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Radiologic Technology Advanced Placement

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RADIOLOGIC TECHNOLOGY ADVANCED PLACEMENT

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Dedication

According to Wikipedia, a family is a group consisting of parents and children living together in a household. My dedication is to my family. My family made this possible for me. Being brought up by immigrant parents, who never graduated high school and who worked tirelessly for their family, gave me a different perspective on education. I knew the value of an education at a very young age because my mom and dad had to miss field trips and bring "your children to work day" because their job just wouldn't allow for the time off or OSHA laws would not allow a 6 year old to observe at a factory while mommy worked endlessly making coats, or daddy worked in a 100 degree flame department. I knew growing up that I wanted the kind of career that gave me the flexibility my parents didn't have and yet allowed me to support myself and my family no matter what the situation.

While acquiring this Master's degree, I got the best job ever!! I became a mom to a beautiful little girl. Ava, you will never know how much your little voice and your endless excitement about spending time with me has motivated me to complete this degree. You were the reason I started this journey before I even knew how amazing this adventure was going to be! I did this for you and your field trip, your school plays and your "bring your child to work days!" I did this for you, for us and our FAMILY!

Abstract

The radiologic technology field is rapidly changing. Its technologists and students need to be prepared for these alterations. All students and technologists must pass the national board exam administered by the American registry of Radiologic Technologist. This exam assesses the participant in patient care, image acquisition, radiation safety and imaging procedures. The performance problem identified is the increased amount of radiologic technologists and radiologic technology students either failing the registry due to being unprepared, or due to insufficient continuing education credits. Many of these technologists have been out of the classroom for 20 years, seemed adapted to their own imaging routines and have completely forgotten most of the pertinent material, especially the more recent changes to the radiology field as digital imaging and tele radiology are now the only means of imaging.

The advanced placement program recreates the 2-year certificate radiologic technology program into a 15-week program. It allows the student to go at their own pace while still begin assessed on the material in an ARRT questions format.

In conclusion, radiologic technology is quickly evolving and branching out into many other modalities. It is important that the technologist be prepared for these changes. Adaptability is a key quality in this field. The advanced placement program helps students and technologists maintain their status.

Key words: Radiologic Technology, Diagnostic Imaging, American Registry Radiology Technology, National Exams, Advanced Placement

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Background Information

Radiologic technology is a subdivision of diagnostic imaging. This field is responsible for the use of ionizing radiation to diagnose patients with conditions or disease otherwise missed by the naked eye. All radiologic technologists must attend an accredited radiography program. The 2- or one-year program prepares the individuals for the national board exam to be administered at the end of the program. The national exam is administered by the American Registry of Radiologic Technologists (ARRT). The ARRT is certification board for all radiologic technologists and provides all rules and regulations to be followed by all technologists. All radiologic technology students have three attempts at the national board, in which to receive a passing grade of 75% or higher. The exam is 220 multiple choice questions subdivided into the following categories: Patient care, Image Acquisition, Imaging Procedures and Safety. If the student is unsuccessful at passing the board exam, the student may participate in an advanced placement program. If a technologist neglects their responsibility of 24 continuing education credits per biennium, their certification is revoked and they must repeat the board exam. This program allows failed students 3 additional attempts at the board exam after further education, assessment and clinical competencies.

There are many other types of boards with different criteria of passing and continued credentialing. For example, “By virtue of being a licensing examination, the NCLEX-RN is a high-stakes examination. In a typical year, 120,000 NCLEX-RN examinations are administered. Therefore, when setting the passing standard, it is important to set it high enough to protect the public by being a barrier to incompetent nurses, yet also be low enough that competent nurses are not denied a license” (O’Neil, 2005, p. 3). The Board of Nursing takes passing rates of

students as a criteria and goal of the nursing schools over outcomes. The Board of Nursing and the Joint Review Committee on Education of Radiologic Technology use these scores to determine the success of learning in the various programs. Unlike the NCLEX-RN which can be taken multiple times in multiple years, the Radiologic Technology boards can only be taken 3 times over 3 years.

Analysis Plan

The needs assessment done for the project consisted of initial surveys sent to graduating students and alumni post graduations. The surveys asked the alumni about graduation date, Registry date and if they had passed. I also surveyed the other professor not in radiologic technology and also other radiologic technology professors and nursing professors. Since nursing students have a similar national exam to pass, I figured I would question the nursing staff in their struggles and triumphs in the field.

The JRCERT makes available the program effectiveness data (credentialing examination pass rate, job placement rate, and program completion rate) of all its accredited programs on an annual basis. This information is self-reported by the accredited programs via the annual report. The program reviewers and the data they collect is much like the questions I asked all alumni. The JRCERT follows the progression of the student up to 5 years post-graduation. The questionnaires help the JRCERT and the program assess their completion rates, employment rates and their certification rates. These rates are published every year for all interested students. There is also a program implemented by some colleges called Castle branch. This program ensured the student information for surveying such as address, email and cell phone number are current and we are able to communicate with students about their success.

The American Registry of Radiologic Technologist outlines the entire board exam. The exam is broken down into 4 detailed components:

- Patient Care (General Patient Care)
- Imaging Acquisition (Radiation Physics)
- Radiation Safety (Radiation Biology)
- Imaging procedure (All anatomy and Positioning)

Analysis Report

The JRCERT keeps track of all the accredited radiologic technology programs in the United States. If the program is not JRCERT accredited, the students are NOT eligible to take the registry. Along with the JRCERT program statistics, each student, after taking the registry, is given an exam printout. This printout breaks down the exam and actually tells the student what their percentage or overall grade in the separate sections are. This detailed breakdown helps to develop an advanced placement for each failed student individually and customizes the learning.

My target audience are the increased amount of radiologic technologists and radiologic technology students either failing the registry due to being unprepared, or due to insufficient continuing education credits. Once a technologist successfully passes the registry, the technologist will never take the national registry again unless the technologist defaults on the mandated 24 continuing education credits policy. Many of these technologists have been out of the classroom for 20 years, seemed adapted to their own imaging routines and have completely forgotten most of the pertinent material, especially the more recent changes to the radiology field as digital imaging and tele radiology are now the only means of imaging. According to the American Board of Radiology, changes have been implemented to the certification examinations

for radiology residents. It examines the purpose for these changes, as well as the impacts, both positive and negative, to residents and the overall radiology system. They discuss the push for subspecialization in American Medicine and how, in regards to long term care of complex patients, these changes may not be useful. (Hall, 2008, p. 2).

I plan on using a similar assessment technique such as testing on a PC and not paper and pencil, and I also plan on using interactive anatomy and physiology lessons much like the registry employs. If the same testing techniques are used, then that would limit some of the test takers anxiety because it would already be familiar. There are many assumptions made about learning and why certain learning is better suited for certain students.

Learning theories are conceptual frameworks describing how knowledge is absorbed, processed, and retained during learning. Cognitive, emotional, and environmental influences, as well as prior experience, all play a part in how understanding, or a world view, is acquired or changed and knowledge and skills retained. I would suggest cognitivism as the theory associated with reviewing for the board exam or in continuing education e-learning. According to Berryman of Innovative Learning e the author's name in addition, "the main assumption of cognitive psychology is that there are cognitive processes that take place and influence the way things are learned. Explanations for how cognitive processes work are known as information processing theories or models" (p. 3). The important concepts found in cognitive psychology include meaningful learning, organization, and elaboration (Berryman, 2003). It is crucial to create an environment where there are lots of manipulatables, tools where they can develop an understanding. Failure may be considered a good thing as it is a tool to help learners realize that they need to learn more.

While studying or "learning" from the convenience of your home and at your own pace are the two biggest advantages of e-learning, there are also many other factors that make it an attractive option for imaging professionals and students. E-learning also puts a different spin on self-learning, and empowers the student or, in this case, imaging professional to use their own style of learning rather than conforming to the usual methods of teaching. It can been argued that the cognitive learning theory and the teaching techniques associated with the theory, may be too outdated to apply in an e-learning environment. However, in my opinion, the way people absorb, process, and retain information remains the same, and e-learning opens up a lot of opportunities to use artificial intelligence and other instructional technologies for improving conventional teaching methods and helping to maintain a certain level of education among a field such as radiology.

In Kirkpatrick's 2019 Model of learning Level 1 speaks to reaction. The reaction of the participants was favorable or unfavorable. They realized the need for such a review for not only passing rate of the board exam but also for technologists who have lapsed in their credentialing and have lost their registration and license to practice**.** Level 2 of Kirkpatrick theory discusses learning. This level was accomplished with the initial learning of the skills and information throughout the program but was then reinforced in the review through the various flashcard quizzes, or mock exam practice questions. Kirkpatrick's level 3 speaks to behavior. The behavior associated with the learning in the advanced placement course has different levels. The first behavior was not passing the registry in the first place or becoming delinquent in their continuing education credits and forfeiting their registration. The most important of the behaviors is the reviewing of the flashcard quizzes because it promotes learning through the

same mechanism of board exam administration. Kirkpatrick's level 4 is results. The results in this course would be 100% student/participant passing of the registry.

Learning/Performance Objectives

- Define and describe both axial and appendicular skeleton and all it landmarks and anatomical reference to human organ systems.
- Describe the x-ray tube, and x-ray circuit as it pertains to the radiologic interactions and scattering.
- Discuss and practice ALARA (As Low As Reasonably Achievable) and the importance of radiation safety.
- Define medical ethics and apply the radiologic standard to critical thinking situations.

Instructional Strategy

Module	Goals	Assessment	Material
1	Describe basics in patient care in radiologic technology field.	Blood pressure, Oxygen, temperature, Sterile technique , respirations competency labs	Patient care screen cast of various radiologic procedures do's and don'ts
2	Discuss radiation safety and the radiation doses to	Mock Radiation Protection exams	Screen-o- matic PowerPoint

	patient, staff and population.		
3	Describe the x-ray circuit and the process of interactions	Build a circuit board, subatomic particle building, exam assessment Discussion of tissue densities such as bone, fat, air and barium	Screen-o- matic PowerPoint
4	Recognize and describe all radiologic procedures and related anatomy	Create a radiologic procedure manual with x-rays done by student on a phantom. Each position will be evaluated on criteria such as Central Ray, Collimation, Center Point	Screen-o- matic PowerPoint

Instructional Materials

I developed PowerPoint screencast presentations of the different modules associated to the registry. Each module will include an introduction, how many questions in this section make

up the registry and then continue with the various parts of the lesson. At the conclusion of each module, there will be an assessment in multiple choice form due to that being the template of the registry.

Development

In the development stage, it is crucial for learning the proper development of material and alignment of objectives and materials. I have developed multiple modules aligning to the corresponding categories of the ARRT board exam.

Module	Title of Module	
1	Patient Safety	Describes medical terminology and proper patient evaluation for imaging
2	Image Acquisition	Discuss radiation production and the various interactions at the molecular level
3	Radiation Safety	Discuss radiation protection techniques throughout the modality and protection of patient, technologist and general public

4	Imaging Procedure	Describe all imaging procedures from head to toe and all fluoroscopy procedures

Another material developed is a registry Mock exam with categorized questions to each of the modules. These questions will allow both the professor and student to recognize strengths and weaknesses in the learning. This will allow for personalized review of the categories.

Implementation and Improvement Plan

Module 4 was presented to the senior students as an extra credit assignment. All students were instructed to participate in the flashcard quiz pre-assessment. All students then had to listen to the screencast of the (Imaging Procedure) module and then take the imaging procedure section of the mock exam. Here are the results of the Pilot Module Roll Out:

Student	Initial Assessment Flashcard Quiz	Post Assessment Mock Exam
1	56 points	75 points
2	66 points	85 points
3	41 points	81 points
4	71 points	79 points
5	63 points	85 points
6	55 points	86 points

Initially, all of the students did not score within the passing rate of 75% as stated by the ARRT. After the screencast presentation and the flashcard quiz initial assessment, this allowed the students to increase their procedure grade greatly. Students increased their scores from 8 points to 30 points. This increase validated the process and the importance of review on the separate categories individually before brining all the sections together in a board review manner.

After initial feedback from the students, I realized perhaps there should be a timing component because the registry is timed.

Evaluation Plan

The American Registry of Radiologic Technology is responsible for not only developing the standards for all technologists, but they also develop the questions for the board exam. All participants in the exam must pass with a 75% or better. The success of this project would be held to the same standard. All students must pass the individual categorized mock exams with a 75% or better and then also pass the cumulative exam with random question selection from the 4 categories with a 75% or better.

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Appendix

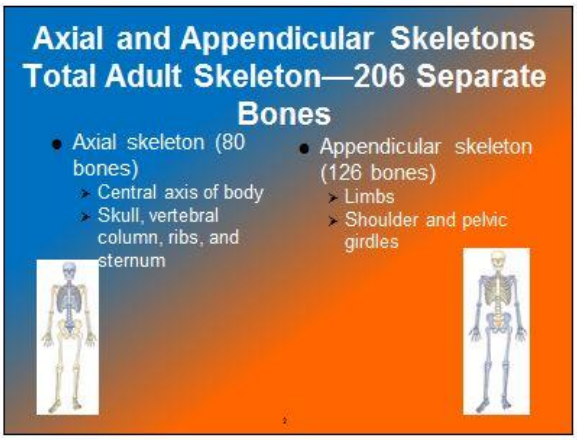
Instructional Material Examples:

Screencast PowerPoint

The screencast of each of the radiologic exam categories reviews all information pertinent to the exam.

- Patient Care
- Image Acquisition
- Radiation Safety
- Imaging Procedure

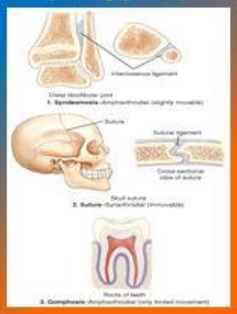
The screencast begin with fingers and hand and continues to upper extremity and then lower extremity then axial skeleton. Each body part is reviewed, anatomy discussed, anatomical positioning and image criteria described.



Classification of Joints (Arthrology)

Structural (classified by tissue type)	Functional (classified by function)
Fibrous (held together by fibrous tissue)	Synarthrodial (immovable)
Cartilaginous (held together by cartilage)	Amphiarthrodial (limited movement)
Synovial (synovial fluid in joint capsule)	Diarthrodial (freely movable)

Fibrous Joints (3 Types)



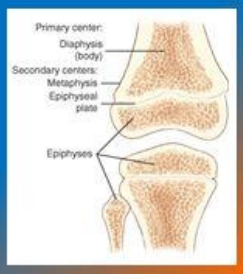
Classification of Bones

Long Bones
- Limbs
- Compact bone
- Spongy bone
- Periosteum

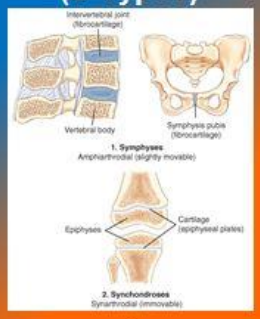
Irregular Bones
- Limbs
- Peculiar shapes (vertebrae, facial bones, and pelvic bones)

Short and Flat Bones
- Carpal and tarsal bones
- Calvarium, sternum, ribs, and scapulae

Bone Development



Cartilaginous Joints (2 Types)



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Synovial Joints (7 Types)

- Generally freely movable or diarthrodial

8

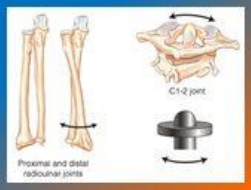
Synovial Joints Movement Types

1. Plane (gliding)
2. Ginglymus (hinge)

9

Synovial Joints Movement Types

3. Trochoid (pivot)
4. Ellipsoid (condyloid)



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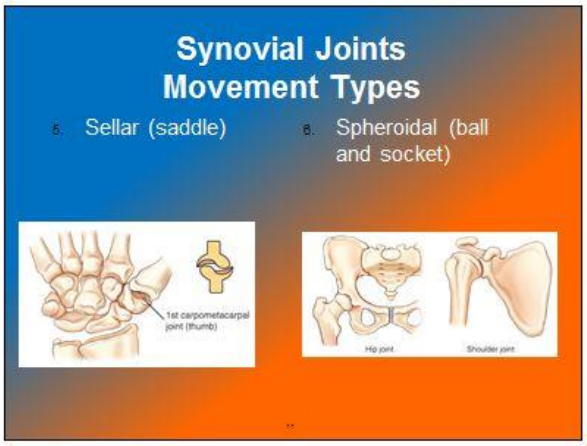
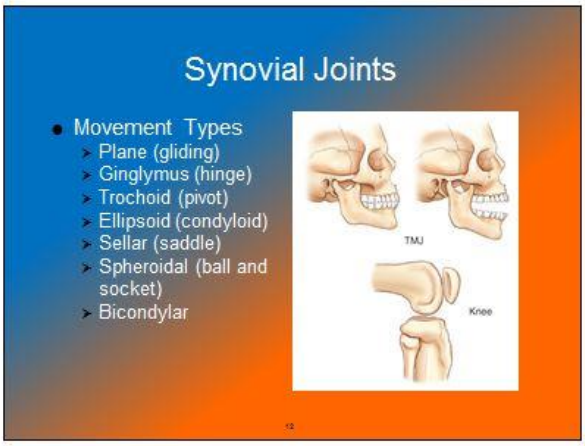
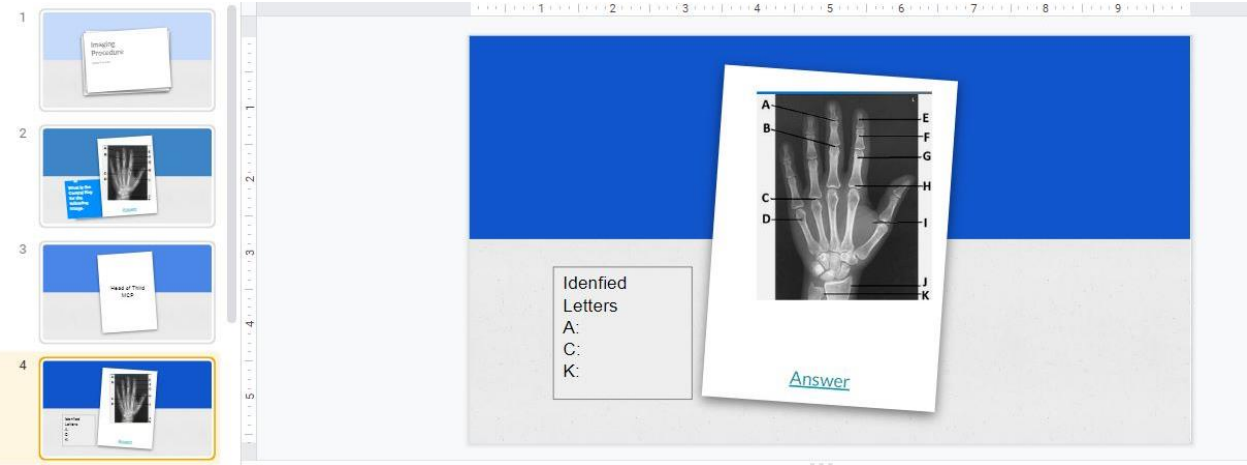


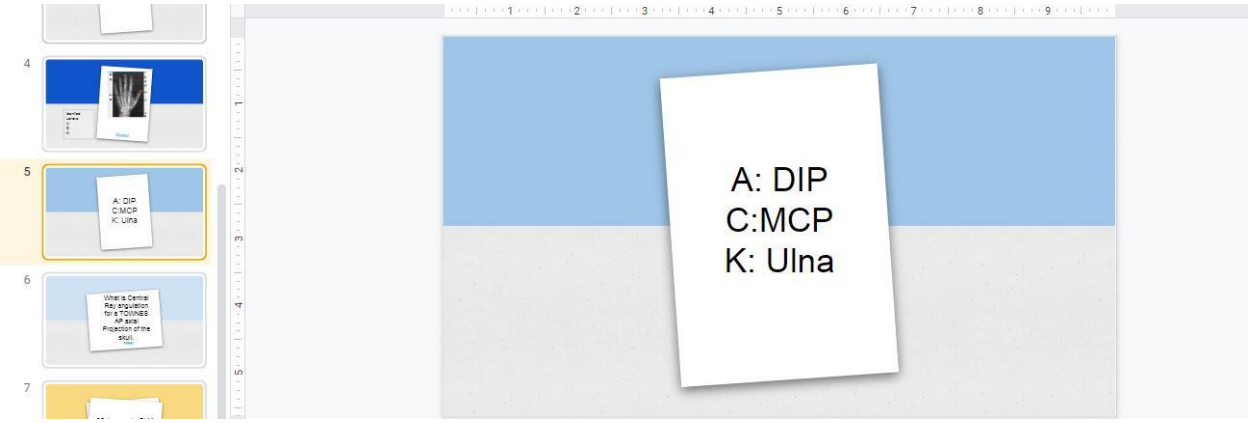


Flash Card Quiz

The Flashcard Quiz is a pre-assessment

Students will sign into the assessment and follow the flashcard prompts. Each flashcard presents a question and a hyperlink to the answer. The student will write down their answer and then click the hyperlink. Answer will give them the answer, giving the student the ability to keep track of the right and wrong answers.





Mock Exam (Post-Assessment)

The Mock exam assesses the student learning after review of the screencast lesson. The mock exam exhibits the exact number of position questions mimicking the American Registry Radiologic Technology exam breakdown.

- Patient Care (30 Questions)
- Image Acquisition (22 Questions)
- Radiation Safety (45 Questions)
- Imaging Procedure (58 Questions)

Imaging Procedures (58 questions)

113. A patient is lying on her back facing the x-ray tube. The right side of her body is turned 20 degrees toward the IR. What is this radiographic position?
   a. LPO
   b. RPO
   c. RAO
   d. LAO

114. A patient is erect facing the IR. The left side of the body is turned 45 degrees toward the IR. The CR enters the posterior aspect of the body and exits the anterior. What is this radiographic position?
   a. LAO
   b. LPO
   c. Left lateral
   d. Posteroanterior

115. The opposite for supination is:
   a. Protraction
   b. Adduction
   c. Pronation
   d. Retraction

116. The iliac crest corresponds to the level of:
   a. L3-4 interspace
   b. L4-5 interspace
   c. L5-S1 joint
   d. S1-2