

**Oregon Institute of Technology  
Medical Imaging Technology Department  
Radiologic Science Program Assessment  
2011-2012**

**I. Introduction**

The Radiologic Science program at Oregon Institute of Technology is entering its 62 year of educating future Radiologic Technologists. The program is proud of its strong retention rates from the sophomore (professional courses) to the senior year (externship). Because of limited space and teacher ratio, the radiology program limits the selection numbers to 48 students into the sophomore professional level each year. The program generally graduates between 44-48 students a year with 41 students graduating in 2011. The average salaries of those reporting for the 2011 graduating class was \$53,482.

**Summary of Program Purpose, Objectives and Student Learning Outcomes**

The Radiologic Science faculty established the program purpose, objectives, and student learning outcomes in fall 2007 and reviewed fall 2011. The faculty reviewed the current outcomes and decided to split teamwork and ethics into two separate outcomes for better clarity in assessment.

**Program Purpose**

The purpose of the Radiologic Science Bachelor's Degree Program at Oregon Institute of Technology is to provide graduates with the knowledge, clinical skills, and compassion that will allow them to become exemplary medical imaging technologists and future leaders in radiology and advanced imaging professions.

**Educational Objectives**

The Radiologic Science program prepares graduates to:

- Be advanced leaders in the profession.
- Be compassionate, caring healthcare professionals.
- Be eligible, well-prepared, and able to sit for and pass the ARRT credentialing examination.
- Have immediate job placement within six months of graduation.
- Work in advanced imaging fields and sit for advanced imaging registries.

## **Expected Student Learning Outcomes**

The Radiologic Science student will:

1. Demonstrate knowledge of x-ray physics and related math.
2. Demonstrate professional conduct and ethical decision making.
3. Demonstrate teamwork while conducting patient procedures.
4. Demonstrate effective critical thinking and problem solving skills.
5. Demonstrate effective patient care skills.
6. Utilize both written and oral communication effectively.
7. Recognize quality diagnostic images for both technical and anatomical criteria and have the technical ability to correctly repeat images when the quality is not adequate for diagnostics.
8. Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standards.
9. Demonstrate an understanding of advanced multiple ARRT imaging modalities and the need for lifelong learning.

## **Additional Student Learning Opportunities**

RDSC students have additional learning opportunities through participation in Association of Collegiate Educators in Radiologic Technology (ACERT) conferences held in Las Vegas each year and attendance at the Oregon Society of Radiologic Technologists conference. The Radiologic Science student club participates in a joint venture with the Federal Fish and Wildlife Services of Klamath Falls, to identify fish species through digital imaging of the fish. In addition the junior imaging students have joined forces with the natural science department to image and record complete anatomical structures of 3 cadavers. A SIM lab is being created this year between the nursing program, respiratory therapy program, and the radiology program which emphasizes teamwork.

### III. Three-Year Cycle for Assessment of Student Learning Outcomes

The current cycle of assessment is shown in Table 1.

<b>Radiologic Science Outcome Assessment</b>	<b>2011 2012</b>	<b>2012 2013</b>	<b>2013 2014</b>	<b>2014 2015</b>
1. Demonstrate knowledge of x-ray physics and related math.	X			X
2. Demonstrate professional conduct and ethical decision making.		X		
3. Demonstrate teamwork while conducting patient procedures.		X		
4. Demonstrate effective critical thinking and problem solving skills			X	
5. Demonstrate effective patient care skills	X			X
6. Utilize both written and oral communication effectively			X	
7. Recognize quality diagnostic images for both technical and anatomical criteria and have the technical ability to correctly repeat images when the quality is not adequate for diagnostics		X		
8. Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standard.	X			X
9. Demonstrate an understanding of advanced multiple ARRT imaging modalities and the need for lifelong learning			X	

Table 1. Three year cycle for assessment of student learning outcomes.

### IV. Summary of 2011-12 Assessment Activities

The program faculty formally assessed three student learning outcomes this year, as follows.

**PSLO #1: Demonstrate knowledge of x-ray physics and related math.** The faculty conducted an analysis of where this outcome is reflected in the curriculum. The mapping of this outcome to the Radiologic Science curriculum can be found in Appendix A-1.

**Direct assessment #1**

The faculty assessed x-ray physics and related math in RDSC 202 Imaging Techniques II Winter term 2012, using a lab project graded with a rubric. There were 50 students assessed, the general results were very positive but the supporting data was not retained, therefore the assessment will be redone winter 2013 and the data will be saved.

**Direct Assessment #2**

The faculty assessed this outcome in RDSC 202 in winter 2012 using exam questions. The same 50 sophomores were involved in this assessment. The faculty rated the proficiency of the students using the same performance criteria described in Table 2 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Average score of cohort
kVp Relationship with x-ray beam quality	Exam Questions	1pt each for 3 questions	80% should score 80% or higher	75%
mAs Relationship with x-ray beam quantity	Exam Questions	1pt each for 3 questions	80% should score 80% or higher	93%
Direct square law SID	Exam Questions	1pt each for 3 questions	80% should score 80% or higher	97%
Grid Relationship with density	Exam Questions	1pt each for 3 questions	80% should score 80% or higher	92%
15% Rule	Exam Questions	1pt each for 3 questions	80% should score 80% or higher	80%

Table 2. Assessment Results for SLO #1 in RDSC 202, winter 2012

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
X-ray physics and math comprehension	15 exam questions	Right or wrong answer	80% should score 80% or higher	86%

Table 3. Assessment results for SLO #1 in RDSC 202 winter 2012

The instructor looked at data by subject as shown in table three to identify subject areas of weakness. It was found that kVp relationship with beam quality is a difficult concept for students to grasp therefore additional lab and lecture emphasis will be added to reinforce this concept. Faculty reviewed all 15 questions and found the resulted exceeded expectations.

### Direct Assessment # 3

Clinical Instructors were asked to rate students on this outcome with 12 CIs reporting, the results showed that 66.7% were highly prepared while 33.3% were sufficiently prepared, for a total of 100% at prepared or better.

### Direct Assessment # 4

ARRT exam results for the June 2011 RDSC graduates using the ARRT Annual Program Summary Report 2011. The results for the image production and evaluation were used to assess this outcome. The exam had fifty questions for image production and evaluation which requires students to calculate miliampere and kilovoltage equations in relationship to a body part thickness to produce diagnostic images. Therefore this is a good measure of students' ability to apply math and physics to produce technical factors directly related to image production. The results of the 41 students who took the exam can be found in Table 4.

Performance Criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Image Production and Evaluation	ARRT National Certification Exam Questions (50)	1-10	80% of students at or above the National average (8.3)	82.9%

Table 4. Assessment results for SLO 1, ARRT exam, April 2011-April 2012

Faculty are pleased with the above results. Comparing our results to the national average on this section of the exam, our students average 8.9 while the national average is 8.3. This section of the exam is often the most difficult part of the exam because it is measuring students' ability to calculate and apply math and physics for imaging production. 100% of our students are above the 75% passing score for this section of the exam. In addition all students passed this exam achieved certification with an average score of a 91% compared to the national average of 85%.

### Indirect Assessment # 1

The faculty assessed student learning on this outcome by surveying graduating senior extern students. The students were asked to rate their level of preparation. With 40 extern students reporting, the results showed that 35% indicated that they were highly prepared, while 50% indicated that they were adequately prepared, for a total of 85% at prepared or better.

**PSLO #5: Demonstrate effective patient care skills** The faculty conducted an analysis of where this outcome is reflected in the curriculum. The mapping of this outcome to the Radiologic Science curriculum can be found in Appendix A-2.

### Direct assessment #1

The faculty assessed patient care skills in RDSC 205 Patient Care winter term 2012 using a lab project graded with a rubric. There were 46 students assessed, results by proficient and highly proficient are listed in Table 5 below.

Performance criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Vital signs (blood pressure, pulse, and respiration)	Competency demonstration in lab	Competency	100% competent	100%
Sterile and aseptic technique	Competency demonstration in lab	Competency	100% competent	100%
Venipuncture	Competency demonstration in lab	Competency	100% competent	100%
Transfer of patient	Competency demonstration in lab	Competency	100% competent	100%
Care of patient medical equipment	Competency demonstration in lab	Competency	100% competent	100%

Table 5. Assessment results for SLO 5, RDSC 205, winter 2012 patient care.

In a controlled laboratory setting students are shown and then demonstrate back to the faculty their skill level in the above patient care skills. Students are required to repeat the above skills until they can pass these ARRT patient care skills with 100% competency. However the real test of each student's proficiency in these skills will be demonstrated on a daily basis while on the year-long externship. As shown in the assessment rated by the clinical instructors in direct assessment #2 below.

### Direct Assessment # 2

Clinical Instructors were asked to rate students on this outcome with 12 CIs reporting, the results showed that 58.3% were highly prepared while 41.7% were sufficiently prepared, for a total of 100% at prepared or better.

### Direct Assessment #3

ARRT exam results for the June 2011 RDSC graduates using the ARRT Annual Program Summary Report 2011. The results for Patient Care and Education were used to assess this outcome. The exam had twenty six questions for Patient Care and Education. The results of the 41 students who took the exam can be found in Table 6.

Performance Criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Patient Care and Education	ARRT National Certification Exam Questions (26)	1-10	80% of students at or above the National average (8.8)	78%

Table 6. Assessment results for SLO 1, ARRT exam, April 2011-April 2012

Faculty are satisfied with the above results. Comparing our results to the national average on this section of the exam, our students average 9.3 while the national average is 8.8. Patient care is paramount in healthcare as not to inflict additional harm or injury to already unstable people. Though the above score is lower than we would like, we know that 98% of our students are above the 75% passing score. In addition 100% of our students achieve certification by passing the exam with a 91% average compared to the national average of 85%. As seen above from the CI survey, our students show 100% proficiency in the clinical setting.

**Indirect assessment # 1**

The faculty assessed student learning on this outcome by surveying graduating senior extern students. The students were asked to rate their level of preparation. With 40 extern students reporting, the results showed that 67.5% indicated that they were highly prepared, while 27.5% indicated that they were adequately prepared, for a total of 95% at prepared or better.

**PSLO #8: Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standard**

**Direct Assessment #1**

The faculty assessed radiation safety in RDSC 272 spring term using multiple choice exam questions. There were 45 students assessed, results by proficient and highly proficient are listed in Table 7 below.

Performance criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Patient protection	7 multiple choice questions	Correct or incorrect	Class average above 85%	85.1%
Personnel Protection	16 multiple choice questions	Correct or incorrect	Class average above 85%	85.1%
Equipment design for safety	11 multiple choice questions	Correct or incorrect	Class average above 85%	85.9%

Table 7. Assessment results for SLO 8, RDSC 272, spring 2012 radiation safety

Individual student results on this assessment were not archived, however the class average on individual questions was available. Faculty reviewed the results on questions for each criteria and felt comfortable with the class average above 85%. This exercise will be revised for the next assessment period so that we have data on individual students.

**Direct Assessment #2**

The faculty assessed radiation safety in RDSC 211 Radiographic Positioning spring term using a practical exam graded with a rubric. There were 46 students assessed, results by proficient and highly proficient are listed in Table 8 below.

Performance criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Patient shielding for exams performed above waist area	Practical scored with a rubric	1 – 3	90% at 3	95%
Patient shielding for exams below the waist area	Practical scored with a rubric	1 – 3	90% at 3	95.7%

Table 8. Assessment results for SLO 8, RDSC 211, spring 2012 radiation safety

Correct patient shielding is critical to patient safety, however not all images or x-rays taken of very body part can be shielded. Exams above the waist are usually shielded and the shielding rarely obscures pertinent anatomy. However x-rays taken below the waist requires higher level critical thinking of the student, making the decision whether shielding can be used correctly or at all resulting in a diagnostic image and ensuing patient safety. If shielding is used incorrectly, a repeat x-ray may result and if shielding is not used when it could be used, unnecessary radiation exposure to sensitive anatomical parts will result. The faculty are very pleased with the above results indicating that over 95% of students understand and can demonstrate appropriate patient shielding and safety prior to their externship.

### Direct Assessment # 3

Clinical Instructors were asked to rate students on this outcome with 12 CIs reporting, the results showed that 66.7% were highly prepared while 33.3% were sufficiently prepared, for a total of 100% at prepared or better.

### Direct Assessment #3

ARRT exam results for the June 2011 RDSC graduates using the ARRT Annual Program Summary Report 2011. The results for *Radiation Protection* were used to assess this outcome. The exam had forty questions for *Radiation Protection* The results of the 41 students who took the exam can be found in Table 9.

Performance Criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Radiation Protection	ARRT National Certification Exam Questions (40)	1-10	80% of students at or above the National average (8.7)	80.5%

Table 9. Assessment results for SLO 1, ARRT exam, April 2011-April 2012

Faculty are pleased with the above results. Comparing our results to the national average on this section of the exam, our students average 9.1 while the national average is 8.7. Radiation protection of patients, staff and self should be of utmost importance in keeping the general population safe when having radiation procedures. Faculty feels confident with students’

performance on this section of the exam with 98% of our students above 75% which is passing and 100% our students passing the entire exam with a an average score of 91% compared to the national average of 85%.

### **Indirect Assessment #1**

In an indirect assessment, the Externship Coordinator surveyed 41 senior extern students in spring 2012 as to how well the program prepared them in the area of radiation safety. With 40 extern students reporting, the results showed that 82 % indicated that they were highly prepared, while 15% indicated that they were adequately prepared, for a total of 97% at prepared or better.

Detailed records of this assessment can be found in the Radiologic Science coordinator's notebook.

## **V. Summary of Student Learning Outcomes**

The program faculty met in June 2012 to review the assessment work for the year and drew the following conclusions.

**PSLO #1:** Demonstrate knowledge of x-ray physics and related math.

**Strengths:** Overall, faculty are pleased with the final results of OIT radiology students when compared to the ARRT national average of students from comparable programs across the United States. In addition clinical instructors located at numerous clinical sites also, rate OIT students as prepared by the OIT faculty upon beginning their externship.

**Weaknesses:** The instructor for RDSC 202 observed a weakness in kVp Relationship with x-ray beam quality.

**Actions:** The students are developing their skills and knowledge base of radiation in the sophomore year therefore this is not a program weakness, however the instructor plans to increase lab procedures and lecture material pertaining to kVp Relationship with x-ray beam quality.

**PSLO #5:** Demonstrate effective patient care skills.

**Strengths:** Faculty reviewed the results and found student performance in the laboratory setting as well as the clinical setting to be highly proficient.

**Weaknesses:** None at this time, however weaknesses have been found in this outcome in previous assessments and were addressed and corrected.

**Actions:** None at the time.

**PSLO #8:** Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standard.

Strengths: Upon reviewing the results faculty are pleased that the OIT radiology students can demonstrate efficiently radiation safety for individual patients in a practical setting both in the laboratory and at the clinical site. The results of students having this knowledge and ability ensures patient safety in *real life* clinical situations.

Weaknesses: Pencil/paper test results are actually lower than the practical application.

Actions: Although the test results are lower than the lab results, faculty conclude that students are sufficiently prepared in this outcome and it is significantly more important that students can do the practical application. Therefore no action needed.

**Appendix A-1  
Radiologic Science  
SLO-Curriculum Map**

**Student Learning Outcome PSLO # 1.** Demonstrate knowledge of x-ray physics and related math.

Courses that are shaded below indicate that the SLO above is taught in the course, students demonstrate skills or knowledge in the SLO, and students receive feedback on their performance on the SLO.

I = Introduced  
R = Reinforced  
E = Emphasized

	<b>Sophomore</b>			<b>Junior</b>			<b>Senior</b>		
<b>Fall</b>	RDSC 201	Imaging Techniques I	I	RDSC 301	Radiographic Positioning III	E	RDSC 410	Extern	E
	RDSC 235	Equipment Operation & Maintenance	I	RDSC 320	Surgical, Trauma & Mobile Radiography	E			
				BIO 336	Pathophysiology				
				RDSC 355	Computed Tomography	I			
<b>Win</b>	RDSC 202	Imaging Techniques II	R	RDSC 356	Magnetic Resonance	I R			
	RDSC 205	Patient Care					RDSC 410	Extern	E
	RDSC 210	Radiographic Positioning I							
	RDSC 366	Radiographic Pathology							
<b>Spr</b>	PHY 217	Physics of Medical Imaging	I	RDSC 326	Cardiovascular/ Interventional Technology		RDSC 410	Extern	E
	RDSC 211	Radiographic Positioning II	E R	RDSC 354	Mammography				
	RDSC 233	Contrast Media Procedures		RDSC 365	Advanced Quality Assurance/Quality Control				
	BIO 335	Cross-Sectional Anatomy		RDSC 388	Externship Prep				
	RDSC 272	Radiation Protection	I						

**Appendix A-2  
Radiologic Science  
SLO-Curriculum Map**

**PSLO # 5** Demonstrate effective patient care skills.

Courses that are shaded below indicate that the SLO above is taught in the course, students demonstrate skills or knowledge in the SLO, and students receive feedback on their performance on the SLO.

I = Introduced  
R = Reinforced  
E = Emphasized

	<b>Sophomore</b>			<b>Junior</b>			<b>Senior</b>		
<b>Fall</b>	RDSC 201	Imaging Techniques I		RDSC 301	Radiographic Positioning III	R E	RDSC 410	Extern	E
	RDSC 235	Equipment Operation & Maintenance		RDSC 320	Surgical, Trauma & Mobile Radiography	R E			
				BIO 336	Pathophysiology				
				RDSC 355	Computed Tomography				
<b>Win</b>	RDSC 202	Imaging Techniques II		RDSC 356	Magnetic Resonance				
	RDSC 205	Patient Care	I				RDSC 410	Extern	E
	RDSC 210	Radiographic Positioning I	I						
	RDSC 366	Radiographic Pathology							
<b>Spr</b>	PHY 217	Physics of Medical Imaging		RDSC 326	Cardiovascular/ Interventional Technology	R E	RDSC 410	Extern	E
	RDSC 211	Radiographic Positioning II	R E	RDSC 354	Mammography	R E			
	RDSC 233	Contrast Media Procedures	R E	RDSC 365	Advanced Quality Assurance/Quality Control				
	BIO 335	Cross-Sectional Anatomy		RDSC 388	Externship Prep				
	RDSC 272	Radiation Protection							

**Appendix A-1  
Radiologic Science  
SLO-Curriculum Map**

**Student Learning Outcome PSLO # 8.** Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standard.

Courses that are shaded below indicate that the SLO above is taught in the course, students demonstrate skills or knowledge in the SLO, and students receive feedback on their performance on the SLO.

I = Introduced  
R = Reinforced  
E = Emphasized

	<b>Sophomore</b>			<b>Junior</b>			<b>Senior</b>		
<b>Fall</b>	RDSC 201	Imaging Techniques I	I	RDSC 301	Radiographic Positioning III	R E	RDSC 410	Extern	E
	RDSC 235	Equipment Operation & Maintenance	I	RDSC 320	Surgical, Trauma & Mobile Radiography	R E			
				BIO 336	Pathophysiology				
				RDSC 355	Computed Tomography	I			
<b>Win</b>	RDSC 202	Imaging Techniques II	I R	RDSC 356	Magnetic Resonance				
	RDSC 205	Patient Care					RDSC 410	Extern	E
	RDSC 210	Radiographic Positioning I	R E						
	RDSC 366	Radiographic Pathology							
<b>Spr</b>	PHY 217	Physics of Medical Imaging		RDSC 326	Cardiovascular/Interventional Technology	R	RDSC 410	Extern	E
	RDSC 211	Radiographic Positioning II	R E	RDSC 354	Mammography				
	RDSC 233	Contrast Media Procedures	R E	RDSC 365	Advanced Quality Assurance/Quality Control				
	BIO 335	Cross-Sectional Anatomy		RDSC 388	Externship Prep				
	RDSC 272	Radiation Protection	I						