, a qualitative inquiry approach was appropriate because (a) the process depicts what happened and how people engaged with each other; (b) I documented the experiences of the webinar participant learners; (c) I explored the idea of the process being fluid and dynamic; and (d) I documented the acknowledgment that the process itself may very well be the outcome (Patton, 2015; Spaulding, 2014).

In conducting formative evaluations, researchers utilize interviews, observation, and questionnaires to collect data (MacPherson & McKie, 2010). In this project study, I utilized recorded interviews and online questionnaires to assess the development and implementation of the webinar program and to determine if the instructional design was effective (MacPherson & McKie, 2010). By using this data collection methodology, I

was able to examine both formal activities and anticipated outcomes as well as informal patterns and unanticipated interactions. The data generated revealed that there were many gaps in the initial implementation process and that although efforts to recover from these gaps had been attempted, ongoing evaluation of the program's implementation using clearly defined goals was paramount for the continuation and success of this program.

Clarifying and understanding the participant learners' experiences with the webinar course program was essential. The ability to incorporate the points of view of the stakeholders (instructors, learners, and administrators) to facilitate an understanding of the program's operation was required (Mack et al., 2005). My objective was to illustrate that this type of qualitative study would aid the program administrators and designers in developing programmatic goals based on the stakeholders' interest, needs, and resources, with information to aid in the program's current design process, function, and implementation.

Since the program's inception in 2012, no type of evaluation had occurred whether formative or summative; this project study was the first programmatic evaluation geared at examining the implementation and delivery of the course material. The essence of programmatic evaluation is collecting data to determine the worth or value of a program (Spaulding, 2014). Data can be collected at various intervals and times during the program evaluation process to address specific program needs (Spaulding, 2014). It was therefore important to ensure that the data I collected were relevant and pertinent.

The best practice methodology for this study was a formative evaluation as opposed to a summative evaluation, which would have centered on a data collection

process that reported how the program performed in a given time frame. A formative evaluation allowed for data to be gathered in the short time frame of this project in a more informal manner. Data collection was focused and limited to the use of interview questions to help make improvements to the program and not focused on summarizing the outcomes or experiences (Fowler & Wilford, 2014; Spaulding, 2014).

In addition, I determined that a summative program evaluation was not appropriate at this stage of the evaluation process because (a) the program, since its implementation, had had no evaluation and no published goals with benchmark performance and (b) the agency director did not know if the implementation process was successful because of the sporadic delivery of courses. A formative evaluation provided feedback that was focused on the learner, constructive, situational, and timely.

Different types of evaluation (formative, process, impact, and outcome) can occur, and each is necessary at different stages within the development and implementation of a program (Lobo, Petrich, & Burns, 2014; Patton, 2014; Spaulding, 2014). However, formative evaluation was the most useful choice because it provided the foundation to inform program development and improvement because the agency had not yet evaluated the webinar training course program. In conducting this study, I focused on the formative or process type of evaluation, using the two concepts interchangeably.

In actuality, a qualitative research design integrated into a formative program evaluation allows for the systematic collection of information that is not only descriptive in nature but also focused on the activities, characteristics, and results of a program that can be used to improve or further develop the program's effectiveness (Patton, 2015).

Patton added that a research design of this magnitude can shape future programming, increase understanding, and enrich participant experiences. In addition, a qualitative research design assists in promoting knowledge that is beneficial for improving public health and lives (Brandon & Ah Sam, 2014; Goodyear, Jewiss, Usinger, & Barela, 2014; Nutley, Powell, & Davies, 2013; Schorr, 2012).

A qualitative inquiry with descriptive questions generated data regarding the webinar courses as they pertained to the interest, needs, resources, assessment, and applicability to the participant's employment. I conducted and recorded the semi-structured open-ended online conversational interviews as part of the data collection. Using Zoom, a web and video conferencing platform, I recorded the interviews without video; by omitting the use of video recording, I was able to ensure confidentiality as well as anonymity for the participants. As the interviews continued, the administrators elaborated on their responses and expanded on the information they wanted to include in the conversation. I was using a semi-structured interview; therefore, a list of pre-established questions did not follow the list. The interviews were more conversational, and in my opinion, I was able to capture more information than if I had adhered to a prescribed and structured method. Open-ended interview questions were original; I generated them using the guiding and sub-research questions. The questions I designed allowed flexibility in the interview process. Afterward, I transcribed the interviews, redacting any personal identifiers and then asked the participants to review the transcribed notes, using member checking as a means to validate the results. When I received approval from the administrators that the transcriptions were acceptable, I

uploaded the transcriptions into the MAXQDA software for indexing, using INTEREST-PBL to aid in the typology coding. I looked for common themes associated with motivation, problem-based learning, needs assessment, resources, evaluation, and reporting.

I used an online questionnaire to collect data from the instructors and the participants; this tool focused on gathering pertinent data to each group's role in the implementation and delivery of the webinar program. The questionnaire was original, and I used Survey Monkey with open-ended questions to solicit responses regarding the guiding research questions as they pertained to interest, motivation, quality of instruction, retention, and use of material learned or instructed (Mack et al., 2005). I uploaded the results from the questionnaire into MAXQDA and recorded my observations in the software, following the same typology method used for the interviews. I paid attention to indexing key words, phrases, topics, and themes that reflected the topics in the guiding questions. I looked for common themes and interactions that alluded to participants' motivations, desires, and interest as well as their ability to apply or advance their knowledge because of their participation in the webinar courses to develop categories of relevance (Cockbain, Blyth, Bovill, & Morss, 2008).

I noted if participants self-reported their skills level and made note of any omissions and limitations to this information. Additionally, careful review of all the material followed simultaneously within the MAXQDA software with the data I received from the program administrators' interviews. Simultaneous analysis occurred with the

purpose of looking for common themes in alignment with my evaluation objectives, which included my guiding research questions.

Data Collections Instruments

My data collection instruments were the questionnaires the instructors and participants completed and the interview questionnaire I developed for the administrators, utilizing Survey Monkey. These documents aided in collecting data from the three stakeholder groups: administration, instructors, and participants. No program records existed to assist me with providing a behind-the-scenes look at the program process and implementation; the program had no record of evaluation data. Therefore, the basis for stimulating the interview and questionnaire inquiries derived from documenting the outputs of the activities included in the implementation. Careful consideration included determining whether or not including information from the interviews in the final document would breach confidentiality before publication (Nutley, Powell, & Davies, 2013). As an added measure to ensure accuracy of reporting and to ensure that confidentiality would not breeched, all interviews were submitted for member checking once transcribed (Patton, 2014; Spaulding, 2014).

Data Collection Instrument Development

I used the following eight open-ended interview questions to collect my data (see Appendix D). Each set of questions included the specific audience related to the data desired. The questions allowed for flexibility in probing stakeholders, engaging with them, and encouraging them to elaborate on their answers. This process of collecting data derived from Mack et al.'s (2005) methodology.

1. What areas of interest from the medical imaging field are most important to the countries served? What areas do you perceive as being the most needed for training? How is the need determined? (RQ1 SQA/RQ2 SQ A/B)
2. Are you aware of any Latin American or Caribbean countries using university online programs in the United States for medical imaging training qualifications? If yes, what are they? Are you aware of any Latin American or Caribbean countries using nongovernmental online training programs? If yes, what are they? Are you using these programs to help model your webinar course program? If yes, what are they? What aspects of those programs' design are you using to help implement your program? (RQ1/RQ2)
3. Are the goals for the webinar course program made available to interested parties? If yes, how? (RQ1 SQB/RQ2 SQA)
4. What results do you expect from implementing the webinar course program? (RQ1 SQ A/B /RQ2 SQ A/C/D)
5. If problems arise in webinar implementation, how do you address them? (RQ2 SQ B/C)
6. At the end of each webinar, do the participants and/or instructors evaluate course delivery? If yes, are these evaluation data shared with you? At the end of each webinar, do the participants and/or instructors evaluate course materials? If yes, are these evaluation data shared with you? If you receive evaluation results, do you share the results with the participants and/or instructors? (RQ1 SQA/B/C RQ2 SQ B/C/D)

7. Before, during, and after a webinar, do you make resources or training available for the instructors to aid in delivery of instruction? If yes, what are they? Before, during, and after a webinar do you make resources or training available for the instructors to aid delivery of course materials? If yes, what are they? (RQ1 SQ C)
8. Before, during, and after a webinar, what resources do you make available to the participants to aid in their delivery of care regarding x-rays? If yes, what are they? (RQ1 SQ C)

All interview questions aligned to specific research question and sub-questions. In turn, the questions followed a nine-step process program evaluation model by Janet E. Wall (n.d.) while also incorporating the area of focus from the INTEREST-PBL framework model. Within this model, attributes and methodological examples assisted me in formulating the guiding evaluation questions as well as questions used in the data collection process. The nine steps are (a) define the purpose and scope of the evaluation, (b) specify the evaluation questions (What do you want to know?), (c) specify the evaluation design, (d) create the data collection plan, (e) collect data, (f) analyze data, (g) document findings, (h) disseminate findings, and provide feedback for program improvement.

Formative evaluations provide process information that can potentially illustrate the progress of an implementation (Harachi, Abbott, Catalano, Haggerty, & Fleming, 1999; Hulscher, et al, 2002; Ingleton, Field, & Clark, 1998;). The use of formative program evaluation data supported collaboration between evaluators and program

managers. It is the process of thoughtfully considering and reconsidering how program and evaluation design elements function and relate to each other (Hall et al., 2014; Roulston, 2014).

I analyzed the data while I collected the information and looked for common themes. Analyzing data in qualitative research is one of the very few aspects that typically happen in a preferred manner (Merriam & Tisdell, 2016). By analyzing the data during collection, the purposeful sampling of participants allowed me, as the researcher, to concentrate on what the problem was, which focused on the lack of any evaluation regarding implementation and delivery (Hatani, 2015; Merriam & Tisdell, 2016). Analysis was an ongoing process. I was able to interpret the data collected, while indexing the data, using a cross-case thematic analysis scheme found in the methodology literature (Hall et al., 2014; Merriam & Tisdell, 2016). Bogdan and Biklen (2011) suggested that data analyzed while collected would be most helpful if the following 10 suggestions were followed:

- Make decisions that narrow the study.
- Make decisions concerning the type of study you want to accomplish.
- Develop analytic questions.
- Plan data collection sessions according to what you find in previous observations.
- Write comments as you go.
- Write memos to yourself about what you are learning.
- Try out ideas and themes on participants.

- Explore the literature while you are in the field.
- Play with metaphors, analogies, and concepts.
- Use visual devices.

Once the data were collected, I organized the data using visuals, so that the findings could be analyzed via coding and categorization. I used MAXQDA qualitative data analysis software. MAXQDA is a commercial software program that allows for data to be imported from interviews and other means for organization of material into groups. In addition, this software helped me develop codes. I then simultaneously analyzed the results, looking for commonalities among the program administrators, student participants, and volunteer instructors. This method of analysis allowed for the results of the data collected to be interpreted in a holistic manner and in the context within which they had been collected. In addition, I described the categories used in coding and how the themes and categories connected. The analysis includes visualizations that summarized the results and utilizes a hierarchy amongst the categories.

Formative evaluation is process oriented; therefore, the analysis of the data must be unbiased and reflective and potentially aid in closing the gap between the guiding research questions and the potential outcomes addressed (Merriam & Tisdell, 2016; Spaulding, 2014). By analyzing the data collected from all the groups simultaneously, I believe I was able to remove biases and focus on repetition of themes.

Limitations

Identifiable limitations of this evaluation were the lack of access to documentation available for research purposes, the length of time of the program, the

number of courses offered, the number of participants, the geographic locations of participants, political climates, and the data, which the agency administrator did not collect. In addition, because I was conducting a formative evaluation 12 years after implementation, there were limitations associated with the research design, including methodological changes associated with the small sample size, the short follow-up period, and the necessity to interpret results in relation to implementation and preserve objectivity (Agency for Healthcare Research and Quality [AHRQ], 2013).

In addition, the field of radiologic technology is not as advanced as other allied health professions in the use of e-Learning materials and technology to train radiographers; however, it is an area of study that is garnering research and implementation (Gunderman et al., 2001). As an evaluation of the implementation of webinar courses to an international audience was the focus of this project study, there was a possibility that this study could impact only a small percentage of individuals. I made assumptions regarding the degree to which I would be allowed access to internal documents and interactions with participants and instructors to provide an analysis to the stakeholders that would assist them with further development of this program. The small number of persons who agreed to participate as well as the documentation on who had participated in the courses were limitations. These types of factors occurred in the reviewed literature (AHRQ, 2013; Fowler & Wilford, 2015; Gunderman et al., 2001).

As a researcher, an educator, and a medical imaging professional, I felt it imperative to ensure that professional development courses fulfill a purpose that increases value in the workplace. As such, my bias with regard to collecting data and then

evaluating a program such as this were evidence of my education background and familiarity with programs, professional development courses and seminars, programmatic evaluation, and accreditation in the United States. In global imaging education, I had to remind myself that the role of a medical imager in Latin America or the Caribbean could exceed my scope of practice limitations and the practice standards that banded me professionally in the United States (ASRT, 2016).

Data Analysis Results

This project involved conducting an evaluation of the effectiveness of the implementation and delivery of a webinar-based course program for medical imaging professionals in Latin America and the Caribbean. The data were gathered from the viewpoints of three stakeholder groups, program administrators, instructors, and medical imaging learners. By codifying the results from the interviews and questions, I could systematize the data for aggregation, grouping, regrouping, and linking to consolidate meaning and explanation. There were two guiding research questions and nine sub-questions to qualify the results. The two guiding questions were:

RQ1: How effectively is the webinar course program being implemented?

RQ2: What components of the webinar course program are working as intended?

Presentation of the data results was best managed using tables, charts, graphs, and other visual depictions as the data were analyzed simultaneously. This method of presentation allowed stakeholders to visualize the impact the webinar courses had on all three groups in a non-convoluted manner. In addition, this method allowed for the data

results to be easily interpreted by stakeholders with limited English proficiency (Muir, 2005; Saldana, 2008; Shenton, 2004).

Figure 3 provides a breakdown of the lexical word search and codes by frequency; the codes I used were based on my INTEREST-PBL model and focused on the concepts of interest, needs, technical development, education, evaluation, and resources. I developed additional codes as patterns began to emerge among the groups regarding implementation, areas of strength and weakness, and opportunities for improvement. Figure 3 outlines the frequencies of the data keys words and concepts that were repeated among all the participants in the study.

Code System		#
Code System		171
	Which course(s) did you participate in and why did you particip	0
	Training Outcomes	0
	JRCERT Accrediation	1
	Testing used to evaluate content not program	1
	Problem	3
	Challenge	1
	Evaluation	2
	Misconceptions	1
	Resources	2
	Results	3
	Implementation Model	4
	Program Model	2
	Other programs	2
	Evaluation	1
	Resources	1
	Training	5
	Access	2
	Need	3
	Goals	5
	Facilitate	1
	Well, worked with the presenters and helping them understand ho	0
	superficial structures,	1
	millennial goals the biggest emphasis is then on decreasing mat	1
	Important	6
	Interest	9
	Knowledge increase	1
	positive outcomes	17
	negative outcomes	29
	misconceptions	25
	YELLOW	4
	Training	21
	MAGENTA	4
	Effective	13

Figure 3. MAXQDA Codices ordered by frequency

In the coding and analysis process, I was able to perform queries of coded passages and document where particular codes co-occurred, overlapped, appeared in a sequence, or were in proximity to each other. I was able to do this type of query and to retrieve, filter, group, link, and compare actions. These actions then made possible making connections, identifying patterns and relationships, interpreting, and building theory with the data (Silver & Lewins, 2007, p. 13). Figure 4 illustrates the possible

interrelationships among the coded data; the varying sizes of the squares within the matrix indicate the relative frequency of the matches. The code relations browser shows how I was able to infer, make connections, identify patterns, and show relationships as I coded and analyzed the data so that I could interpret and identify the gaps in practice and use the responses to correlate the connections to the INTEREST-PBL model.

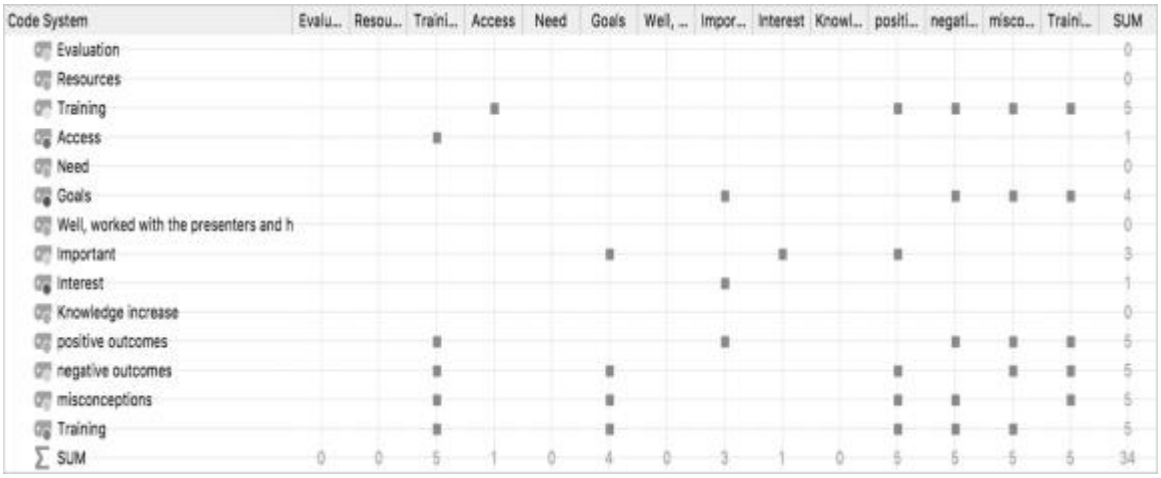

Figure 4. The MAXQDA code matrix browser

Figure 5. The MAXQDA code relationship browser

The code relationship browser presented in Figure 5 demonstrates the relationship between the codes among the administrators, instructors, and students. This matrix

represents the number of intersections that appeared between two codes and between the participants in the study. Upon further analysis of the codes, I could compare them as they related to INTEREST-PBL. If the data from each document reflected similar codes, I determined that a correlation existed within a given segment; if there were multiple codes within a given segment, then I inferred another correlation. This manner of evaluating correlations between the data sets to further determine similarities or differences within responses helped me to determine areas in which the webinar program showed strength and opportunities for improvement as well as the areas in which there were noted weaknesses and threats. Presenting the results of the data in this manner engaged the stakeholders and the organization invested in this program. Above all, a visual presentation of the data ensured transparency and the inclusion of stakeholders who could not speak English.

Response results RQ1. Research question 1 was directed towards evaluating the efficacy of the webinar courses in totality. Its six sub-questions focused on the implementation process and knowledge of goals and determined if the participants had access to course materials, information, and training on how to effectively use the course environment. All participants responded positively to questions in this area. Participants and instructors mainly focused on course content as opposed to course implementation and delivery. Participants and instructors were unclear of the overall goal of the webinar course program, but all expressed clear knowledge regarding the goals of their individual courses. The negative outcomes presented themselves in the area regarding the overall goals of the program and the intention of the course; all participants reported a lack of

clarity regarding the overarching goal of the webinar course program, and the administrators thought this area could improve. In spite of the lack of clarity regarding the goal of the program itself, all participants expressed positivity regarding the manner in which the courses were accessible, their delivery, and the availability of materials.

According to the program administrators, the webinars were designed and implemented based on the formats and structures of continuing education courses offered via webinars in the United States. One administrator confirmed that instructors openly discussed what resources they needed prior to course dates. In addition, instructors and administrators conducted dry runs of the courses to ensure that the instructors were prepared and familiar with the webinar atmosphere; the dry runs were also used to assess any technological concerns.

Recommendation #1. In order to ensure that all stakeholders have a clear understanding about the purpose and intention of the webinar course program, I recommended that program mission, vision, goals, and objectives be developed and published. To fulfill this recommendation, the mission of the webinar course program should be established and a set of goals and outcomes vetted with the agency. The mission, goals, and outcomes should then be published and readily made available, to ensure transparency and clarify the purpose of the program.

In addition, I recommended that goals and outcomes for the learners in individual webinar courses be established, aligned to the goals of the course program, and subsequently published. This process will ensure that instructors are aware of the importance of aligning course materials and educational pedagogy with the program's

goals. Learners should be assured of the goals of the courses they are taking and what learning outcomes they should expect on course completion. I also suggested that instructors be required to supply lesson plans that include objectives and goals for the intended subject that are in alignment with the goals of the program and also ensure that all stakeholders are aware of the main program goals.

Second, I recommended that implementing the webinar courses should follow a systematic outline and calendar, with an implementation checklist incorporated into the process. Program administrators would then be able to evaluate the process and delivery of content. Incorporating a resource checklist prior to delivery could also alert the program administrators if resources are insufficient to meet the needs of the course. An online training manual should be made available for all stakeholders for immediate reference. To ensure that all participants are prepared and able to access the course, a pre-webinar readiness assessment survey should be sent to participants.

In addition, all instructors should attend a documented training session with the agency regardless of familiarity with the system; this can be conducted online. A notification of training completion should be set up to alert the agency, the instructor, and the learners that the course is ready for participation. This alert should also contain the required resources. These recommendations would ensure that the implementation of the webinar courses is adequate and that the courses are being implemented as designed. In addition, these recommendations would ensure that the technical webinar functions are working as intended.

To determine if the webinar course program, as a whole and independently is effective, a questionnaire should be embedded within each course for participants to complete at the conclusion of the session. The questionnaire should be short but should cover all of the required content areas. By collecting this information immediately at the conclusion of a session, administrators can evaluate and assess the program and immediately determine areas for improvement.

Response Results RQ2. Research question 2 and its four sub-questions were concerned with the functioning of the webinar course program to address areas of strength, weakness, and opportunity. I used the results of the data gathered from this question to provide agency stakeholders with an opportunity to show participants, institutions, and societies who they are, why they exist, and what services they deliver; this insight derived from Shawer (2012). A thorough analysis of the data collected for RQ2 had the potential to influence the performance of the program and enhance the stakeholder's professional development (Shawer, 2012; Shenge, 2014).

Again, the stakeholders responded on the individual webinar courses in which they participated and not on the webinar course program as a whole. With regard to whether the components of the program were working as intended, all parties were positive in their responses regarding the level of instruction, information being presented, and the manner in which the individual courses were delivered. Administrators and instructors commented that the areas for improvement generally were limited to the skills and knowledge levels of the learners. Another area in which improvement was noted was related to the use of the resources provided by the program administrators; they noted that

while training materials and manuals were available to instructors and participants for the webinar course system, many of the participants did not access the guides. Sample comments by participants were "Yes. I explained the need to educate techs on specific common routine protocols" and "Goals and objectives stated prior to lecture (in PowerPoint) and also provided to the agency."

Conclusion

This evaluation provided the program directors and administration with data regarding implementing the webinar professional development courses. From this study, the agency administrators acquired a conceptual framework model—INTEREST PBL—that they could use to conduct subsequent evaluations of the program. Similarly, the agency administrators received information to further construct and develop goals and objectives to be embedded within the webinar program. As I collected and analyzed the data from the agency administrators, I emphasized the importance of performing a formative evaluation early in a program's implementation.

I asked questions and sought answers from the stakeholders (administration, instructors, and participants) that were demonstrative and grounded within the theoretical framework of problem-based and adult learning. I planned and documented the questions carefully and systematically in an effort to demonstrate the nature and results of the webinar course program implementation. I also documented the outcomes in a manner that was not only of value but also of significance in designing and developing future webinar course programs in an effort to provide the agency with the data required to create and maintain a sustainable program as well as to help document the impact of the

program. The guiding research questions in this study were valuable to the program; I validated their significance with regard to the program's sustainability.

Questions that address the interest, needs, resources, and assessment process are indicative of the learning process (Cockbain et al., 2009). The goal of this study was to provide the international agency with data and possibly a framework model with which future evaluations could be conducted. In the next section, I discuss the project, an evaluation report, in detail. The problem of the project and the results of the program evaluation will be outlined and discussed. The last section of this paper provides reflections and possible directions for a project of this magnitude.

Section 3: The Project

Introduction

In 2012, an international public health organization began to offer webinar courses, following hands-on training workshops, to medical imaging professionals in 35 Latin American and Caribbean countries. The purpose of this study was to assist the agency by performing an external peer review of the effectiveness of the implementation and delivery of the webinar course program. The CDC framework for program evaluation in public health served as a model in my developing my conceptual framework model, INTEREST-PBL. The webinar course program was housed within the confines of an international public health organization.

Therefore, it was most appropriate to ensure that the evaluation process mimicked a strategy that stakeholders understood how to use. The context within which public health programs operate is complex and ever changing. Program evaluations are essential for addressing questions regarding programs' effectiveness over their life cycles (CDC, 2011). The contribution of this study to the field is that it acknowledges and incorporates the differences in values and perspectives from the beginning while addressing questions and concerns in order to produce results for a varied audience (CDC, 2011).

Rationale

Fournier (2005) defined evaluation as an applied inquiry process for collecting and synthesizing evidence that provides conclusions and recommendations about the state, value, effectiveness, or quality of a program, product, or plan. The conclusions and recommendations made in the evaluation encompass both empirical and normative

aspects. My reasoning for performing a program evaluation as my doctoral project was that as a volunteer instructor for the webinar program and a university professor, I was interested in how my particular course was delivered, what measures the administrators used to assess my course regarding my delivery, and if the participants found my particular course helpful.

What I learned when I inquired with the agency regarding this information was that there were no mechanisms in place to gather this information, nor had they ever gathered this type of information. As such, I inquired if it was possible for me to assist the agency with improving the overall delivery and effectiveness of the webinar course program via an evidence-based, best practice program evaluation. The program, since its inception in 2012, had never been evaluated, and thus, a formative evaluation was important because of its potential to serve as the benchmark for future programmatic evaluations.

Separately, I was interested in understanding the history behind the development and implementation of the program as well as understanding if the participants and instructors found their participation to be valuable. At the completion of my evaluation, I made recommendations to the agency that, if implemented, had the potential to increase the value and impact of the program and reinforce the importance of a global learning platform focused on eradicating health disparities related to diagnostic medical imaging. Any other possible research outcomes, such as a curriculum plan, professional development plan, or policy recommendation would have been inappropriate for this type of research study.

Review of the Literature

The literature review for this section of the project focused on topics related to interpreting the collected data, associated findings, and recommendations. Using Walden University and California State University, Northridge libraries, a literature search began with locating topics relevant to *continuing training program evaluation, professional development evaluation, program development implementation, accreditation,* and *program evaluation data analysis*. I achieved saturation when searches yielded the same resources and the remaining sources were too old for inclusion in the review.

Continuing Training Program Evaluation

Training is an activity that gives organizations access to resources, including but not limited to human resources, materials, money, and methods (Shenge, 2014). Training allows for an organization to compete in changing environments and to plan and design activities that accomplish prescribed goals (Krishnaveni & Sripirabaa, 2008). Training is also an organized approach to impacting and improving an individual's knowledge, skills, and attitudes to elicit improvement (Shenge, 2014).

In the field of medical imaging, continuing education is important. Training is the systematic approach to improving individuals' knowledge, skills, attitudes, and performance (Aguinis & Kraiger, 2009; ASRT, 2017; Shenge, 2014). Training and learning are integral to the educational paradigm. Coherent instruction and assessments that support student-centered learning and training take into consideration various aspect of not only instruction but also learning. In particular, adult learning involves interaction and collaboration with educators who facilitate how students constructs knowledge and

put learned information into action. Within a continuing education learning environment, the adult learner practices new concepts via problem-based learning. Programmatic evaluation incorporated into this type of learning environment provides evidence regarding what information transfers from instructor to student (Martino & Odle, 2008; Morales, 2016; Muir, 2005; Nuebrander,2012). In addition, evaluations of continuing education training programs help stakeholders describe the programs and ensure that there is a clear and consensual understanding of their activities and outcomes (CDC, 2011; Mertens & Wilson, 2012; Muir, 2005).

Training programs provide knowledge to the program instructors, and this knowledge builds confidence and enhances learning. The purpose of a training program is to include not only content information but also teaching methods and assessment tools that influence both the instructor and the leaning. Including program evaluation as part of the training program aids in assessing programs' efficacy (Masood & Usmani, 2015).

Another key area of importance noted in the reviewed literature is that no studies included a programmatic evaluation of medical imaging professional development or continuing education programs for allied health professionals; the lack of evidence and research in this area was a clear indication that a gap in practice existed. An increasing number of higher education institutions are requiring programs to demonstrate that they meet national and international standards. This requirement contributes to the accreditation process and, as such, serves as the impetus to include training evaluations as part of accreditation documentation (Mazal & Steelman, 2014; McInerney & Baird, 2015; Murray, Wenger, Downes, 2010; Ogrezeanu & Ogrezeanu, 2014; Shawer, 2012;

Shenge, 2014). Training is one of the fundamental activities that provide organizations with resources, materials, money, and critical human talent. All activities should be planned so that organizational leaders can accomplish their intended goals (Krishnaveni & Sripirabaa, 2008; Shenge, 2014).

Program Evaluation and Professional Development

Professional development program evaluation has an impact on programs' components as well as on the stakeholders (Shawer, 2013). Effective professional development strategies, in conjunction with well-planned program evaluation, assist in developing effective program improvement strategies. According to Arguinis & Kraiger (2009), the cornerstone in programmatic evaluation is that its use results in information that improves, changes or terminates programs. With regard to professional development, a program evaluation provides information regarding the services delivered. If a professional development program is accredited by a national or international agency, a program evaluation must answer questions regarding competency, student outcomes, accountability, and quality (JRCERT, 2016; Nuebrander, 2012 Shawer, 2013).

Professional development involves "learning beyond the point of initial training" (Craft, 2000, p. 9). Individuals who engage in formal or informal program evaluations continue to advance professionally in their own respective careers. This undertaking is demonstrative of the lifelong learning process and is a testament to the knowledge and skills developed, cultured, and motivated during one's career (Shawer, 2013). Program evaluations can be used to assess program learning, teaching, unsatisfactory performance, resources, employment, commitment to establishing community relationships, and

program implementation, to name a few (Ogrezeanu & Ogrezeanu, 2014). The research approaches used to perform program evaluation might be quantitative, qualitative, or mixed. Depending on the type of information desired, the research design can include elements to ensure optimal data collection. Both quantitative and qualitative evaluations can assess program effectiveness, planning, implementation, and instructional methods (Mack, Woodson, MacQueen, Guest, & Namey, 2005; MacPherson & McKie, 2010; Patton, 2015; Shawer, 2013). The aim of program evaluation can be to provide stakeholders with information to aid in improvement via gathering qualitative data that examine missions, goals, and objectives of the organization (Shawer, 2013).

Program Evaluation Planning and Implementation

The CDC (2011) developed a how-to guide for planning and implementing program evaluations, outlining in detail the activities undertaken in public health programs. When reviewing the implementation of a program, evaluations examine the program's operations. If the activities were implemented as planned, it is necessary to identify the strengths of a program and determine areas for improvement.

Program planning and evaluation can use logic models that articulate the parameters and expectations of a program in addition to changes among participants, systems, or organizations as related to program activities. An evaluation is most useful when evaluators have developed and implemented activities thoughtfully. The logic model structure allows for articulating and communicating the aspects of a program that could benefit most from review. Theories of change help to bring about health activities and programs that lead to intended outcomes. Logic models require strong community

partnerships and provide the blueprints for how programs should work. A program most likely succeeds when there are realistic expectations grounded in sound evidence and best practices. With well-planned program evaluations, evaluators are able to identify and address gaps in practice; the ultimate goal of evaluation is improvement. Evaluation is an ongoing process and should be integrated into the planning and implementation of any well-intended program.

Project Description

Resources and Support

This project study was a formative program evaluation of a webinar professional development course program in an international public health organization. The project was supported by the regional director and the organization's course administrator. Persons who agreed to participant in the study were enthusiastic, supportive, and genuine in their responses. Administrators were readily available for member checking of their respective interviews and quite helpful in my soliciting participants to complete the questionnaires. The individuals who volunteered and completed the questionnaires were also genuine in their responses. Participant learners in this project resided outside of the United States; therefore, soliciting participants required assistance, which proved to be a difficult task. The program administrator was a valuable source of information because the agency's website offered very little information regarding the webinar courses, and access to internal documents was restricted.

Potential Barriers and Solutions

The primary potential barrier to this study was the lack of access to participants. One solution to the problem was to integrate into the webinar courses a copy of the evaluation questionnaire by embedding a link to the survey that needed to be completed at the end of the webinar course. Another effective method for gathering as many responses as possible was to link the completion of the survey to the receipt of a certificate of completion or certificate for attendance. In addition, lack of access to internal documents also presented a problem; in the future, a review of internal documents could be helpful when access to participants is restricted. Programmatic review and evaluation of documentation can then serve as a blueprint for reciprocity and duplication of assessment efforts. The last barrier noted in this study was time; given that this evaluation was performed as part of my doctoral study, assessing and evaluating training programs was an ongoing process for the agency to track and determine areas for improvement, weakness, strength, or growth. A more extensive and concentrated time frame would have been helpful, with sufficient time devoted to the data collection.

Project Evaluation Plan

I am not aware of whether the agency administrators will adopt any recommendations from this project study evaluation. However, in the spirit of best practices and educational pedagogy research, I intend to make the following recommendations strongly for the agency administrators to consider as they continue to develop and implement the webinar program. To begin with, my first recommendation will be that the agency administrators develop a set of standardized goals. These goals

should align with the agency's mission and vision and should be written and posted in the webinars and in all documentation and correspondence.

he goals should be assessed on a periodic basis to ensure alignment with the agency's mission and for relevance. No well-defined goals exist for this program; therefore, the process of writing goals and vetting them with the agency's directors should take months to complete. Once the goals are established, the next recommendation is that administrators develop a set of questionnaire surveys for all stakeholders to complete. The set of surveys should contain a readiness assessment survey, a post webinar completion survey, and an instructor evaluation; these documents should be completed within a month.

While all surveys might not be used, they will be helpful for assessing if all participants have the necessary technology and skills level for the webinar courses. If the surveys are administered prior to the course delivery dates, the program administrators can address with the participants and instructors any deficiencies prior to the course. Lastly, the instructor evaluation survey can be used to determine if the course goals have been met, if delivery of materials was effectives and if resources were sufficient. The instructor survey can also be used to help gauge transfer of knowledge and to provide follow-up for future webinar course topics. This survey can also be used as the end of the course evaluation and should include questions regarding delivery, resources, and effectiveness.

The questionnaires should be tested for reliability and validity and then placed in an online survey instrument and/or maintained as part of Microsoft Word or PDF

document for distribution. My final recommendation is that program evaluation and assessment be conducted on a continual basis. Assessment of each webinar course should be incorporated into the delivery plan and a scheduled developed to show when overall programmatic evaluation will occur. Upon completion of formal evaluations, the results should be shared with the communities of interest and the stakeholders via either publication or recorded video presentations on the website to ensure transparency (Shenton, 2014).

Section 4: Reflections and Conclusions

Project Strengths and Limitations

The relevance of this project was grounded in a clear understanding that an evaluation of the program was necessary. The agency administrator approved me as an external evaluator to perform the evaluation. An external peer reviewer gives credibility to the use of evidence-based approaches and innovative applications as well as the support of the scholar practitioner model (McKenzie et al., 2009; Saunders-Russell, 2016; Vonderwell & Boboc, 2013). The agency administrator recognized that an evaluation of the program was long overdue and appreciated my efforts. Given the importance of increasing access to health care via a trained and competent workforce and improving the overall health of individuals and communities worldwide, evaluating and assessing educational programs are important. The key strength of the project was the fact that the agency administrator understood and valued the importance of evaluation.

This qualitative formative program evaluation was grounded in the areas of problem-based learning and Knowles's (1970) adult learning theory. The conceptual framework model, INTEREST-PBL, guided the evaluation process. The research and the sub-research questions, the program administrator's interview questions, the instructors and participant learners' questionnaires, and the literature review applied the classifications of INTEREST-PBL and Knowles's theory on adult learning.

The findings from this qualitative program evaluation provided the agency administrators with descriptive data on the status of the program. I also provided suggested improvements as well as a guide for future assessments. Suggested

improvements addressed the gap in practice and the lack of assessments before this study, during, or after. The agency administrators have the option to use the research-based recommendations provided in the evaluation report at their discretion; they might also incorporate the INTEREST-PBL model into any future assessment efforts for guidance.

Limitations

The project limitations included the lack of clearly defined goals, the lack of a desired response rate, the data collection process, and cultural responsiveness. One recommendation I made to address the aims of the webinar course program was to make public and put in writing the program's goals and have them readily available and accessible to any interested parties. Another recommendation designed to improve both data collection and the response rate was to give evaluation questionnaires at the conclusions of the webinar courses. I was challenged in collecting data because no courses were in process during the review period; therefore, I had to contact participants and instructors following their courses.

In addition, to overcome cultural reluctance to complete data-gathering processes for research purposes, administrators need to address the importance of completing evaluations (Altin, et al., 2014; CDC, 2014). Some cultures are reluctant to participate in research studies when there are no personal relationships established. This limitation exists because within these cultures, a level of trust has to be present. When administrators gain trust from the instructors, learners are more likely to get responses from individuals that are truthful and informative (George, et al., 2014).

Another potential limitation of the project was the number of responses received. Only 3 learners and 2 instructors out of 18 responded to the invitation to participate in the study; this limited the representation of individuals who participated in the webinar course program. I could not use this sample to make generalizations regarding two of the groups of stakeholders, instructors and learners. Overall, one of the best recommendations for future evaluations was to incorporate evaluation into the webinar course program. With this incorporation, stakeholders could give immediate feedback, and the program administrators could make necessary changes within the webinar course environments immediately.

Recommendations for Alternative Approaches

Alternative Definition and Solution to the Local Problem

The problem that I addressed in this project study was the lack of a formative evaluation of the implementation of the agency's webinar course program. An alternative method of addressing this problem could be to investigate whether the program's goals and mission align with its public health initiative training. In this study, selecting professional development training from another agency and comparing the respective webinar courses of the two agencies could have afforded the agency with an evaluation that was both educationally sound and evidence based. In addition, following a prescribed methodology for conducting programmatic evaluations that use industry benchmarks would ensure that every course, when offered, aligns with the program's goals and mission. A prescribed methodology ensures that learners are completing courses that will meet their professional expectations (CDC, 2014; Patton, 2015; Schorr & Farrow, 2011).

Scholarship, Project Development and Evaluation, Leadership, and Change

Scholarship

To determine if my research project study was worthwhile and of interest to other researchers and students in the field of medical imaging, I vetted my conceptual framework model for program evaluation among national educators in the field of radiologic sciences in the form of a poster presentation during several national conferences. My research garnered interest, and I gained more insight into the structure of educational programs in various under-resourced geographic regions after speaking with different various educators. During this vetting, I spoke in depth with Dr. Stewart Bushong, a noted author and professor at Baylor College of Medicine in the field of radiologic technology regarding my interest in global imaging training. I was also able to discuss my study with Jonathan Mazal, an author I referenced frequently in the literature review. Mr. Mazal serves as regional director of the Americas and a board member of the International Society of Radiographers and Radiologic Technologists; his professional interest is in global medical imaging. I became an active member of RAD-AID International and volunteered to be an editor for several international journals in radiologic sciences and medical imaging. The vetting process demonstrated to me that my research could expand the knowledge base of radiographers and educators in the field of global imaging, as well as expand the knowledge of individuals interested in studying how medical imaging links to global public health initiatives.

Scholarship involves exposing one's vulnerabilities as well as interest to experts in the field in the hopes of garnering attention. What I learned from this experience is the

dedication to researching a topic that has global implications and provides opportunities to promote social change. As I worked to complete my project study, I became a better radiologic technologist and educator dedicated to promoting global learning via the practice of evidence-based assessment. I learned to submit manuscripts for publication in peer-reviewed journals as well as present research in poster format for vetting amongst my peers. My improvement as a scholar afforded me the opportunity to make recommendations and suggestions using pedagogical theories and foundations to promote public health initiatives geared toward the professional training of adult learners in the field of medical imaging and health administration.

Project Development and Evaluation

Several important lessons emerged about developing an evaluation project; the most important were

- obtaining support and buy-in from the organization where the evaluation will occur;
- understanding the scope of authority of individuals within the organization who will be offering their support and guidance to you; and
- being flexible during the evaluation process and being prepared with contingency plans in place for participant solicitation and data collection and analysis.

The ability to conduct research in a trustworthy and credible manner can be a challenge. A researcher has to prepare for the unexpected as well as subsequent disappointment when plans to proceed do not turn out as expected. For this reason, a

researcher must be able to modify and adjust the research methodology to garner as much data as possible (Hall et al., 2014; Patton, 2015, Spaulding, 2014).

Qualitative program evaluations using case study models are useful when sample sizes are small. The purpose of qualitative analysis is to understand how the stakeholders understand, react, think about, or integrate situations into their personal or professional lives (CDC, 2014; Hall et al., 2014). The simultaneous analysis of qualitative data collected produces information in programs' real-world contexts, thereby providing key stakeholders with valuable content in which a program's sustainability can be determined (Office of Planning, Research, and Evaluation, 2010; Patton, 2015; Spaulding, 2014).

I chose to communicate my evaluation findings and recommendations of the qualitative formative evaluation by employing an evaluation report through a PowerPoint presentation; this presentation is provided in Appendix A. In developing the evaluation report, I learned that the findings from the data collection and analysis phase of the study provided an assessment of the agency's strengths and weaknesses, including potential threats and opportunities for improvement and advancement (Nuebrander, 2012; Shenton, 2004; Spaulding, 2014). I also learned that writing this report required me to be precise and concise because the report needed to be concise and clear regarding the recommendations that I believed would add value to the program. Therefore, the format I chose to follow for the report was the one used by CDC researchers for evaluations. Because the agency administrators so graciously agreed to allow me to perform this evaluation for my doctoral project, I wanted to be sensitive to the presentation of the findings while still displaying a professional demeanor. I realized that the evaluation

report needed to include sound evidence that would be consistent with communicating conclusions that might not be sufficiently persuasive to elicit positive social change.

Leadership and Change

To promote social change, I had to demonstrate that I possessed the required leadership skills of a qualified educator in the field of medical imaging. I used clinical knowledge as well as training in effective teaching methods to communicate verbally and in writing throughout the life cycle of this project. I committed myself to providing updates to the status of this project to the agency administrators and stakeholders on a consistent basis. I learned that maintaining open communication was vital and required for conducting this project; for example, I communicated bimonthly with the agency administrator via email notes and telephone calls, thereby keeping the key stakeholders within the loop.

The Importance of the Work

Analysis of Self as Scholar and Practitioner

"When the student is ready, the teacher will appear." This Buddhist proverb was a grounding force in my development as a scholar and a practitioner. This journey was wrought with highs and lows, setbacks, and progressive milestones. I learned that I was capable of conducting research, analyzing data, and collaborating with other scholars and administrators of other agencies. I presented information at national meetings and professional conferences, and I wrote for publications. I learned that program evaluations can be either formative or summative and can use qualitative, quantitative, or mixed-methods research designs.

This journey has not been easy, but I have learned that I am capable of performing duties as a professional as well as a well-rounded and developed scholar, practitioner, and academic, a *pracademic*. As a pracademic, an individual who is both an academic and an active practitioner, in the field of health services, I was interested in the idea of integrating technology to enhance program evaluation. Learners are becoming more hands on and technologically advanced. Students want to be engaged in their learning, and I want to be engaged in my teaching. My transformation as a pracademic began with the writing process. I learned that by developing my writing skills, I would be able to bring engaging activities into my classroom, and therefore be able to apply the various pedagogical theories in adult education and problem-based learning. In addition, I will now be able to be more effective in my programmatic accreditation evaluation teaching.

Analysis of Self as Project Developer

Research begins with a desire to solve a problem or develop a new way of thinking, and it has the most impact when it is relevant to the researcher, and that person is invested in the project. Qualitative inquiry places priority and value on a person's lived experience (Allen, Donhan, & Bernhardt, 2011; Fitzpatrick, 2012). As such, learning how to develop a project that would reflect my interest in and dedication and commitment to enhancing the lives of others on a global level was my goal with this study. I learned that I needed to collaborate with others on multiple levels, that time was of the essence, and that flexibility was key. As a project developer, I learned that I must "think outside of the box" in terms of interacting with international participants and that there must be contingency plans in place. I learned to use my research skills that I had newly developed

to make analytical and reflective conclusions. I found out that all research must be grounded and that it must strive to search a purpose. Therefore, this journey of project development is only beginning as I continue to develop a research agenda and scholarship.

Directions for Future Research

The implications of this study are profound in the sense that I established benchmarks for assessing the webinar courses program. Future research in the area of programmatic evaluation, most importantly summative, could assist agency administrators with justifying why the program should continue (Clouston, Westcott, & Whitcombe, 2010; Greig, Dawes, Murphy, Parker, & Loveridge,2013). I recommended implementing a system of assessment and evaluation on a continual basis to not only ensure efficient implementation but also expand evaluation and assessment to include learner satisfaction as well as transfer or increase in knowledge, technical skills, and professionalism (Caldwell, 2014; Goldfarb, & Morrison, 2014).

Conclusion

The purpose of this doctoral project study was to determine the effectiveness of a webinar course program held by an international public health agency from the stakeholder's point of view. Interview results as well as questionnaire responses resulted in findings that the program participants value the knowledge they are obtaining. However, the stakeholders are not aware of the goals of the program nor is there any mechanism in place with which the agency can assess progress or improve on the delivery of the webinar course materials. I suggested that if mechanisms are put in place

that allow for stakeholders to provide immediate feedback regarding course delivery and content, the program administrators could address any concerns regarding implementation, delivery, and content before the next scheduled webinar (Azene, 2014; Aguinis, et al.,2009; Bok, et al., 2013; Fradd, 2006). The results of this study could help the international agency improve program effectiveness by creating a mechanism for performing program assessment in alignment with the agency's mission and goals for improving access to care in under-resourced geographic regions in Latin America and the Caribbean (Aguinis, & Kraiger,2009; Azene, 2014; Cockbain, Blyth, Bovill, & Morss, 2009).

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Appendix A: The Project

Educating Globally in Medical Imaging
Final Evaluation Report

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Executive Summary

According to the World Health Organization (WHO, 2014), approximately two thirds of the world's population has little to no access to life-saving radiology services.

In developing and underprivileged communities, there exist serious health disparities with regard to the availability of medical imaging care and services and the shortage of personnel to perform the procedures (PAHO, 2014).

Populations in remote or under-resourced settings that are separated from modern technology bear an increased burden of morbidity and mortality.

The WHO (2014) reported that between 3.5 and 4.7 billion individuals worldwide are in radiologic scarce zones (RSZ), meaning that there is limited access to radiology services.

Limited access refers to the lack of imaging services and/or to the lack of trained medical imaging professionals.

The lack of access is of particular importance in Latin American and Caribbean countries where strong cultural beliefs, cost, training, and government support are essential for the success of any international public health outreach program.

Radiologic technologists are a critical asset in solving this global crisis. By working alongside other medical professionals as part of ongoing medical relief projects, members provide the education, training, and resources local health care specialists need in order to become self-sustaining, high-quality facilities.

Background

- In 2012, an international agency began offering webinar courses to its 35 member states regarding various radiological and imaging needs following country assessments.

- The webinar course program has been offered in the absence of any formative or summative evaluation process.

- Nine webinar courses have been offered since June 2012 to medical imaging professionals in various Latin American and Caribbean countries (executive director, personal communication, March 12, 2014).

- According to the executive director, designing and implementing the webinar course program is part of the agency's global public health initiative for education and training in diagnostic imaging. For public health intervention programs to be successful, their implementations must be assessed.

Purpose

- The goal of formative evaluation is to gather data as a program unfolds and provide the program developers with data to make improvements, if needed.

- With the case of the webinar training programs, a formative evaluation will allow the program developers to improve the program as well as aid in gathering data that can be used, if needed, to determine the impact of the professional developing training web courses as they are being offered (Mazal & Steelman, 2014).

- The agency administrators agreed that program improvement will be the focus of this formative program evaluation.
- As such, data were gathered for this project from the viewpoint of the stakeholders.

Evaluation Rationale

As early as 2006, the World Health Organization (WHO) documented that demographic and epidemiological changes would have a global impact on the availability of qualified allied health professionals and that the need for a modern and skilled health care workforce would have to be addressed (Fradd, 2006).

In medically underserved communities, the availability of medical services is frequently associated with poor-quality procedures, unnecessary exposure to radiation, and shortages of human resources. The global health issues that occur when there is a lack of access to care in resource-limited countries have prompted NGOs to seek collaboration opportunities that will provide training to community health workers and peer educators (Wallace, 2007).

Mollura and Lungren (2014) provided perspectives from multiple authors concerning radiology in global health efforts. According to Mazal and Steelman (2014), international outreach organizations worked toward successfully increasing access to medical imaging services where there is a growing demand for appropriately trained imaging professionals.

Significance of the Study

This study is important in that it provides an initial evaluation of professional development courses offered in the global medical imaging community via webinars. This study is also important because it disseminates information regarding the need to educate medical imaging professionals in under-resourced geographic regions (Shah, 2014). A qualitative formative evaluation of the webinar course program implementation and delivery process that utilized an evidenced-based, data-focused model identified several issues required to adequately modulate program effectiveness and enhance professional development training and process planning.

Program Description

The webinar courses are modeled after the continuing education course formats utilized in the United States.

•Courses are created based on need assessed during country visits requested by the domestic health ministries or medical imaging professionals in member states.

•Courses are facilitated by volunteer instructors from the United States.

•Courses are offered either individually or in a series depending on the topic.

Stakeholder identification and engagement

Stakeholder identification

•Members of the 35 member states with an interest in radiology

•Medical imagers in the United States

•Ministries of Health of the 35 member states

•Program administrators

•Medical imaging instructors

Engagement

•Contact was made with potential research participant instructors and learners via email
•Program administrators were contacted via phone, email, and web conferencing.

The Need - The Problems – The Solution

In Latin America and the Caribbean, the following factors are challenges to providing medical imaging services

- Access and quality
- Availability of qualified human resources and continuing education
- Quality control and assurance programs
- National regulatory programs

Solution

The agency offered medical imaging professionals in Latin America and the Caribbean continuing education courses using e-Learning technology to increase knowledge and improve service delivery.

Research Evaluation Questions

The two guiding questions and the nine sub-questions follow.

•RQ1: How effectively is the webinar course program being implemented?

•Is the webinar course program being implemented as it was designed?

•Are the webinar course program stakeholders' (administrators, instructors, students) goals being met by the program?

•Are sufficient resources available for instructors to effectively deliver the course materials and information?

•Do the instructors go through training before they deliver the webinars?

•Are sufficient resources available for students to effectively utilize course materials and information?

•Is training available for students on how to effectively utilize course materials and information?

•RQ2: What components of the webinar course program are working as intended?

•Do the students understand the webinar course program concepts?

• Do the students or instructors have any misconceptions about the webinar course program? If yes, what are they?

•Have any negative outcomes surfaced since the course implementation?

•Have any positive outcomes surfaced since the course implementation?

Evaluation Methods

Study Design

•Qualitative formative program evaluation, encompassing a case study design, allows for a small sample size to be used.

•A formative evaluation using a qualitative design was the best method because it allowed for the stakeholders to provide input into whether or not the implementation of the webinar courses program met the specific goals and outcomes of the sponsoring agency.

•As suggested by Andres (2012) and Creswell (2012), a qualitative study research design works best when attempting to understand how participants' experiences influence a program in addition to understanding the impact of the research problems and questions. A case study strategy of inquiry in which in-depth exploration of the program and its implementation was also employed as part of the research design (Creswell, 2009).

• Using both a formative evaluation and a case study research design, I could conduct the evaluation to be conducted was in progress as well as permitted for a small number of participants to be used for data collection.

•A qualitative case study is an in-depth description and analysis of a bounded system. It is ultimately an empirical inquiry that investigates a contemporary phenomenon within its real-life context (Merriam & Tisdell, 2016). This was a qualitative study that focused on the effectiveness of the implementation of a program within a specific group; therefore, the use of any other method to perform this study would not have been sufficient.

•A qualitative formative program evaluation allowed for the ongoing collection of data that could be used to improve the program at any given point in time; the feedback I received will ultimately be used to elicit change in practice (Alkin, 2013, Bowen, 2009).

• In addition, a qualitative design was also the best method to use because it provided the agency with immediate feedback that can be used to frame future program evaluations because there has been no evaluation of any kind since the program was implemented (Hall et al., 2014).

Narrative

In evaluating the effectiveness of the implementation of webinar courses offered by an international agency in the field of medical imaging using a logic model, the overall goal was to provide the international agency with data and a framework logic model with which future evaluations can be conducted. The purpose of a formative evaluation was to examine various aspects of an ongoing program in the early stage of its life cycle in order to make changes or improvements as the program is was implemented. I documented what has transpiring in the program since its inception (Wall, n.d.). The groundwork for the in-depth analysis and development of the formative evaluation of the global medical imaging webinar course program was centered around interview questions regarding the effectiveness as well as the relevance of the courses with program administrators and feedback from questionnaires received by instructors and learners.

Sampling Procedures

•The audience was very specific: medical imaging professionals from at least 35 Latin American and Caribbean countries who have participated in webinar courses offered by the agency as either program administrators, instructors, or students. As such, my sample for this case study was selected via purposeful sampling.

•A total of seven participants completed either an interview or questionnaire; a minimum desired number of 15 participants had been predetermined. However, as the data collection portion of the study progressed, acquiring the minimum number of purposefully sampled participants became difficult, and my data began showing redundancy. As I collected the data, my approach for this research study reflected a case study design. A bounded system, a single entity, the webinar course program, became the focal point, the phenomenon to be studied (Merriam & Tisdell, 2016).

•I sent emails to potential participants that included an informed consent form.

•Participants were free to discontinue participation of their own will.

•Identifying information for program administrators was redacted, and I collected no identifying information from any participants.

Data Collection Procedures

- Instructors and learners completed a SurveyMonkey questionnaire.

- I interviewed the program administrators using Zoom web conferencing, recorded the interviews through Zoom, transcribed them, transcribed and sent them to the administrators for member checking. All identifying information was redacted.

Data Analysis

This section will cover the thematic analysis of the data I collected.

Profile of Participants

Table 1

Profile of Participants

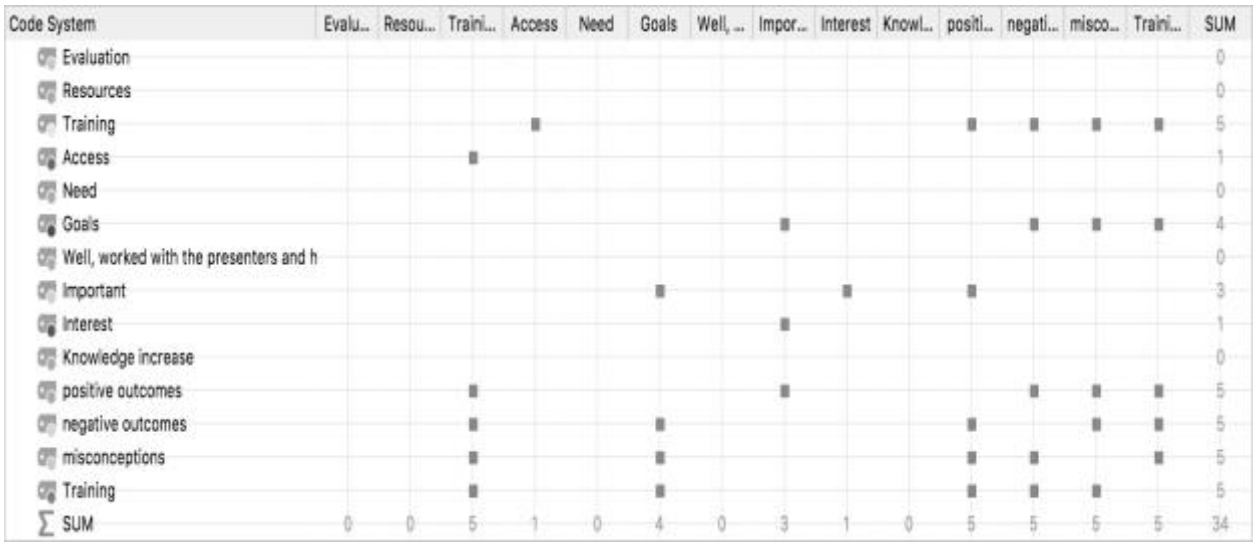
Participants	Position	Type of Organization
P1	Administrator	Affiliated Non-Government Organization
P2	Administrator	Affiliated Non-Government Organization
P3	Medical Imaging Professional	Latin American and Caribbean
P4	Medical Imaging Professional	Latin American and Caribbean
P5	Medical Imaging Professional	Latin American and Caribbean
P6	Instructor	Affiliated Non-Government Organization
P7	Instructor	Affiliated Non-Government Organization

Table A2

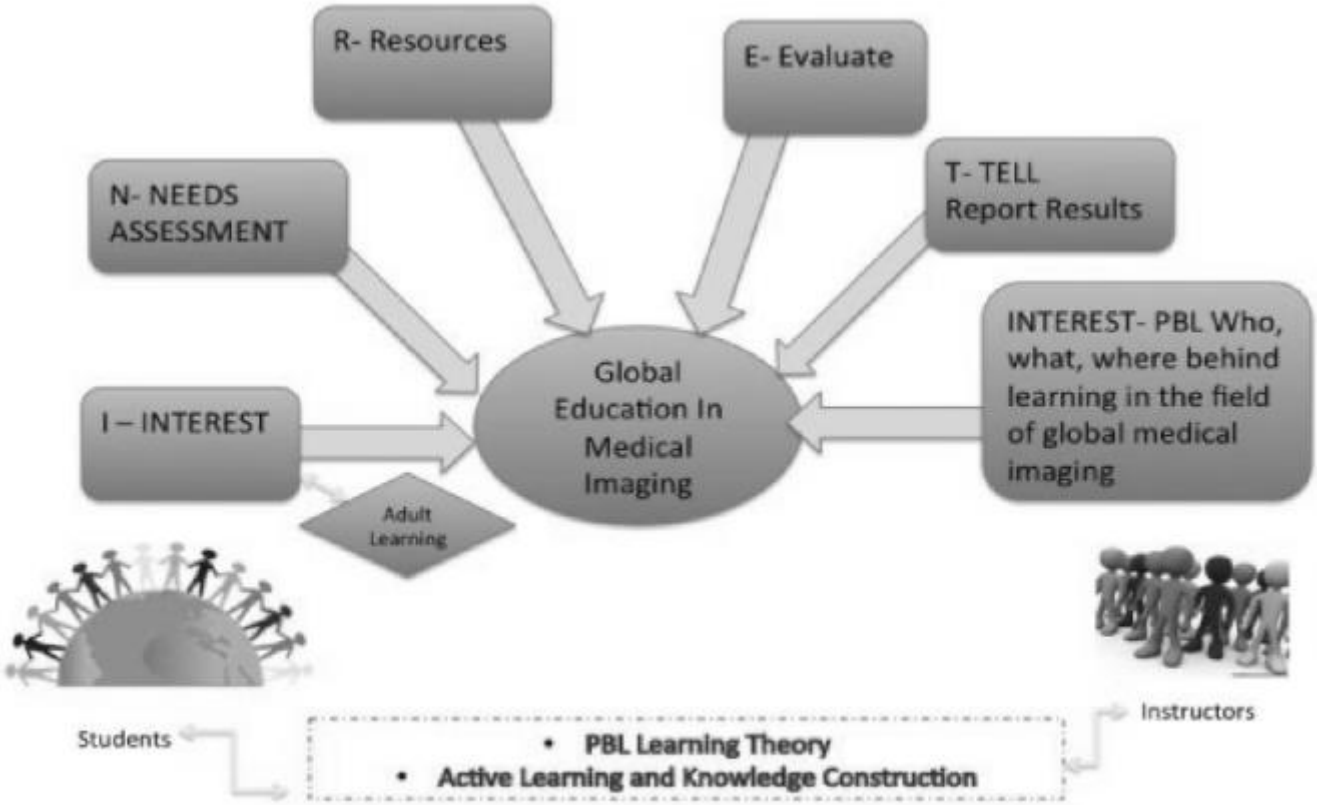
MAXQDA Codices Ordered by Frequency

Code System		**#**
Code System		171
	Which course(s) did you participate in and why did you particip	0
	Training Outcomes	0
	JRCERT Accrediation	1
	Testing used to evaluate content not program	1
	Problem	3
	Challenge	1
	Evaluation	2
	Misconceptions	1
	Resources	2
	Results	3
	Implementation Model	4
	Program Model	2
	Other programs	2
	Evaluation	1
	Resources	1
	Training	5
	Access	2
	Need	3
	Goals	5
	Facilitate	1
	Well, worked with the presenters and helping them understand ho	0
	superficial structures,	1
	millennial goals the biggest emphasis is then on decreasing mat	1
	Important	6
	Interest	9
	Knowledge increase	1
	positive outcomes	17
	negative outcomes	29
	misconceptions	25
	YELLOW	4
	Training	21
	MAGENTA	4
	Effective	13

Code Matrix Browser



Code System	Evalu...	Resou...	Traini...	Access	Need	Goals	Well, ...	Impor...	Interest	Knowl...	positi...	negati...	misco...	Traini...	SUM
Evaluation															0
Resources															0
Training				■							■	■	■	■	5
Access			■												1
Need															0
Goals								■				■	■	■	4
Well, worked with the presenters and h															0
Important						■			■		■				3
Interest								■							1
Knowledge increase															0
positive outcomes			■					■				■	■	■	5
negative outcomes			■			■					■		■	■	5
misconceptions			■			■					■	■		■	5
Training			■			■					■	■	■		5
∑ SUM	0	0	5	1	0	4	0	3	1	0	5	5	5	5	34



INTEREST_PBL Conceptual Model

- I chose INTEREST as the acronym for my model because it reflected why adults strive to improve their professional skills in medical imaging. In addition, INTEREST also integrates some of the rudimentary steps that are undertaken by educators who have been challenged to develop curriculum and teaching materials that are interesting, appropriate, and in alignment with the needs of medical imaging professionals in resource-limited and developing countries. The acronym INTEREST refers to the following concepts:

- I: Interest—What topics are the learners interested in learning more about? What areas of interest are most important to the country's stakeholders?

- N: Needs assessment—What are the learners' skill levels? What areas of improvement or development are the stakeholders most concerned with addressing? What time frame does the instruction of the participant learners need to occur within? Are there available resources?

- T: Technical development—Do the stakeholders possess adequate, reliable technology that will aid in educating students?
- E: Educate—Knowledge transfer is now the focus and goal)
- R: Resources—Before, during, and after instruction, will there be resources available to participants to aid in the delivery of care?
- ●E: Evaluate—Evaluate the stakeholders after delivery of course
- ●S: Summarize—Analyze the evaluation or assessment
- ●T: Tell—Report your progress and results

Limitations– Program Design

- The program design was modeled after continuing education courses in the United States. Continuing education courses have varying formats. This presents challenges because the format used for the webinar program depends upon which format administration choose to model.
- Lack of documentation available for research purposes
- The length of time of the program
- The number of courses offered
- The number of participants
- The geographic locations of participants
- The political climate
- Data the agency did not collect

– Research Design

Also, because I was conducting this formative evaluation 12 years after the program was first implemented, other limitations were associated with the research design: methodological changes associated with the small sample, short follow-up periods, the need to interpret results in relation to implementation, and lastly, preserving objectivity (AHRQ, 2013).

Limitations Specific to the Field and Professional Development

• The field of radiologic technology is not as advanced as other allied health professions in the use of e-Learning materials and technology with regard to training and educating radiographers. However, it is an area of study that is seeing increased research and implementation (Gunderman, Kang, Fraley, & Williamson, 2001).

•In addition, because my focus was evaluating the implementation of webinar courses to an international audience, there is a possibility that this study will only affect a small percentage of individuals.

• I made assumptions regarding the amount of access I would have to internal documents and to students and instructors in order to provide an analysis to the stakeholders that would assist them with further developing this program. I was limited by the number of persons who responded to and agreed to be participants as well as by the agency's lack of documentation on who had participated in the courses (AHRQ, 2013; Fowler & Wilford, 2015; Gunderman et al., 2001).

Discussion with Audience and Recommendations

Recommendations – Administrative

•Develop and publish mission, vision, values, and goals for webinar program

•Establish goals and outcomes for learners that are aligned to the goals of the webinar course program and publish them

•Require instructors to supply lesson plans that include objectives and goals that align with the program's goals

•Implement the webinar courses following a systematic outline and calendar

•An implementation checklist can be incorporated into the process.

•Incorporate a resource checklist prior to delivery that will alert the program administrators if resources are not sufficient to meet the needs of the course

• An online training manual can be made available for all stakeholders for immediate reference.

• To ensure that all students are prepared and able to access the course, a pre-webinar readiness assessment survey should be sent to students.

•To determine if the webinar course program as a whole is effective, a questionnaire should be embedded within the courses for participants to complete at course end. The questionnaire should be short yet cover all of the required content areas. By collecting these data immediately at the conclusion of a session, the program can be evaluated and assessed and areas for improvement can be determined immediately.

•Require all instructors and students to complete a standardized anonymous questionnaire to evaluate each training webinar course.

•Administer pre- and posttests to assess the students' skills

•Require all instructors to complete a documented training course on the use of the e-Learning environment

•Track student participation in cohorts

•Maintain a repository of courses for participants to use for review

•Establish and publish a set of goals associated with the webinar course program and require instructors to submit outlines that demonstrate learning outcomes that are in alignment with those goals

•Develop an ongoing methodology for program review utilizing both internal and external peer review methodology

•Make public the results of the review process to demonstrate transparency

Recommendations – Instructors

•Also, all instructors should attend a documented training session with the agency regardless of familiarity with the system. This can be conducted online.

•A notification of training completion can be set up to alert both the agency, the instructor, and the learners that the course is ready for participation. This alert should also contain the resources that will be needed.

•These recommendations will ensure that the webinar course program's implementation process is adequate and is being performed as designed. In addition, these recommendations will also ensure that the webinar course program's technical functions are working as intended.

Recommendations – Participant Learners

•When students complete the courses, they can receive certificates of course attendance.

Discussion with Audience

Thank you.

Think Global. Think Community.

Think “We are the Eyes and Heart of Medicine”

What we do is important.

.

Appendix B: Survey Monkey Questionnaires

Questionnaire: Instructors

2. Questionnaire

2. Which webinar course(s) did you provide instruction for and why did you choose that course(s)?

3. What areas do you perceive as being the most needed for the training? How do you determine need? How do you determine the participant's skills level?

4. Were you offered resources and/or training to assist with development and delivery of the webinar courses materials? If yes, explain the type of resources and/or training that was offered and how you used them? If no, please explain why.

5. At the end of each webinar, did you have the participants evaluate your course delivery? What methods do you use for evaluation. Please explain.

6. At the end of each webinar, did you have the participants evaluate your course materials? What methods do you use for evaluation. Please explain.

7. If you do not have the participants evaluate your course delivery or course materials please explain.

8. Do you report your evaluation outcomes to anyone? If yes, who and how do you report your evaluation outcomes? Do you use the evaluation information to improve your delivery/course materials? or If you do not report your evaluation outcomes to anyone, how do you use the information you have gather?

9. Do you use the evaluation information to improve your delivery/course materials? If yes, how is this done.

10. If you do not report your evaluation outcomes to anyone, how do you use the information you have gather?

11. Before, during and after a webinar do you make available to the participants, resources,or course materials to aid in their delivery of care in x-ray? If yes, how? If no, why not?

12. How do you develop your materials for presentation? Do you explain the goals and objectives of the webinar course(s)? If yes, how do you make the explanation part of your presentation? or If you do not develop your own materials for presentation, what do you use? Do you explain the goals and objectives?

13. Do you explain the goals and objectives of the webinar course(s)? If yes, how do you make the explanation part of your presentation?

14. If you do not develop your own materials for presentation, what do you use?

15. Do these materials contain an explanation of the webinar course(s) goals and objectives?

16. Please explain what you found to be the most helpful portion of the program.

17. Are there aspects of the webinar instruction that you like or dislike? Please explain.

18. Do you have any suggestions do you have for improving the content of the webinar course (s).

19. Do you have any suggestions do you have for improving the webinar course(s) delivery?

20. Have you made changes in your job performance as a webinar instructor as a result of instructing in the webinar course program?

Questionnaire: Participant Learners

2. Questionnaire

2. Which course(s) did you participate in and why did you participate in that course?

3. Did you improve your knowledge and skills in x-ray, ultrasound, mammography after you completed the webinar course? If yes, how did your knowledge and skills improve? If no, explain why.

4. Did the webinar course(s) you participated in meet your needs? If yes, explain how. If no, explain why not?

5. Do you know what the goals of the webinar course(s) were? If yes, how did the webinar course(s) achieve the goals?

6. Were there activities, lessons, interactions, discussions, assignments of the webinar course(s) that you participated in that you liked? If yes, what were they and why did you like them?

7. Were there activities, lessons, interactions, discussions, assignments of the webinar course(s) that you participated in that you disliked? If yes, what were they and why did you dislike them?

8. Did the webinar course program help you in performing your job? If yes, explain how? If no, explain why.

9. Are there any practices, techniques that you use or will begin using as a result of attending a webinar course? If yes, what are they? Explain how you will use them.

10. Are there any practices, techniques that you will stop using as a result of attending a webinar? IF yes, what are they? Explain why you will stop using them.

11. What suggestions do you have for improving the webinar course (s).

12. If you don't have any suggestions for improving the webinar course please explain what you found to be the most helpful portion of the program.

13. How would you describe your skills level as an xray technician/technologists before participating in a webinar course(s)? Is it basic, competent, excellent? Please explain

14. How would you describe your skills level as an xray technican/technologist after participating in a webinar course(s)? Is it beginner, competent, excellent? Please explain.

Appendix C: Interview Questions

Interview Questions – Administration

1. What areas of interest in the medical imaging field are most important to the countries served? What areas do you perceive as being the most needed for training? How is the need determined? **(RQ1 SQA/RQ2 SQ A/B)**

2. Are you aware of any Latin American or Caribbean countries using university online programs in the United States for medical imaging training qualifications? If yes, what are they? Are you aware of any Latin American or Caribbean countries using online NGO training programs? If yes, what are they? Are you using these programs to help model your webinar course program? If yes, what are they? What aspects of those programs' designs are you using to help implement your program? **(RQ1/RQ2)**

3. Are the goals for the webinar course program made available to interested parties? If yes, how? **(RQ1 SQB/RQ2 SQA)**

4. What results do you expect from implementing the webinar course program? **(RQ1 SQ A/B /RQ2 SQ A/C/D)**

5. If problems arise in webinar implementation, how do you address them? **(RQ2 SQ B/C)**

6. At the end of each webinar, do the participants and/or instructors evaluate course delivery? If yes, are the evaluation data shared with you? At the end of each webinar, do the participants and/or instructors evaluate course materials? If yes, are the evaluation data shared with you? If you receive evaluation results, do you share the results with the participants and/or instructors? **(RQ1 SQA/B/C RQ2 SQ B/C/D)**

7. Before, during, and after a webinar, do you make resources or training available for the instructors to aid in delivery of instruction? If yes, what are they? Before, during, and after a webinar do you make resources or training available for the instructors to aid in delivering course materials? If yes, what are they? **(RQ1 SQ C)**

8. Before, during, and after a webinar, what resources do you make available to the participants to aid in their delivery of x-ray care? If yes, what are they? **(RQ1 SQ C)**