

ONLINE LEARNING PRIOR TO ONSITE TRAINING

BRITTANY MANN

MHS, Washburn University, 2018

A PROJECT SUBMITTED TO THE DEPARTMENT OF ALLIED HEALTH
OF WASHBURN A PROJECT UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF HEALTH SCIENCE

Committee Chairperson

Department Member

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WASHBURN UNIVERSITY OF TOPEKA

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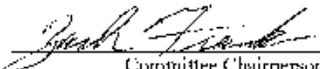
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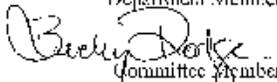
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Master of Health Science Degree

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Abstract

Creating online courses in conjunction with onsite or face-to-face training involves many detailed considerations. It will be proven that administrators who construct on-line courses and support onsite applications training must take into consideration both didactic and clinical learning objectives to develop a high-quality course that best serves the technologist and provides consistent information about the equipment. The role of a radiographer will be reviewed, outlining professional expectations to better construct pre-work courses. Some aspects for the instructor to consider include course design, method of content delivery, assessment, benefits of online learning, ADA accessibility, legal requirements and technological requirements when creating the online pre-work courses. This paper examines the significance of blended learning along with the benefits to creating online courses prior to onsite GE Computed Tomography (CT) applications training.

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Healthcare facilities often purchase General Electric (GE) diagnostic imaging equipment, specifically computed tomography (CT) scanners. Typically, once the scanner is purchased and installed, a clinical applications specialist from GE is sent to the facility to deliver training to the staff on the equipment. In the field, customers have stated that they would have gained more knowledge from the training if they were exposed to the scanner prior to onsite applications training. There are classes offered at GE Healthcare headquarters in Milwaukee, Wisconsin, but often most of the staff is not able to participate due to travel and expenses. Creating an online self-paced course that the technologists can take prior to training could potentially aid in learning about the new scanner prior to onsite applications training.

Purpose

Clinical applications training programs can deliver a blended learning approach that combines online and face-to-face training, innovative technology, and ongoing support. It also assures a rich learning experience that will help build the skills, knowledge, and competencies necessary to work safely and effectively in a clinical setting and empower healthcare professionals to use GE's equipment at its highest level of performance. The online course curriculum will be presented in knowledge-progressive phases, beginning with self-paced, online courses that technologists, or learners, will take prior to the onsite training. Learners will benefit from the flexibility and mixed-use of learning channels and media formats presented in the curriculum because of its appeal to different learning styles. The curriculum also caters to varying facility circumstances and needs.

Significance of the project

A “Pre-work” online training course will be developed as an educational resource prior to onsite applications training. This course can expose the technologists to the GE user interface, layout, workflow, and terminology prior to the go-live week. This course will not only provide exposure but will also provide a chance for follow up questions and modules for the staff to use as practice. This online course will better prepare the technologists prior to working on the system, allowing for a smooth transition during the go-live week.

Not only will the online course be created, but best practice research, assessments, American with Disabilities Act (ADA) compliance, technological compliance, and educational compliance will also be supplied. Included will be research supporting the best way to assess that the technologists are grasping and learning the concepts. This can be done by providing assessments, “check your knowledge” exercises etc. ADA compliance will need to be researched to ensure that each student is given a fair chance to learn. By researching ADA compliance, courses will be able to be tailored to the different types of learning styles. Different types of software, webpages and user interfaces will be researched to ensure that the course is technologically compliant and compatible with different operating software and hardware. Finally, there will be research supporting educational compliance to ensure that the information provided through the course is approved by GE and is delivering the correct material for the pre-work objectives.

Project Objectives

- Analyze recent curriculum changes and proposed clinical revisions for GE Healthcare clinical applications training.
- Assess the needs of online learners prior to onsite CT applications training.
- Implement necessary changes to course curriculum to meet the needs of the workflow/ user interface and better align course curriculum.
- Review methods and concepts related to online learning for the GE CT scanners and advanced software.
- Determine appropriate methods of online instruction and assessment.
- Create an online course to enhance student engagement and learning prior to onsite applications training.
- Apply best practices of online learning to develop an effective online course, preparing students for onsite training.

Background of the Activity

The National Occupational Standards for CT scanning represent the basic skills for all radiographers working in CT whether on a rotational basis or as a permanent CT team member. In both cases, the radiographer must have expertise that builds upon pre and post- registration education and training to work safely and effectively. In addition to this, radiographers may undertake further training and education to Master and Doctorate levels to extend their scope of practice to advanced and consultant practitioner standards. The College of Radiographers offers an accreditation scheme for advanced and consultant level practice (Johnson, 2017). The

radiographer has a duty to understand medical terminology and abbreviations to produce high quality CT images safely. They will apply their anatomical, physiological and radiographic knowledge to ensure the scan is appropriate, justified and meets the needs of the patient. They must also ensure that the patient is safe and comfortable and always treated with respect, compassion and dignity. Radiographers employ knowledge of, and adhere to, national and local policies on manual handling, basic and immediate life support, infection control, patient identification and record management (Johnson, 2017). The technologists not only have to comply to the standards above, but also are expected to fully understand how to operate the equipment with which they are working. Some technologists have different learning styles and need more exposure to the scanner prior to the go-live week of training to be successful.

Appropriate training on new equipment and continuous training on existing equipment not only helps the technologist and the facility, but also helps the patient. The more the technologist knows about the scanner they are using, the more they can tailor the exams for their patients. Contemporary CT scanners are designed with many features to optimize radiation dose and apply it more efficiently. These include automatic tube current modulation, individual kVp optimization, and iterative reconstruction. However, continuous education of personnel to ensure that they are knowledgeable about and proactively apply dose optimization features is essential. A study from Austria published online in the *European Journal of Radiology* reinforces the fact that training and retraining increases awareness, compliance and continuous optimization (Keen, 2015). The study compared previous pediatric radiation doses compared to new pediatric radiation doses. Mandatory training programs were implemented prior to the study to ensure that the radiologists and technologists were adequately trained to ensure consistency. The statistical

analysis showed that a statistically significant reduction in dose for cranial, thoracic, and abdomen/pelvis scans was achieved. The Dose Length Product (DLP) is the product of the scan length for a group of scans. This number can be summed over the entire exam to give an estimate of the total dose. The value is expressed in milliGray (Morgan, 2018). The percentage of scans performed with DLPs exceeding the German Dose Reference Levels (DRLs) was reduced from 41% to 7% for cranial CTs, from 19% to 5% for thoracic CT, from 9% to zero for abdomen-pelvis CT, and from 26% to zero for trunk CTs. When Austrian DRLs for cranial CTs were used, the reduction was from 21% to 3%; DRLs for thoracic CT had a similar impressive reduction, from 15% to 2%, (Hojreh, Weber & Homolka, 2015). The authors noted that the radiologists and radiographers at the Medical University of Vienna were highly experienced and very well trained. They point out that methods to reduce radiation dose are continually being refined and improved upon, and that continuous education is critical to keep everyone utilizing these methods to achieve the greatest potential for radiation dose reduction.

Considering the demands of the profession and the need to continually align with regular curriculum and clinical guidelines, the decision has been made to design an online course offered prior to onsite training. Since normal onsite training consists of a face to face teaching, the course design must consider online learning theories and models to create an effective online course. This process will involve the review of educational and assessment theories as well as best practices for applying relevant models within an online environment to enhance technologist engagement and knowledge.

Literature Review

Online Learning

In 2010, the U.S. Department of Education released a meta-analysis and review of empirical studies focused on online learning in K-12 schools and higher education from 1996-2008. Their findings revealed that students in online courses performed modestly better than students learning the same material through face-to-face instruction. In addition, they reported that blended instruction combining online, and face-to-face elements had a larger advantage than purely online instruction (Means, Toyama, Murphy, Bakia & Jones, 2010). Although these results suggest that blended learning environments can provide a learning advantage when compared to purely face-to-face instruction, the researchers emphasized the findings do not demonstrate that online learning is superior, rather it was the *combination* of elements in the treatment conditions that produced the observed learning advantages. In other words, it is important for the instructor to create an interactive, supportive, and collaborative learning environment for students to reap the potential benefits afforded by online learning.

A recent survey of 1,500 individuals nationwide, who were recently enrolled, currently enrolled, or planning to enroll in an online course found that a wide variety of students were drawn to online learning (Aslanian & Clinefelter, 2012). However, they also identified the following key themes in online students' responses:

- Most online students have several responsibilities in life, so they seek convenience and flexibility when furthering their education. Millions of post-secondary students have

turned to online education because it enables them to fit education around their work and family responsibilities and to study anytime and anywhere.

- Online students unquestionably value the independence, self-direction, and control online education offers them. Among several factors that drive them to online programs, students most often point to “the ability to study when and where I want” and “the ability to study at my own pace” (Aslanian & Clinefelter, 2012).

When designing a course, it is important to develop as comprehensive a picture as possible of the specific students who will be enrolling in the class (Angelino, Williams & Natvig, 2007). Gaining a sense of students’ prior knowledge and technology competency will help identify what supports they will need and tailor instruction accordingly. A few ways to gain these insights include asking students to complete an online survey, concept inventory, or pre-assessment. In addition, students can reflect on their prior knowledge and experiences through an online discussion or blog post.

Blended learning (also known as hybrid or mixed-mode courses) are classes where a portion of the traditional face-to-face instruction is replaced by web-based online learning (UCF, 2018). Blended learning is typically as flexible, engaging and learner- centered compared to face- to face instruction. Online instruction can include many of the same forms of interaction found in face-to-face courses. In fact, blended learning encourages interaction, collaboration and communication, albeit often asynchronously. Blended learning allows an individual to utilize an online platform along with traditional face- to- face learning to absorb the material at their own pace. Integrating the traditional face- to- face learning in the blended learning approach helps

keep the socialization benefit that face -to-face learning offers. Healthcare is constantly changing. With advances in medicine, the knowledge needed is also changing and must be retained by practitioners. Online learning could be beneficial in aiding in long-term retention of this information. Individuals may not always fully absorb or retain the information received in didactic lectures or may need more time and accessibility to review the material (Suliman, Hassan, Athamneh, Jenkins & Bylund, 2018). Hybrid learning has been used successfully in the medical environment. It has been shown that participants' knowledge was superior to previous groups that did not use hybrid learning (Suliman et al., 2018).

ADA Compliance

Due to the shift in education, not only do on-campus courses have to follow ADA compliance, but so do online courses. ADA is the acronym for The Americans with Disabilities Act. The Americans with Disabilities Act (ADA) became a law in 1990.

The ADA is a civil rights law that prohibits discrimination against individuals with disabilities in all areas of public life, including jobs, schools, transportation, and all public and private places that are open to the public. The purpose of the law is to make sure that people with disabilities have the same rights and opportunities as everyone else. The ADA gives civil rights protections to individuals with disabilities like those provided to individuals based on race, color, sex, national origin, age, and religion. It guarantees equal opportunity for individuals with disabilities in public accommodations, employment, transportation, state and local government services, and

telecommunications. The ADA is divided into five titles (or sections) that relate to different areas of public life (ADA, 2018)

In 2008, the Americans with Disabilities Act Amendments Act (ADAAA) was signed into law. While it did not become effective until January 1, 2009, it significantly impacted the way the word “disability” is defined. These changes in the definition of disability in the ADAAA impacted all titles of the ADA (ADA, 2018).

Courses offered to students should accommodate all learning styles and should be accessible following ADA compliance. Regardless of disability or not, all individuals must have the right to be able to equally obtain all course information. The definition of "accessible" used by the Office of Civil Rights and the U.S. Department of Education regarding inaccessible IT is as follows:

"Accessible" means a person with a disability should have the same opportunity as a person that is not disabled to acquire the same information, engage in the same interactions, and enjoy the same services in an equally effective and equally integrated manner, with the same ease of use (Burgstahler, 2017).

Institutions should make accommodations for each student regardless of their learning preference disability. "Accommodations" are adaptations made for specific individuals when a product or service is not accessible, such as providing captions on a video only when a specific student who is deaf requests them rather than including them in the original product design (Burgstahler, 2017). Some students may need more time to take assessments for whatever reason, allowing them an extended period would accommodate those individuals. Some

individuals might have a hearing impairment and need to use videos or visual aids to comprehend the information. Other individuals might be blind or dyslexic and need the visual options altered or maybe need more audio tools to absorb the material. These accommodations can be making learning easier for students, especially when the course is offered online and not in the traditional face-to-face environment. Proactively developing, procuring, and using accessible software, websites, videos, documents, and other IT reduces the need for accommodations (Burgstahler, 2017).

There are many different strategies to making online learning accessible. Developing a strategy that provides different ways for individuals, both with and without disabilities, to gain knowledge can be challenging. That is why it is crucial to be well rounded or exposed to different types of technology that supports learning for various disabilities and understanding their limitations. Understanding different assistive technology gives students a different approach to gain knowledge and demonstrate knowledge. Certain technology like screen readers for blind users can read the text from the page to the user. There are features within the screen reader that allow the user to skip from page to page by pressing certain keys on the keyboard. The user can only utilize some of these functions if the course is created with appropriate or compatible structure headings. It is important for the instructor to understand the limitations of this technology prior to releasing it for the student to use. The following table demonstrates examples of accessible functions for an online course, limitations of the functions and solutions for the limitations.

Table 1: *Adding accessible functions to assistive technologies*

Assistive Technology Limitation	Solution
Emulates the keyboard but may not fully emulate the mouse	Design websites and software to operate with the keyboard alone
Cannot read content presented in images	Provide alternative text
Can tab from link to link	Make links descriptive
Can skip from heading to heading	Structure the content with hierarchical headings
Cannot accurately transcribe audio	Caption video and transcribe audio

Note. Reprinted from ADA Compliance for Online Course Design by Burgstahler (2017).

Retrieved from <https://er.educause.edu/articles/2017/1/ada-compliance-for-online-course-design>

When designing informational material such as hand-outs or PowerPoint presentations, there are specific fonts that are easier to read than others. Sans serif fonts such as Arial and Helvetica are the easiest fonts to read and are font styles that do not have additional strokes attached to the letters. Other fonts that should be avoided due to the additional strokes of the font include Times New Roman and Palatino (Rabidoux & Rottman, 2017). Once a sans serif font is selected, it is best to use the same font throughout the course. Minimizing font variation helps ensure courses ADA compliant, and it can help all learners stay focused (Rabidoux & Rottman, 2017).

Additionally, course designers should also focus on things such as usability, accessibility and readability when choosing text design. The best option for readability is a black font with a white background. If instructors want to use color, they need to avoid using extremely bright background colors, such as red (Rabidoux & Rottman, 2017). It is best to have a dark-colored font on a light-colored background, also known as high contrast when focusing on usability and accessibility (Rabidoux & Rottman, 2017). It is recommended to avoid red-green or yellow-blue combinations as contrasting colors because individuals with colorblindness are unable to differentiate the text from the background. When choosing the text formatting, there should not be an overwhelming amount of information or graphics on the document. If bolds or italics are used, they should be kept to a minimum, and the only text that should be underlined is hyperlinked text to ensure ADA compliance (Rabidoux & Rottman, 2017).

There are ADA regulations concerning images and graphics that need to be taken into consideration. Images and graphics should be relevant to the content, easy to see and in high resolution. Alt text stands for Alternative Text and is a word or phrase that can be added to describe the image or graphic. To make images and graphics ADA compliant, it is best to avoid animated or blinking images and to add an alt tag or alt text (Rabidoux & Rottman, 2017).

Online courses are also successful when offering clear audio and video to ensure comprehension. Factors that affect using audio appropriately include minimal background noises, clear word pronunciation and consistent volume. Videos should feature minimal movement to avoid blurred refocusing and diminished resolution. Written transcription, also known as closed captioning, should be provided for all audio and video. Including appropriate

audio and video, as well as providing transcripts of audio feedback, within courses reinforces ADA compliance (Rabidoux & Rottman, 2017).

There are additional suggestions when including audio and video clips. Audio or video clips should be compatible with universal audio or video players, ensuring all students can access them. They should be short and segmented, only ranging from 3 to 10 minutes in length. MP3 (audio) or MP4 (video) file formats are recommended (Rabidoux & Rottman, 2017). All text in a course should be searchable, which allows learners to search for words or phrases within a document. If a PDF document is not searchable, an accompanying plain text version should be available. When linking documents within a course, the label of the link should have the file extension type at the end (.doc or .docx for a Word document, .ppt for PowerPoint, .xlsx or .xltx for Excel, etc.) (Rabidoux & Rottman, 2017).

Tables and charts are also beneficial tools that can represent content being covered but, like the other resources listed above, must adhere to ADA compliance. When supplying tables or charts, they need to have identifying headers and labels as well as summaries. By ensuring that all the resources listed above are included, instructors are showing that they are in compliance with ADA requirements. While exhibiting due diligence, instructors should also strive to meet all ADA compliance regulations when designing and redesigning courses (Rabidoux & Rottman, 2017).

Legal Requirements

Legal requirements go hand in hand with ADA compliance for online courses. With the advent of online courses, however, the concept of accessibility has emerged. Ensuring that an

online course is accessible by all includes removing as many barriers as possible before ever offering the course to the learner. Due to lawsuits, schools are requiring instructors to create accessible online courses, even though they can be more expensive. Prior to creating an accessible online course, instructors must become experienced with traditional print techniques. Designing online courses can be challenging. These challenges are in two broad categories: Technical and Pedagogical.

Creating accessible online courses require time, technical skills and knowledge about the software or learning management system (LMSs). Most instructors utilize the learning management system provided by the institution or use one of a third-party package. Online instruction has its own problems and challenges regarding accessibility. In class, for example, a sight-impaired student can hear and differentiate speakers and ask for immediate clarification. Neither strategy is possible with online text-based discussion boards, which form the backbone of many online courses (and which pose serious challenges for screen reading software) (Moore, 2014). When utilizing learning management systems, time constraints are typically built into courses. Instructors must remember that not all students can complete the task or comprehend the information within the preset time. This may require the instructor to increase the time allowed for students to complete tasks. Offering closed captioning to lectures or including videos can require a significant amount of time on the instructor's end, which may hinder one's ability to create the course in a timely manner.

Even if screen readers could identify and translate onscreen text with 100% accuracy (which is not the case), the very act of turning a complex textual presentation into a single continuous audio stream creates significant barriers to instruction (Moore, 2014). Most screen readers read

in the order as one would read a book, from top to bottom and left to right. Students may want to read out of order or skip around and re-read material that is out of order. The screen reader must support this method to cater to both sighted and unsighted students. Redundant frames and headings can become confusing to unsighted students because they cannot easily skip around the pages. Screen readers also may not be able to interpret maps, tables or charts correctly and may convey the wrong information without the student being able to see the material. Resources should be adapted accordingly while including a pedagogical understanding both of what needs to be conveyed and how best to convey it audibly is required (Moore, 2014).

Technological Requirements

Anytime a course is offered as remote learning, there are specific technological requirements that the course must meet along with expectations of the students or in this case the technologists. Prior to the start of courses, technologists will be sent an e-confirmation letter (to the email address they provide upon registration) with a "user ID" and a "password" as well as instructions to access courses. Although this is not specific to the courses created for the CT onsite pre-work, the following technical and software suggestions may be required when creating other online courses. The requirements may consist of things such as:

1. **Computer and Internet Connection:** Students will need regular access to a computer with internet connection. Courses may have different system requirements such as high-speed broadband access. A Macintosh system must have OS X compatible operating software along with Firefox, Chrome or Safari web browsers. A PC system must be compatible with Windows XP, Vista, 7, 8,

8.1 operating software along with Firefox, Chrome, Internet Explorer 10 or higher web browsers.

2. **Software:** Some courses may require different software that support video or audio. Upgrading to different versions of Java or Flash player may be necessary. Most courses require basic word processing software.
3. **Other Devices:** Depending on the learning management system used to deliver the course, tablets and smartphones may be used to access some or all course elements.
4. **Web Browser:** A graphical browser is required for any online course. Sometimes, it may be necessary for users to upgrade their web browser programs from internet explorer or other browsers.
5. **Email:** Depending on the learning management system being used to deliver the course content, the student may have to use their personal email account or create one through the learning management system.

Note. Summarized from Technical requirements for online courses by Algonquin College (2018). Retrieved from <http://www.algonquincollege.com/ccol/info-page/technical-requirements-for-online-courses/>

Implementation Plan/ Methodology

The online courses have been designed to prepare the healthcare facility for onsite training. As the curriculum follows a progressive pattern, it is essential that the technologists complete the pre-requisite courses before the onsite portion of the curriculum. These topics will be reviewed during the onsite training but will not be covered in depth. The following online courses are strongly recommended prior to turnover training. There are several additional online courses available to the facility which focus on products, fundamentals and clinical concepts. The courses listed below will provide a good foundation and help the technologist get the most out of the initial onsite training. It is highly recommended that the technologists complete these courses prior to turnover training.

CT Product:

- Revolution EVO Overview: Provides an overview of the Revolution EVO system including software layout, gantry controls and table as well as a detailed review of the operator console.
- Dose Optimization using AutomA, SmartmA, and Organ Dose Modulation Reviews the factors that impact image quality and dose.

CT Fundamentals:

- CT Safety Part 1 Discusses general electrical and mechanical CT safety basics for the CT System.

The assessment section considers the intended learning outcomes as well as student learning styles and the desired level of student comprehension and knowledge. Researchers who have reviewed methods of online instruction in healthcare settings have discussed the challenges of online learning for healthcare professionals due to the need for hands-on clinical experience (Smith, Passmore & Faight, 2009). Considering this and the fact that much of the content has a strong hands-on influence, the course offers many opportunities for technologists to engage in both didactic and clinical learning activities during onsite training. The Community of Inquiry (CoI) model (Myer, 2014) and SECTIONS model were also considered in the development of course content to optimize student learning.

Throughout the course, there are three synchronous sessions scheduled using an online course catalog. The course catalog was created by using the TalentLMS website. The online classroom offers the opportunity for the technologists to ask questions through messaging which an important aspect in creating an educational experience according to the Community of Inquiry Model (Myer, 2014). The selected format lets the instructor offer presentations utilizing audio on course content to those in attendance, which aids to the visual and auditory learners. Another advantage is that once enrolled in the course, the technologists can reference the resources at their convenience. In addition to the presentations, the selected format also allows for student-

interactivity by creating multiple choice or true/false quiz questions to help engage the technologists and assess their knowledge.

Administrators of the online course not only have to be experts at knowing the equipment to create the course, but they also need to become experts in using the TalentLMS website. The TalentLMS website consists of specialized software used to design and deliver the GE pre-site course content. The Talent LMS infrastructure was customized and implemented to be utilized as a hybrid course allowing online learning prior to applications training while also focusing on in person learning. By using TalentLMS, the GE pre-site courses were created as an interactive course environment using presentations, surveys, testing and providing feedback on student work. The assessment engine within the software supports different ways to create questions and tests along with extensive reporting on test results (TalentLMS, 2018). The pre-work courses will utilize the quiz feature to assess comprehension of the course material. The pre-work courses that were developed will aid in face- to- face and online learning. The technologists have the ability to ask questions through a question repository prior to in person training. The courses can be brought to life with Badges, Points, Levels, Rewards and Leaderboards.

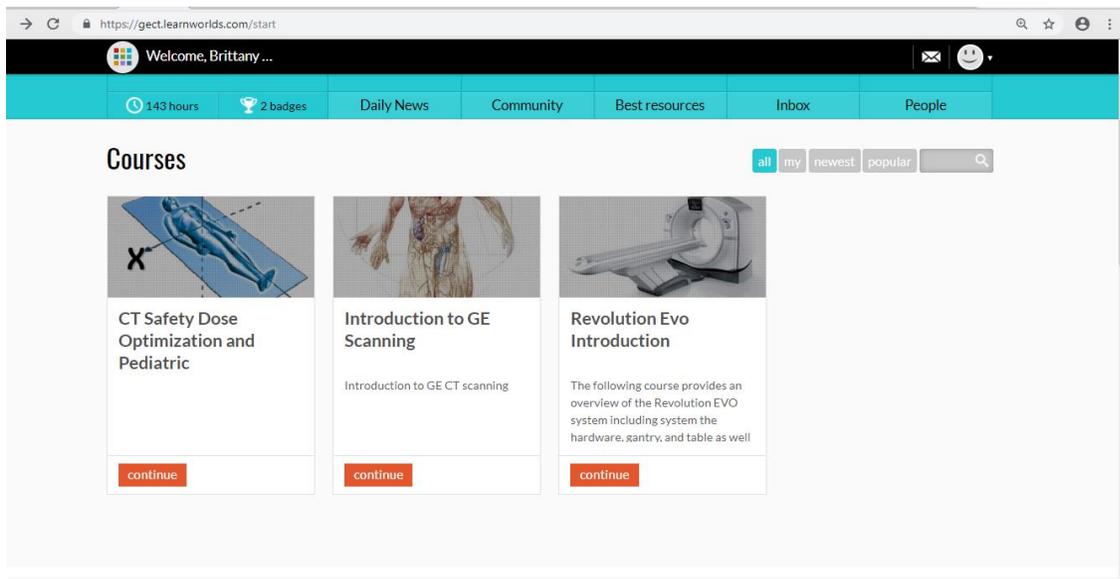
Not only does the site focus on the learning deliveries but it is enterprise ready. TalentLMS offers extensive reporting, analyzing everything within the eLearning environment. Heightened security allows the administrator to work over a secure communication channel. Security engines work to offer suggestions in enforcing strong passwords and adding watermarks on videos or presentations. Since not all technologists may have actual laptop or PC computers,

this website is native to applications for iOS and Android devices and has a responsive design that fits any device. The software conforms to WCAG-2 accessibility requirements, is available in multiple languages and allows technologists to create unique single sign-on's (TalentLMS, 2018).

Special considerations were made when creating the contents and presentations for the courses. The course objectives, presentations and quizzes were created in accordance with Bloom's Taxonomy. A well-designed course is created around objectives or Bloom's Taxonomy. Bloom's Taxonomy is a classification of actionable objectives for learning opportunities. Bloom's Taxonomy was published in 1956 under the leadership of educational psychologist Dr. Benjamin Bloom, who recognized most classroom activities never pushed beyond rote learning (Growth Engineering, 2018). Six categories of thinking were created in relation to action verbs. The six categories of action verbs are: Knowledge, comprehension, application, analysis, synthesis, evaluation. When developing learning activities, one does not have to start at a skill set and move to a higher or lower order of skills, these activities can be out of order. For example, having students create a video might give them opportunity to touch on the other thinking categories and promote deeper level of content mastery, (UCF, 2018). Since the technologists are already routinely performing CT scans and should be registered in CT, there is not a review of basic CT physics or anatomy offered with the pre-work. The presentations start off with information introducing the technologists to GE CT terminology and concepts.

Figure 1 displays the dashboard of the three online courses provided to the technologists as pre-work. These pre-work courses are available to the technologist after the administrator creates their user name and single sign-on. Once the username and single sign-on is created and sent to the technologist, the technologist is sent an automated email allowing them to access the site. After the technologist visits the site they can make changes to their email, single sign- on and password while also accessing the courses.

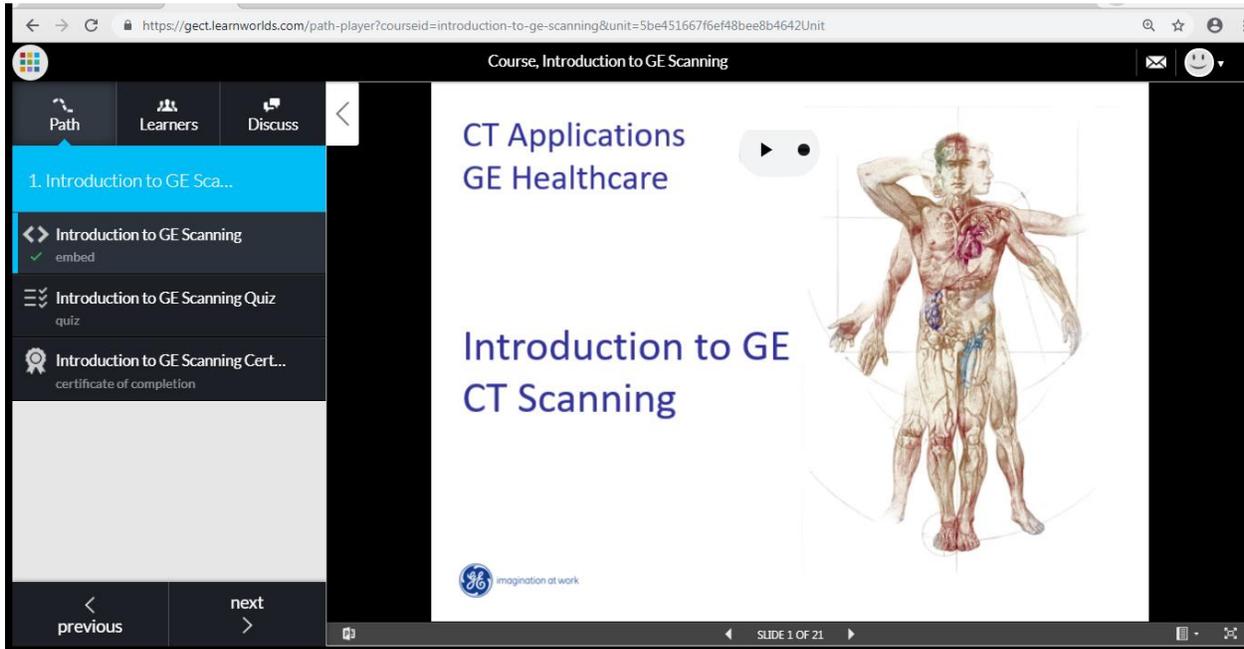
Figure 1: Course Options



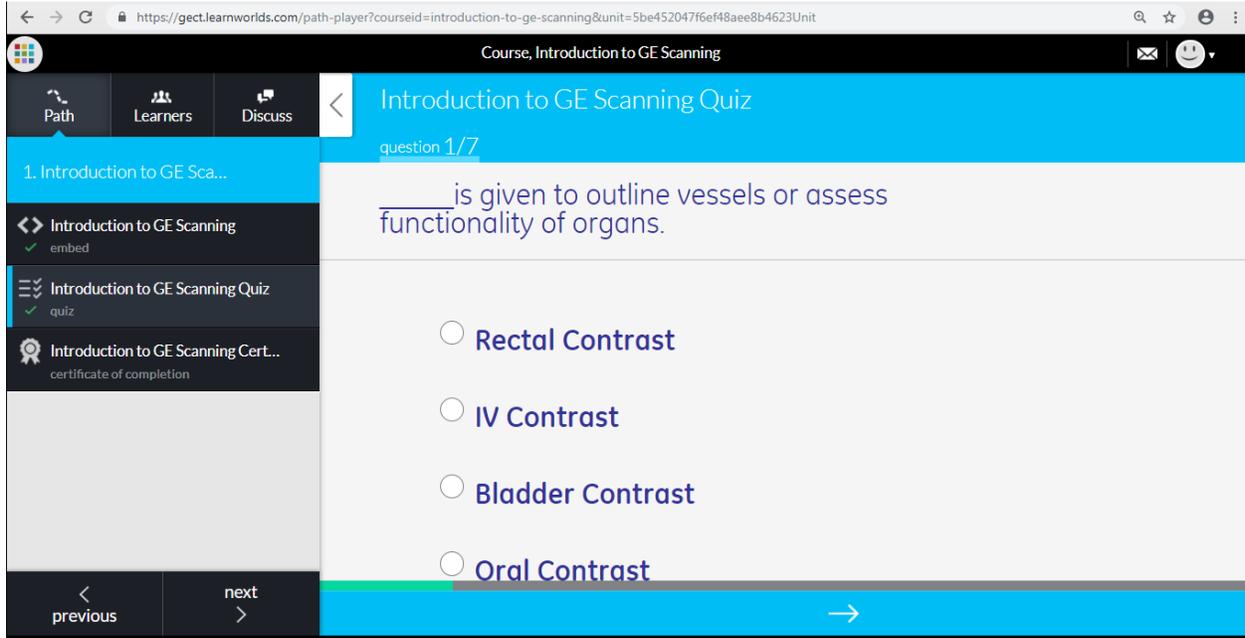
The course design is organized into modules and each module contains sub-modules made up of relevant content. The designated layout is used to allow for easy student access to necessary material displayed in the image below. Once the specific course is selected, the technologist will have access to the contents within the course. Figure 2 displays the contents of

the course on the left side of the page. After entering the course, the presentation automatically opens and is ready to be reviewed by the technologist.

Figure 2: Course Dashboard



After the technologist has ended the presentation, the quiz over the presentation content immediately starts. The technologists do not have a time limit on this quiz due to reviewing at their own pace. Figure 3 provides an example of the quiz over the presentation content. Using the multiple choice or true/false question model, the administrator can view the technologist's responses to help assess student knowledge and optimize comprehension of important concepts. This current TalentLMS software platform (free) does not have the ability to include review questions throughout the presentation for student interaction. However, there is a variety of quiz or testing layout templates (TalentLMS, 2018).

Figure 3: Course Quiz

After completing the assessment quiz for the pre-work modules, the technologist will receive a certificate as displayed in Figure 4. Each technologist in attendance of the onsite training should present this certificate to the onsite Clinical Applications Specialist.

Figure 4: Course Certificate of Completion

After the technologist has completed their pre-work, onsite applications training will take place according to the status of the system being installed. As part of the progressive blended learning approach, onsite, or instructor-led training is an integral piece of the technologist's learning experience. Outcomes of onsite training include offering hands-on scanning practice, learning scanner features and workflows, and providing an open, varied learning environment for all types of learners, solidifying their learning experience. This also facilitates ensuring that protocols needed for efficient patient flow are practiced and ready. Finally, it allows for the opportunity to deliver immediate system performance results. It is essential that a facility Radiologist is available during the training period to direct system configuration, site specific protocol creation, and review and approve image quality.

Outcomes/ Summary of Project

The knowledge gained from research regarding online education and education in relation to healthcare helped to create an online course used as pre-work for GE CT onsite clinical applications training. By exposing the technologists to information regarding what they will be training on and giving them resources for reference, the technologists will be more familiar with the devices. This will allow them to learn the equipment more efficiently and faster. The course design will better prepare the technologists for onsite CT applications training. The presentations and assessments are built according to outlined objectives and are designed with consideration to the GE CT onsite applications training agenda and various online learning theories highlighted above. This online course was integrated with the onsite training agenda by considering the learning objectives and the affordances of each process and deliberately linking what occurs in each process. There are many aspects that need to be considered when creating the online material, but studies above have shown that pre-education and continuous education is critical to the outcome of the technologist's work (Keen, 2015).

Since this course has not been presented to technologists at this point, there has not been any feedback or surveys regarding the quality of the courses. Once the course is presented to technologists and they have completed the CT onsite applications training, there will be surveys to provide feedback. The evaluations will consist of questions regarding the course design, offering access to information prior to onsite training and the extent of the information provided. Course outcomes will also be assessed by their knowledge of the equipment once onsite

applications begins. Surveys given to the onsite clinical applications specialists and facility department directors will be evaluated to address course effectiveness, their opinion of technologist knowledge and preparedness for working on the specific equipment.

Conclusion

As reviewed above, creating online courses in conjunction with onsite or face-to-face training involves many detailed considerations. The role of a radiographer was defined outlining professional expectations to better construct the course. Benefits of online learning, ADA accessibility, legal requirements and technological requirements were analyzed when creating the online pre-work courses. It has been proven that administrators that construct on-line courses and support onsite applications training must take into consideration both didactic and clinical learning objectives to develop a high-quality course that best serves the technologist and the consistent information of the equipment. As demonstrated through research, blended learning can be an effective pedagogic approach for this category of professionals because of the crucial need for exposure prior to training and hands-on training for practicing and translating knowledge into skills.

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