

Part 1: E-Learning Module Proposal

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Radiation Safety and Protection for Radiologic Technology Students

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Introduction:

Radiation safety is an essential component of radiologic technology education because students must learn to use ionizing radiation while minimizing unnecessary exposure to patients, themselves, and others. Beginning radiologic technology students may learn basic radiation-protection concepts through textbooks, lectures, and classroom instruction; however, they may have limited opportunities to apply those concepts to realistic radiographic situations. The gap between “what is” and “what ought to be” is therefore the difference between knowing radiation-safety principles and consistently selecting appropriate protective actions during radiographic procedures. Current radiological-protection guidance emphasizes optimization of patient exposure while maintaining image quality adequate for the clinical purpose (International Commission on Radiological Protection [ICRP], 2023).

To address this instructional need, the proposed four-lesson e-learning course will help beginning students connect foundational knowledge with practical decision-making. Learners will use concise instructional content, video demonstrations, interactive activities, realistic scenarios, feedback, and assessments to learn, observe, practice, and apply radiation-safety principles. A self-paced online format will allow learners to review difficult concepts and repeat practice as needed. Consistent with learner-centered online design, the course will provide multiple opportunities for active engagement and application rather than relying only on presentation of information (Conceição & Howles, 2021). The course is intended to strengthen preparation for laboratory and clinical learning while making effective use of instructional time and resources.

Instructional Goal and Objective:

Instructional Goal: A student successfully completing this e-learning course will be able to apply fundamental radiation-safety principles and select appropriate protective practices to minimize unnecessary radiation exposure to patients, themselves, and others during radiographic procedures.

Sub Goal 1: Students will apply fundamental radiation-safety concepts and the ALARA principle to reduce unnecessary radiation exposure.

After completing this lesson students will be able to:

Objective 1.1: identify fundamental radiation-safety principles and the purpose of ALARA.

Objective 1.2: match basic radiation-protection principles with appropriate exposure-reduction practices.

Objective 1.3: select appropriate radiation-safety actions in introductory radiographic scenarios with at least 80% accuracy.

Sub Goal 2: Students will select appropriate radiation-protection practices to minimize occupational exposure to themselves and other healthcare personnel during radiographic procedures.

After completing this lesson students will be able to:

Objective 2.1: identify appropriate methods for reducing occupational radiation exposure.

Objective 2.2: select appropriate positioning, distance, barriers, monitoring, or protective measures for presented radiographic situations.

Objective 2.3: differentiate between safe and unsafe occupational radiation-protection practices in simulated scenarios with at least 80% accuracy.

Sub Goal 3: Students will apply appropriate patient-protection and exposure-optimization practices to minimize unnecessary patient radiation exposure while supporting the clinical purpose of the examination.

After completing this lesson students will be able to:

Objective 3.1: identify practices that reduce unnecessary radiation exposure to patients.

Objective 3.2: select appropriate patient-protection and exposure-optimization actions in common radiographic situations.

Objective 3.3: analyze situations involving positioning, collimation, technical factors, and repeat exposures and choose appropriate corrective actions with at least 80% accuracy.

Sub Goal 4: Students will analyze simulated radiographic situations and apply appropriate radiation-safety practices to protect patients, themselves, and others.

After completing this lesson students will be able to:

Objective 4.1: identify radiation-safety risks presented in simulated radiographic procedures.

Objective 4.2: sequence appropriate radiation-safety actions for selected radiographic situations.

Objective 4.3: analyze a simulated procedure and select corrective actions that protect the patient, technologist, and others with at least 80% accuracy.

Intended Audience:

The intended audience is beginning radiologic technology students who are developing the knowledge and skills needed to perform radiographic procedures safely. Learners may differ in age, prior healthcare or clinical experience, technology proficiency, and familiarity with radiation-protection concepts. Some may recognize radiation-safety terminology but have little experience applying it in realistic situations. These differences will inform the design of instruction: limited clinical experience will be supported with realistic scenarios and demonstrations; differences in technology proficiency will be addressed through clear navigation and guided instructions; and varied learning needs will be supported through concise text, visuals, videos, and interactive practice. Matching, drag-and-drop, procedural sequencing, and scenario-based decisions will provide practice before formal assessment, while immediate feedback and opportunities to retry activities will support self-paced progress.

Learning Environment and Context:

The course will be delivered as a web-based, self-paced learning experience accessible through an internet-connected computer or compatible device. Students may complete the online instruction in a classroom, computer lab, library, or at home. The course will include text, graphics, short video demonstrations, interactive activities, discussions, quizzes, and other assessments. Although instruction occurs online, the knowledge and decision-making skills are intended to transfer to laboratory and clinical settings where radiation-safety practices are applied. Simulated situations and visual demonstrations will connect online learning with realistic radiographic practice. Because learners may have different devices, internet connections, accessibility needs, and levels of technical proficiency, navigation and multimedia will be kept clear, consistent, and manageable.

Summary:

The proposed Radiation Safety and Protection for Radiologic Technology Students course will address the gap between beginning students' theoretical knowledge of radiation protection and their ability to apply appropriate safety practices in realistic radiographic situations. Four lessons will progress from foundational radiation-safety concepts to occupational protection, patient protection and exposure optimization, and integrated application in simulated procedures. Through demonstrations, interactive practice, realistic scenarios, feedback, and assessment, learners will receive repeated opportunities to practice safe decision-making. The self-paced online format will support review as needed, strengthen preparation for laboratory and clinical learning, and make effective use of instructional time and resources.

References

Conceição, S. C. O., & Howles, L. L. (2021). Designing the online learning experience:

Evidence-based principles and strategies. Stylus Publishing.

International Commission on Radiological Protection. (2023). Optimisation of radiological

protection in digital radiology techniques for medical imaging (ICRP Publication 154).

Annals of the ICRP, 52(3).

AI Declaration

ChatGPT was used to assist with organizing the proposal, refining wording and grammar, and aligning the draft with the assignment instructions and rubric. The project topic, instructional decisions, professional context, and final review of the content are the author's responsibility.