Purpose: To improve the radiology residents’ understanding of medical physics concepts through visualization of physical phenomena.

Methods: Several medical physics concepts in x-ray transmission imaging are relevant to many radiographic modalities, not only to planar radiography. Therefore, it is important that the diagnostic radiology residents obtain a good understanding of these concepts. However, standard PowerPoint slides or blackboard-based graphical representations are not always effective ways to communicate these novel concepts to the residents. To improve upon the understanding of these concepts, the computer, projector and screen in the lecture room are used as surrogates of an x-ray imaging system. The projector is the source of light (x-rays) with PowerPoint slides defining the pattern emitted (x-ray field) on to the projector screen (detector/monitor). Several different transparencies and acrylic objects are used to demonstrate varied medical physics phenomena relevant to transmission imaging, such as: straight-line travel of electromagnetic radiation; tissue superimposition; object, subject, image and display contrast; linear systems; point spread functions; frequency domain; contrast and modulation transfer functions; quantum and image noise; noise frequency and noise power spectrum; anatomical noise; magnification and geometric unsharpness; inverse square distance relationship; sampling and aliasing; and x-ray scatter.

Results: The residents’ comprehension and ability to explain these concepts has substantially improved, in addition to their interest in these topics. This was reflected on improved test scores and on anonymous feedback surveys post-lectures.

Conclusions: The use of demonstrations that mimic the conditions and physical phenomena found in transmission imaging by taking advantage of the projector and screen together with transparencies and other objects improves the residents’ grasp of basic radiographic concepts and promotes live interactions between the residents and the medical physicist. Additional concepts that can be demonstrated in this manner are being sought.