WASHBURN MAMMOGRAPHY SEMINAR: AN ANALYSIS

BY:

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A PROJECT

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[Signatures and names]
Abstract

Throughout this paper, the Washburn University Mammography Seminar course will be discussed. The purpose of the paper is to discuss the Seminar, and prove, by research and thorough analysis that this course is quite adequate in providing a specific group of students, namely Radiologic Technologists, the appropriate educational criteria and hands-on training for those pursuing a career in Mammography. The main questions that any higher education course generally asks, are "does this course meet the required educational content", and "will the students be better prepared for their future careers if they take and pass this course," and the following research and observations will prove that this seminar will in fact, help students with both. Because the following research is based on an established University course, the instructor, Jera Roberts, was the main contact person, providing all the necessary educational content, and other associated course materials to the author. The results are as follows: The Washburn University Mammography Seminar is a well-thought out and established program, preparing students to take and pass their mammography board registry. Since no program in and of itself is perfect, there will be a couple of specific suggestions for possible enhancement of the seminar at the conclusion of the paper.
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Each and every day women across the globe live out their daily lives, full of multiple commitments. This can include: family, spouses, children, careers, continuing education, cooking, and physical exercise. Within these time commitments and life choices, the last thing a woman wants to hear is that she has just been diagnosed with breast cancer. However, breast cancer in females is quite common. According to the American Cancer Society, approximately one in eight women (12%) will develop an invasive type of breast cancer. It is the second most common type of cancer found among American women, following skin cancer.

As scary as this sounds, there is hope. This is where early detection comes into play. Early detection, specifically screening mammograms, can help find cancer at the beginning stages. With all of this being said, there are individuals who are responsible for performing screening mammograms. They are called Mammographers, or more specifically Radiologic Technologists who have additional training and are board certified to perform these screening exams. Obviously, the training of these technologists is vital in order that they are prepared and knowledgeable to take on the job description that follows. The Washburn University Mammography Seminar course is designed specifically to meet this criteria; to prepare registered technologists in the specialty area of mammography, in order that they are capable of performing the work required to assist in the task of detecting breast cancer via their imaging skills.

Background information or history of diagnostic imaging is important so that one can fully comprehend exactly why mammography as a profession is vital to the
health of women. The very first recorded understanding of breast imaging came in
1913, by a surgeon, A. Salomon, who discovered links between mastectomies
(looking at the removed tissue via specimen radiographs), and a link between the
spreading of the cancerous tissue to axillary lymph nodes, as well as a need for
clinical correlation (Gold, Bassett, Widoff, pgs. 1-2). Progress was noted around the
1940's, but more significant changes occurred around the 1960's, that of which most
individuals today would find relatable. This includes: screening mammography
using general x-ray with no compression in the 1970's. These images would look
similar to a chest x-ray.

Then in the 1980's more improvements to imaging quality came about. The
introduction of film-screen mammography meant less radiation does to the patient,
faster imaging times, and much higher image quality due to compression
techniques. In turn, physicians became more aware of the significance of screening
mammography to detect breast cancer earlier, and also, mammography proved to
be valuable in assisting with breast biopsies and procedures. In the 1990's with
mammography becoming more main stream, regulations and standards were put
into place, and the MQSA (Mammography Quality Standards Act) began in 1992,
placing quality standards nationwide. Then, in the 2000's digital mammography
took over, and has replaced the vast majority of film-screen imaging. Digital
imaging proves to produce higher contrast quality images, is more helpful in
analyzing dense breast tissue, and utilizes less radiation. The most current
advancement in mammography is that of digital tomosynthesis (or 3D) imaging.
Multiple images or slices are taken while the breast is under compression, and has
been shown to reduce the rate of false-positive findings in regards to breast cancer (Joe, B. pg. 1).

In addition, it is important for the reader to understand the basic history of online education as a learning tool. Distance education in its earliest form came about in Great Britain in the form of mail correspondence. Over 170 years ago, instructors would send lesson plans in the mail to students, who would complete the work, and mail it back. In the 1960’s while the world wide web was still merely a thought in someone’s imagination, the University of Illinois created an internal “intranet” for their students. The Electronic University Network (EUN) in 1986 created its own version of online courses for students, which correlated with specific computers. Then, in 1994, CALCampus offered the first “online” course, which involved real time instruction and interaction via the Internet. Next, in the year 1999, the Jones International University accreditation happened, which changed the game in the sense that online education became an alternative to the traditional classroom style learning (thanks to the accreditation process). Moreover, in the year 2009, statistics proved that 5.5 million students were enrolled in an online course of some sort, and that a large amount of traditional universities had incorporated online learning into curriculums. To date, studies suggest online learning enrollment will continue to increase, for reasons such as convenience, preference, or for time management reasons (Hickey, R. pg. 1).

Any type of mammography course or seminar must meet specific requirements that will properly prepare students to take and pass their mammography registry. Mammography and Mammography facilities in the United
States are highly regulated by the MQSA (the Mammography Quality Standards Act), which is in place through the FDA. In addition to the FDA, mammography courses must follow the educational content set in place by the ASRT or American Society of Radiologic Technologists. This is because all technologists take the content examinations and become certified through the ASRT. Therefore, these courses or seminars follow the strongly suggested content guidelines set by the ASRT. The Washburn course is no different. This paper will explain in great detail the Washburn seminar that is currently in place, and show that this course in fact meets the appropriate standards. In order to completely understand the content of this paper, the reader should be made aware of the current ASRT content guidelines put into place. This is the material students will be tested over if they choose to take their mammography board examination after completion of the mammography seminar.

To elaborate further, one can access all the suggested mammography course content information on the ASRT website. All of the following can be accessed easily in order for programs to work on developing educationally appropriate content.

Suggested ASRT content includes:

1. Breast Anatomy and Mammographic Correlation
   a. Definition of the breast
   b. Gross anatomy of the normal breast
   c. Mammographic appearance of the breast

2. Breast Pathology
   a. Breast anomalies
   b. Clinical breast changes
   c. Mammographic appearance of pathology
   d. Benign breast pathology
e. High risk breast pathology
f. Malignant breast pathology
g. Diagnosis of breast carcinoma
h. Treatment options for breast cancer
i. Breast cancer classifications
j. Hormonal influences
k. Risk factors associated with breast cancer

3. Correlative Physical Breast Assessment
   a. Description of physical breast assessment for imaging correlation
   b. Patient education (Breast Self-Examinations or BSE)
   c. Patients with special needs

4. Departmental Structure and Regulatory Guidelines
   a. Types of mammography departments
   b. Essential personnel requirements and responsibilities
   c. Patient services and procedures offered
   d. National guidelines and standards

5. Equipment
   a. Dedicated mammography equipment
   b. Digital mammography
   c. PACS
   d. FDA/MQSA requirements
   e. Quality assurance of equipment

6. Interventional Procedures
   a. General information
   b. Localization modalities
   c. Interventional procedures
   d. Pathologic analysis
   e. Patient care

7. Mammography Quality Management
   a. Quality management program for digital equipment
   b. Additional quality assurance procedures
   c. Image quality standards
8. New Technologies
   a. Computer aided detection
   b. Digital breast tomosynthesis
   c. Breast imaging enhanced mammography
   d. Breast elastography ultrasound imaging
   e. Nuclear medicine studies
   f. Positron emission tomography

9. Positioning
   a. Clinical data of patient
   b. Description of examination
   c. Screening mammography
   d. Diagnostic and additional projections
   e. Evaluation of images
   f. Correct image labeling
   g. Image quality problems

10. Technical Applications
    a. Technical factors
    b. Exposure range

11. Sonomammography
    a. Ultrasound
    b. Breast imaging with ultrasound
    c. Patient positioning
    d. Labeling of images
    e. Mammographic correlation
    f. Bioeffects and safety (asrt.org, pgs, 4-54)

One of the more important aspects of any higher education coursework is the instructor. The role of the instructor is a valuable one; it is imperative that the instructor be both qualified and knowledgable, and very accessible as students who partake in online coursework have questions and concerns at all hours of the day. The main instructor of the mammography seminar is Jera Roberts; an individual
who is passionate about women’s health and works diligently to prepare her
students for taking and passing their mammography board registry. Jera has been
instructing this course since 2007, when the course was first starting out at
Washburn University. In addition to the responsibility of the mammography
seminar, Jera is the full time Program Director of Radiologic Technology and an
Associate Professor of Allied Health, instructing other courses at the university such
as: Exposures Labs, Radiographic Labs, Independent Studies, and Advanced
Radiographic Imaging.

Some brief background information about Jera Roberts, explaining her
qualifications as head instructor of the mammography seminar. Jera graduated
from a hospital based radiology program, and shortly after graduating and passing
her x-ray boards, she began performing mammography on a part time basis.
Therefore, her mammography career has included many years of experience. She
began teaching full time at Washburn, instructing courses in the Radiologic
Technology Program. Because of the full time schedule of teaching higher education
level courses, Jera was not able to continue working in a mammography
department; however she decided to take (and passed) the ARRT mammography
board registry exam. Teaching a mammography seminar course annually as well as
working with students on positioning skills and quality control tests that are
routinely performed all at MSQA regulated mammography sites allows for Jera as
well as the other mammographers who assist with the seminar to keep up their
mammography certification.
Originally this course was designed and offered one time a year (which is still the current process), with the content component requiring students to meet on the Washburn campus on a Wednesday through Sunday. The class met five days in a row; from 8:30am to 5:30pm. The year 2007 was when the mammography seminar was first put into place. The original target audience was registered radiologic technologists in northeast Kansas. Facilities knew they needed technologists to specialize in mammography, since the FDA (and MQSA) put into place regulations that required all mammographers who performed breast imaging to be board registered. Therefore, hospitals and imaging centers were better served if they sent their technologists to a mammography course or seminar to learn the basics. Thus, the Washburn mammography seminar came into play. This five-day course saw Jera Roberts as the main educational content holder, but also utilized three other registered mammographers to assist with positioning labs, quality control testing, and exam grading and registering reviewing.

Each of the four initial mammographers involved taught according to their strengths. Jera taught anatomy, physiology, pathology, instrumentation and physics. Becky Lackey, (who is still involved in the mammography seminar as present) a mammography coordinator for Stormont Vail, taught QC digital information and regulations, digital QC labs, interventional procedures, and screening positioning labs. Jeanette, who was associated with St. Francis hospital in Topeka, taught patient education, diagnostic positioning and assisted with digital information. Lastly, Deb presented information on film-screen, and assisted with labs. The three of these ladies would show case studies including pathology, artifacts, and image
quality, while Jera would perform exam grading of a mock registry exam consisting of 60 questions. This set up, the five consecutive days of training and coursework, became difficult for full time technologists. It was not feasible for many facilities to send a technologist away for three to five working days; it caused many facilities to be short-staffed temporarily. Therefore, Washburn University decided to make a change in the set up of the mammography seminar and its educational layout. Washburn went to an online content-based program.

That was then; this is now. The current mammography seminar course targets a very specific group of individuals. This includes the working radiologic technologist, an individual who desires to study and learn the diagnostic imaging field of mammography, and to become board registered to perform this type of specialty. The course has been set up such that all required content is presented on Washburn's online system, called Desire2Learn or D2L. The first point of accessible important course information for students is the "Course Instructions: AL 353 Mammography Seminar" handout. This is the first item students should read through and be familiar with in order to get basic first step questions answered. On this course instructions sheet, students can recognize how they qualify for the course, or how they should go about applying to Washburn if they are not current or past university students. Because this course is accessible to radiologic technologists, students may meet the criteria to enroll in the seminar in one of several ways. These include: a current Washburn student, a former Washburn student, or a student new to Washburn University. If a student is new to Washburn, the online course instructions have all the details in regards to the
process of enrollment for new students. The course instructions are taken one step further for “degree seeking students, i.e., students wanting to possibly obtain a Bachelor’s Degree, or students who are taking this course simply to further their knowledge of mammography. These are classified as “non degree seeking students.” The course instructions also are broken down to explain when the course officially starts or is open access, and offers suggestions or access to a new student orientation in order for students to become acclimated to D2L.

In addition, the course instructions sheet is where students are told the basic set-up of the seminar. The content of the course can be accessed under the “Content” folder, and students also can easily access the “Course Overview“ and “Syllabus,“ and the follow the preferred order of completing the content modules—obviously they are listed chronologically. It is here that students will notice that the content is displayed on PowerPoint or Word documents, that work hand in hand with the required textbook for the course, entitled, “Mammographic Imaging: A Practical Guide,” written by Valerie Andolina and Shelly Lille.

Thus, the current mammography seminar course is online driven. In fact, the material or educational content of the course is comprised entirely online. The required educational material is quite organized, and set up in module format by content or topic/subtopic areas. Following each online module, there is of course a required quiz or exam for the students to take and test their skill knowledge. This is considered “Phase One.” The mammography seminar consists of three distinct phases, all of which will be discussed in great detail.
Although students can take the content quizzes whenever they feel ready, there is suggested statements that encourage students to take these quizzes following each module. Again, there is a time restriction, each quiz or exam is "open book" and students are allowed to take each quiz or exam up to two times, with the best score being recorded. Typically speaking, the students have approximately one month to complete the educational content modules, as well as complete all quizzes and exams.

The course instructions sheet also states the overall intended learning outcomes. These learning outcomes are essential to the course content, therefore they will be listed directly from the course instruction sheet below:

Outcomes:

1. Provide radiologic technologists an opportunity to advance their education into the practice area of mammography.
2. Establish a base of knowledge in breast anatomy, physiology, and pathology
3. Discuss the concepts of mammography equipment with both analog and digital imaging.
4. Establish a knowledge base of factors that govern and influence producing and recording mammographic images.
5. Explain the latest MQSA requirements.
6. Describe advanced positioning for diagnostic views and non-routine patients.
7. Discuss the technologist's role in patient education and breast assessment.
8. Establish a knowledge base in interventional procedures in mammography
9. Develop an understanding of the various imaging modalities involved in breast imaging; i.e., sonography and magnetic resonance imaging. (Roberts, pg.1-2)
Another key aspect of any course instructions sheet is contact information. Jera has designated a brief section on who has a teaching role in this course. Jera is the main instructor, responsible for educational content material; the Word documents and PowerPoint presentations, and generalized content questions related to: breast anatomy, pathology, and viability, breast imaging modalities, and procedures, instrumentation and quality assurance questions, equipment questions, both digital and analog and quality assurance related questions, and any technical factor questions. Becky Lackey, who has been involved in the mammography seminar since the earliest days, should be contacted with questions related to: MQSA regulations, medical auditing, ARRT standards and inventory, any patient-related questions such as patient communication and medicolegal issues, breast imaging procedures, and routine positioning questions, any questions related to interventional procedures, and other basic quality control questions (Roberts, personal communication, September-November 2016).

The course instruction sheet also outlines the parts or multiple aspects involved in the mammography seminar. Phase one is also step one, or the completion of all the educational content modules. Throughout this paper, educational content may be referred to as “phase one.” Students must complete all online course modules as well as pass each corresponding quiz/exam. Phase two on the other hand, consists of one full Saturday during the course duration in which students work hands-on in the field of mammography; practicing their positioning skills on a live, volunteer female model, as well as work on performing quality control (or QC) tests that each and every MQSA certified mammography facility,
department and machine must comply with in the order to stay in operation. Phase
three is the final step of the mammography seminar in which students are required
to perform twenty-five screening mammograms, to include the standard images
(RCC, LCC, RMLO, LMLO), under direct supervision by a board certified
mammographer. Since the vast majority of students who enroll in the Washburn
mammography seminar are full time working radiologic technologists, many
choose to do this step at a facility in which they currently work, or one affiliated
with their current place of work. More of "phase two" and "phase three" will be
discussed in detail later in this paper.

Another key piece of information for students taking the seminar is a
syllabus. Some of the previous information discussed was included both the
syllabus as well as the course instructions handout. Additional information on the
syllabus includes a grading scale. How is this course graded? Similar to that of a
radiologic technology program, the mammography seminar has a stricter grading
scale than that of many typical higher education courses. This is due to the fact that
students must pass their board registry with a 75% or higher. Therefore, the
instructors who teach these allied health courses believe that a more strict grading
scale only benefits the students come board exam time. The grading scale for the
seminar is as follows: 92-100 (A), 82-91 (B), 75-81 (C). The distribution of grades
includes 90% content based (module quizzes and exams), and 10% participation
(attendance at the Saturday on campus session).

Any quality course syllabus should include an overview of the content
information to be covered throughout the course. The mammography seminar
syllabus is broken down into content information by what is required from different governing bodies. This includes: the ASRT's (American Society of Radiologic Technologists) Curriculum for Mammography, the ARRT's (American Registry of Radiologic Technologists) Mammography Certification Handbook, and MQSA requirements. More specifically, this area is broken down on the syllabus as follows:

**ASRT:**

1. Breast anatomy, viability, and pathology
2. Correlative physical breast assessment
3. Department organization and regulation
4. Equipment
5. Interventional procedures
6. Mammography quality management
7. Positioning
8. Sonography and mammography
9. Technical applications

**ARRT:**

1. Patient Care: education and assessment
2. Instrumentation and quality assurance
3. Anatomy, physiology, and pathology
4. Mammographic techniques and image evaluation
5. A total of 115 board registry questions

**MQSA:**

1. Required: 40 hours of initial training.
2. Completion of 25 screening mammograms under direct supervision of a certified mammographer (counts as 12.5 of the total 40 hours)
3. Required: 8 FDA hours of instruction in film-screen mammography
4. Required: 8 FDA hours of instruction in digital mammography (Roberts, pg. 2)
Phase two of the mammography seminar plays a crucial role for the students as well. During this portion of the course, the enrolled students are required to meet at a designated site for hands-on lab experience. The students are divided into groups, with all students meeting at the Women’s Center at Stormont Vail Health Care in Topeka. During this Saturday session (running typically from 8:30am to 3:00pm), students will cover three areas: performing quality assurance for digital mammography, screening positioning using a live model, and watching a positioning DVD. (Roberts, pg. 1) With the average number of students enrolled in this annual summer course, it is highly unlikely that any students will miss the lab component of the seminar. To date, no students have missed the lab portion and thus had to make it up. Therefore, it is safe to assume most students who enroll in this five-week course realize their commitment once they enroll.

When students work with the live model, they will position to include the standard screening mammography views of RCC (right cranio-caudal), LCC (left cranio-caudal), LMLO (left mediolateral oblique), and RMLO (right mediolateral oblique). The students work one on one with Becky Lackey, who is a registered mammography technologist who works at Stormont Vail Health Care in women’s imaging. Becky has been affiliated with the mammography seminar since nearly the program’s start date in 2007.

Obviously, as with any diagnostic imaging examination, hands-on experience on real people is of utmost importance. Students are able to get much more valuable insights with this type of lab experience over simply reading or learning
about how to position. Hence, this type of “hands-on” experience is required in order to sit for mammography boards. Washburn pays a volunteer “patient” to act as a stand in for the students to get first hand positioning experience. Students can practice positioning, but obviously do not expose the volunteer patient to radiation.

The second portion of phase two is the QC (quality control) lab. Jera takes on this task of explaining the QC process, and performing some actual QC tests that student mammographers may very likely be involved in if they routinely perform mammography.

Next, phase three comes into play. Because a hands-on component of mammography plays such a crucial role, there is a requirement for each student enrolled in the seminar to perform 25 screening mammograms under direct supervision of a registered mammographer. Since the vast majority of these students are full time staff technologists, these 25 mammograms can be performed at any facility, after approval through the instructor. Most students choose to perform these 25 mammograms at their place of employment; however Stormont Vail in Topeka accepts students as well if the student needs a different clinical site. This phase three portion is also considered a “clinical experience.” Please note: this clinical experience portion is a requirement for the mammography seminar; however, the ASRT requires more student imaging, and other aspects of mammography to be learned/observed/explored before the student can apply and take their mammography board registry.

The additional requirements are referred to as a “preceptorship.” At this point it is necessary to include a brief overview of a mammography preceptorship in
order that its importance be fully understood as a crucial role for students enrolling in the mammography seminar. In addition to the course requirements mentioned previously, students who want to sit for mammography boards must do further training, specifically from an actual clinical side of mammography. Jera and others who are in charge of preparing the students with the educational content and brief hands on experience with positioning and QC labs have done their part; the remainder is up to the student/s.

Specifically, the ARRT requires the following from a mammography preceptorship:

Mandatory Procedures:

MQSA Requirements:
1. Completing 25 supervised screening mammograms on live patients

Mammographic Examinations:
1. Student must perform 75 mammograms (either screening or diagnostic) on live patients

Patient Preparation/Education
1. Provide for patient comfort and cooperation by helping patient become familiar with both the equipment and procedure
2. Be able to record accurate patient clinical information/history, that which is relevant to mammographic examination
3. Proper documentation of lumps, scars, areas of pain, etc.
4. Respond to any patient questions related to CBE’s, procedures, the mammogram, etc.

Mammographic Procedure:
1. Appropriate selection of mammographic equipment utilized for the exam
2. Documentation of correct breast imaged/projection used
3. Position patient according to department protocol
4. Select appropriate technical factors which can be patient specific

Quality Control: (please note that some of these tests are to be performed by the student more than once-hence the number beside the test)
1. Accurate QC documentation of the following
   a. Laser imager (10)
   b. Interpretation workstation (5)
   c. Monitor cleaning (5)
   d. Phantom imaging (5)
   e. Artifact evaluation, Detector calibration, FFDM (5)
   f. SNR, CNR, MFT (required by machine manufacturer) (5)
   g. Compression force (2)
   h. Repeat analysis (2)
   i. Visual checklist (2)
   j. Review of medical physicist’s annual survey (1)

Radiographic Critique/Interpretation:
1. Student must review 10 mammographic examinations with a
   MQSA qualified interpreting physician to evaluate radiographic
   technique, positioning, breast anatomy, and pathology

Elective Procedures:
   The student must observe, assist with and/or participate in at least four of
   the following procedures:
   1. Needle Localization
   2. Breast MRI
   3. Breast Ultrasound: imaging, biopsy, FNA or cyst aspiration
   4. Stereotactic Procedure
   5. Breast Implant imaging
   6. Ductography/Galactography
   7. Diagnostic work-up
   8. Clip placement (ARRT, pgs. 1-3)

After completion of the mammography seminar, and a preceptorship,
students may submit their necessary paperwork and request a time to take their
mammography registry. Students do have up to two full years after completing a
mammography seminar/course in order to finish up a preceptorship and request to
take their board exams. Jera stated that on average, the majority of students who
have taken and completed the Washburn mammography seminar, most, on average,
take/wait about one year to finish up the necessities before taking their board exam.
As with any higher education course, students are asked to fill out course evaluations in order to help the university, the instructor/s, and anyone else involved to see where their students are struggling, and where there could be areas of improvement. The mammography seminar is no different. With this course being offered to a very specific group of individuals, the areas of improvement and the areas of most student struggle are quite specific.

Jera mentioned that on average, most students who have taken the seminar since 2007, on average, seem to struggle academically most with going from film-screen mammography to digital mammography. To elaborate, the majority of these technologists have worked in the field for a while, and many worked on film screen equipment. Mammography, because it is not generally known as a “money maker” type of imaging modality, is typically one of the last modalities departments will switch to digital equipment. Therefore, the switch involves not only a significant change of equipment, but also a change in mindset. The techs are looking at dramatically different images, image quality, technical aspects, and other new challenges due to the clarity of a digital image (Roberts, personal communication, Sept-Nov., 2016).

As far as the overall concept of an online seminar to an on campus seminar, Jera has found that students prefer the online format. This is in part due to the infusion of technology within the field of radiology across the board. Also, the 24-7 access to all learning modules, quizzes, and exams from the beginning of the course to the closing allows the students to go at their own pace, and at their own time convenience.
Of course, universities and instructors are always looking for ways to improve their courses, whether it be accessibility, student enrollment, or educational content improvement. This mammography seminar is no different. Jera has mentioned and is actively working on one specific improvement to the educational content component. At present, there are no audio recordings available to students that go along with an outline, powerpoint, or word learning modules. This is quite a task to take on, since there are multiple learning modules, and documents to go along with each, and one person to perform all the audio recordings. However, this is a project for the future.

It is important with any online course that the quality of the course, the accessibility of the course, and the concept of the course overall can be measured. This means that the course should meet certain auditable criteria in order that it can be considered at the academic competency level it needs to be. Therefore, a rubric will be included within this reading material with measureable scores to show if in fact the course meets necessary standards. Following are two rubrics, borrowed from Vickie Kelly, MHS director (Kelly, personal communication, November 2016). For the sake of this paper, the rubrics will show outcomes to be measured, and if the online Mammography Seminar meets the criteria.
<table>
<thead>
<tr>
<th>Standard</th>
<th>Met?</th>
<th>Reviewer Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructions make clear how to get started and where to find various course components.</td>
<td>Yes</td>
<td>*please note: comments will be discussed below</td>
</tr>
<tr>
<td>Learners are introduced to the purpose and structure of the course.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The course learning objectives, or course/program competencies, describe outcomes that are measurable.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The module/unit learning objectives or competencies describe outcomes that are measurable and consistent with the course-level objectives or competencies.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>All learning objectives or competencies are stated clearly and written from the learner’s perspective.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The relationship between learning objectives or competencies and course activities is clearly stated.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The learning objectives or competencies are suited to the level of the course.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The assessments measure the stated learning objectives or competencies.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The course grading policy is stated clearly.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Specific and descriptive criteria are provided for the evaluation of learners’ work and are tied to the course grading policy.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The instructional materials contribute to the achievement of the stated course and module/unit learning objectives or competencies.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Both the purpose of instructional materials and how the materials are to be used for learning activities are clearly explained.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The learning activities promote the achievement of the stated learning objectives or competencies.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Learning activities provide opportunities for interaction that support active learning.</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>The instructor’s plan for classroom response time and feedback on assignments is clearly stated.</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>The tools used in the course support the learning objectives and competencies.</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
## I. Instructional Design

Instructional design refers to the analysis of learning needs and the systemic approach to developing an online course in a manner that facilitates the transfer of knowledge and skills to the learner through the use of a variety of instructional methods, which cater to multiple learning styles, strategies, and preferences.

### A. Learning Outcomes

| Course Outcomes | Course outcomes are present and explicitly stated to the learner. | Yes |
| Module Outcomes | Module outcomes are clearly presented to the learner and are aligned with the larger course outcomes. | Yes-most |

### B. Structure

| Sequence | Content is sequenced and structured in a manner that enables learners to achieve the stated goals. | Yes |
| Chunking | Information is "chunked" or grouped to help students learn the content. | Yes |
| Purpose | Purpose of learning activities is clearly presented. | Yes |

### C. Course Information

<p>| Description | A course description is provided. | Yes |
| Instructor Information | Instructor information is available to student with contact, biographical, availability information, and picture. | Yes-via website |
| Instructional Materials | Students are provided with a list of supplies such as textbooks and other instructional materials needed for the course. | Yes |
| Credit Hours | Course provides information regarding number of Credit Hours earned for successful completion | Yes |
| Content | A clear concise list of modules and activities that will be completed within each of the course modules/chapters/topics is provided. | Yes |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>6. Grading Policy</td>
<td>Grading policy is provided including grading scale and weights.</td>
<td>Yes</td>
</tr>
<tr>
<td>7. Calendar</td>
<td>Calendar of due dates and other events is provided.</td>
<td>Yes</td>
</tr>
<tr>
<td>8. Technical Competencies</td>
<td>A list of technical competencies necessary for course completion is provided.</td>
<td>No</td>
</tr>
<tr>
<td>9. Technical Requirements</td>
<td>A list of technical requirements such as connection speed, hardware, and software is provided.</td>
<td>No</td>
</tr>
<tr>
<td>D. Instructional Strategies</td>
<td>A variety of instructional delivery methods, accommodating multiple learning styles are available throughout the course.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>The selected tool for each activity is appropriate for effective delivery of the content.</td>
<td>Yes</td>
</tr>
<tr>
<td>E. Academic Integrity</td>
<td>Course abides by copyright and fair use laws.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>A Code of Conduct including netiquette standards and academic integrity expectations is provided.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

II. Communication, Interaction, & Collaboration

Communication, Interaction, and Collaboration addresses how the course design, assignments, and technology effectively encourage exchanges amongst the instructor, students, and content.

A. Interaction Activities And Opportunities (Need At Least 2)

<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1. Student-Student</td>
<td>Learning activities and other opportunities are developed to foster Student-Student communication and/or collaboration.</td>
<td>Yes</td>
</tr>
<tr>
<td>2. Student-Instructor</td>
<td>Learning activities and other opportunities are developed to foster Student-Instructor communication and/or collaboration.</td>
<td>Yes</td>
</tr>
<tr>
<td>3. Student-Content</td>
<td>Learning activities and other opportunities are developed to foster Student-Content interaction.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

B. Discussion Organization and Management (Only applicable if you use discussions in your course)

<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1. Organization</td>
<td>Discussions are organized in clearly defined forums, topics and/or threads</td>
<td>N/A</td>
</tr>
<tr>
<td>2. Access</td>
<td>Access is available to individuals and groups based upon discussion's purpose such as private conversations between student and instructor, group work, and class interactions.</td>
<td>N/A</td>
</tr>
<tr>
<td>3. Role</td>
<td>The instructor's role in discussion activities is clearly defined.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

C. Group Work (Only applicable if you use groups in your course)

<p>| | | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>1. Task</td>
<td>A statement of the group's overall task is provided with clear and concise outcomes that are appropriate, reasonable, and achievable. A statement of how, when, and where the final product will be delivered is provided.</td>
<td>N/A</td>
</tr>
<tr>
<td>2. Formation</td>
<td>Rules for forming groups and assigning roles within each are clearly stated.</td>
<td>N/A</td>
</tr>
<tr>
<td>3. Management</td>
<td>Benchmarks and expectations of group participation are clearly stated.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

III. Student Evaluation and Assessment
Student Evaluation and Assessment refers to the process your institution uses to determine student achievement and quality of work including the assigning of grades.

### A. Goals and Objectives

| 1. Aligned | Assessment and evaluation are aligned with learning objectives. | Yes |
| 2. Communicated | Assessment and evaluation goals are clearly communicated. | Yes-somewhat |

### B. Strategies

| 1. Method | Assessments and evaluations use multiple methods and appropriate tools, such as quizzes, tests, discussion, essay, projects, and surveys. | Yes-including hands-on |
| 2. Frequency | Assessments and evaluations are conducted on an ongoing basis throughout the course. | Yes |
| 3. Academic Integrity | Assessments and evaluations are designed and administered to uphold academic integrity. | Yes |

### C. Grades

| 1. Rubric | Explicit rubric, rationale, and/or characteristics are provided for each graded assignment. | Yes |
| 2. Grading Scale | A grading scale that defines letter grades and/or weights, if applicable, is provided. | Yes |
| 3. Gradebook | A gradebook is available for checking progress. | Yes |

### D. Feedback

| 1. Delivery | A statement explaining when, what, and how students should receive feedback is provided. | |

### E. Management

| 1. Time | A statement of the time allocated or deadline for each assessment is provided. | Yes |
| 2. Availability | A date/time when the assessment will be available is provided. | Yes |
| 3. Retake | A statement indicating whether or not the assessment can be retaken is provided. | Yes |

### IV. Learner Support & Resources

Learner Support and Resources refers to program, academic, and/or technical resources available to learners.

### A. Institutional/Program Support and Resources

| 1. Policies | Links to institutional/program information and/or policies and procedures are provided. | Yes |
| 2. Technical Support | Links, e-mail addresses, and/or phone numbers to technical support are provided. | No |
| 3. ADA Support | Statement of ADA Compliance and request for special services is provided. | No |

### B. Academic Support and Resources

| 1. Orientation | Opportunities for program and/or course orientation are provided. | Yes |

### V. Web Design

Web design refers to the use of Web pages, graphics, multimedia, and accessibility standards in the web pages of a course under the course developer's control.
### A. Layout/Design

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1. Scrolling</td>
<td>Scrolling is minimized.</td>
</tr>
<tr>
<td>2. Consistency</td>
<td>Consistent layout design orient users throughout the site.</td>
</tr>
<tr>
<td>3. Fonts</td>
<td>Fonts meet the following standards:</td>
</tr>
<tr>
<td></td>
<td>- Uses dark font colors on light backgrounds</td>
</tr>
<tr>
<td></td>
<td>(preferably use black text on a white background)</td>
</tr>
<tr>
<td></td>
<td>- Avoids extremely bright colors as a background colors.</td>
</tr>
<tr>
<td></td>
<td>- Uses one font throughout the site.</td>
</tr>
<tr>
<td></td>
<td>- Avoids overuse of all CAPS, bold or italics</td>
</tr>
<tr>
<td></td>
<td>- Avoids underlining words, as the screen reader can mistake it for a navigation link.</td>
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</tbody>
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### B. Use of Multimedia

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<tbody>
<tr>
<td>1. Technical Requirements</td>
<td>Audio/Video hardware requirements do not extend beyond the basic sound cards, speakers, and video players unless appropriately needed to meet course goals and objectives.</td>
</tr>
<tr>
<td>2. Audio Standards</td>
<td>Audio files meet minimum standards in the following areas:</td>
</tr>
<tr>
<td></td>
<td>- Audio quality is clear.</td>
</tr>
<tr>
<td></td>
<td>- Audio file length is adequate to meet the goals of the activity without being too large to restrict users' ability to download the file on computers with lower bandwidths.</td>
</tr>
<tr>
<td></td>
<td>- A written transcript is provided with all audio files.</td>
</tr>
<tr>
<td></td>
<td>- Audio file length is adequate to meet the goals of the activity without adding unnecessary information.</td>
</tr>
<tr>
<td></td>
<td>- Audio player required is compatible with multiple operating systems and requires only a standard, free plug-in.</td>
</tr>
<tr>
<td>3. Video Standards</td>
<td>Video files meet minimum standards in the following areas:</td>
</tr>
<tr>
<td></td>
<td>- Video quality is clear.</td>
</tr>
<tr>
<td></td>
<td>- Video file length is adequate to meet the goals of the activity without being too large to restrict users' ability to download the file on computers with lower bandwidths.</td>
</tr>
<tr>
<td></td>
<td>- A written transcript is provided with all video files.</td>
</tr>
<tr>
<td></td>
<td>- Video file length is adequate to meet the goals of the activity without adding unnecessary information.</td>
</tr>
<tr>
<td></td>
<td>- Video player required is compatible with multiple operating systems and requires only a standard, free plug-in.</td>
</tr>
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</table>

### C. Use of Images

<p>| | |</p>
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1. Images</td>
<td>Images meet the following standards:</td>
</tr>
<tr>
<td></td>
<td>- Images are clear</td>
</tr>
<tr>
<td></td>
<td>- Image files are optimized for efficient loading.</td>
</tr>
<tr>
<td></td>
<td>- Use of animated images is limited to only those that contribute to the learning experience – supporting the course content.</td>
</tr>
<tr>
<td></td>
<td>- Avoids animated or blinking images, text or cursors. These can cause seizures for some people.</td>
</tr>
<tr>
<td></td>
<td>- All images have alt texts/long descriptions attached to them.</td>
</tr>
</tbody>
</table>

### D. Links
WASHBURN MAMMOGRAPHY SEMINAR: AN ANALYSIS

| 1. Link Identity | Links are obvious based on visual cues such as color, underlining, and text directives (e.g., Start here). Avoids using "click here" or full URL for link text. | Yes |
| 2. Link Function | Course has no broken links. | Yes |
| 4. Link Target | Links open in appropriate windows or frames. | N/A |

VI. Course Evaluation

Course Evaluation refers to the processes and mechanisms used to elicit feedback from learners for the purpose of course improvement.

A. Layout/Design

| 1. Instruction | Opportunities for learners to offer feedback to instructor on all aspects of the course (structure, instruction, and content) are provided. | Yes |

Overall, this course meets the requirements necessary to be an effective and appropriate online course. As the reader can notice, key components are ease of use and accessibility for students, effective and adequate educational content, timely grading, and direct access to the instructor to name a few. The content (which for this course is power point presentations) matches what is needed to prepare students who are planning to take their mammography boards. All of the educational content matches the ARRT and ASRT requirements (this material was read through and confirmed with the actual online presentations students review) (Roberts, online mammography seminar). The above rubrics were given from Vickie Kelly, MHS Director. There are practical online resources such as “Quality Matters” and “Online Learning Consortium” that provide higher education individuals (and others) with subscriptions that will assist an instructor of the online education type with developing and critiquing online set-ups.

As with any online course, it is helpful to have an outside person to review and analyze in order to see if any suggestions or improvements can be made.
Education is a field in which change is inevitable, and usually welcomed, if it in fact will enhance the overall educational content or experience for students and faculty alike. Some suggestions for the online mammography seminar course are as follows.

First, the students may benefit from an audio component of this course. The power points are extremely valuable, and do not need to be replaced by all audio presentations. However, in order to add an additional learning modality such as audio recordings may be of great benefit to students who are struggling with understanding certain topics. The audios could be brief, and possibly limited to those topics that the instructor has found a majority of students tend to struggle with, such as differences or transitions from film screen mammography to digital mammography. There is something to be noted about the convenience of online educational content components, however, some individuals learn well hearing information in addition to reading it, therefore, an audio component could prove to be a very valuable asset to this course. At present, Jera Roberts is considering adding this component to the online seminar (Roberts, personal communication, Sept-Nov, 2016).

A second suggestion is this: that the online quizzes show what questions students missed. The understanding is that the quizzes are graded automatically, and can be taken up to twice, with the highest score recorded. However, it would be quite valuable for students to see what questions they missed in order to gain a better understanding of where their weaknesses lie content wise.
In conclusion, radiologic technologists who are planning to become board-registered mammographers would benefit from the online mammography seminar course offered by Washburn University. Those technologists will find that the educational content of the course is sufficient, that the hands-on component (which includes quality control (QC) training, and positioning on a live volunteer "patient"), and the supervised 25 screening mammograms will prepare them to take their Mammography Registry.
Reference List:


