

**Oregon Institute of Technology  
Medical Imaging Technology Department  
Radiologic Science Program Assessment  
2009-2010**

## **I. Introduction**

The Radiologic Science program at Oregon Institute of Technology is entering its 58th 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 50 students into the sophomore professional level each year. The program generally graduates between 44-48 students a year. The average salaries reported for the 2008 graduating class was \$46,150, with 13 graduates reporting.

## **II. 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. There have been no changes to date.

### **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.
- Address the healthcare shortage of Oregon and bordering states.
- 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 ideals essential to the profession including teamwork, ethics.
3. Demonstrate effective critical thinking and problem solving skills.
4. Demonstrate effective patient care skills.
5. Utilize both written and oral communication effectively.
6. 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.
7. Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standards.
8. Perform imaging procedures using departmental protocol complying with ARRT curriculum 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.

### 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>2007 2008</b>	<b>2008 2009</b>	<b>2009 2010</b>	<b>2010 2011</b>
1. Demonstrate knowledge of x-ray physics and related math.		Winter		
2. Demonstrate professional conduct and ideals essential to the profession including teamwork and ethics			X	
3. Demonstrate effective critical thinking and problem solving skills	X			
4. Demonstrate effective patient care skills	X		X	
5. Utilize both written and oral communication effectively				X
6. 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		
7. Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standard	X		X	
8. Perform imaging procedures using departmental protocol complying with ARRT curriculum standards		X		
9. Demonstrate an understanding of advanced multiple ARRT imaging modalities and the need for lifelong learning				X

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

### IV. Summary of 2009-10 Assessment Activities

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

**PSLO #2: Demonstrate professional conduct and ideals essential to the profession including teamwork and ethics.** 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.

*Teamwork*

### Direct assessment #1

The faculty assessed teamwork in fall 2009 in RDSC 301 Radiographic Positioning III using a rubric scored project where faculty reflected on student performance in groups. Forty-one junior students were involved in the assessment, using the performance criteria described in table 2.

Performance criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Achieves Goal/purpose	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	86%
Assumes roles /responsibilities	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	86%
Appropriate interactions	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	93%
Reconciles differences	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	93%
Shares in work of team	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	86%
Effective actions	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	100%

Table 2. Assessment results for SLO 2, RDSC 301, fall 2009, faculty ratings on teamwork

The faculty reviewed the results of the team assessment and concluded that although some of the teams did not reach the benchmark of 90% on all criteria, overall the scores were acceptable and that students in general have achieved proficiency in teamwork skills.

### Indirect Assessment # 1

The faculty asked each student to rate the performance of their group on the same criteria that the faculty used above. The student results are shown below in table 3.

Performance criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Achieves Goal/purpose	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	95%
Assumes roles /responsibilities	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	98%
Appropriate interactions	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	98%
Reconciles differences	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	100%
Shares in work of team	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	95%
Effective actions	Rubric scored project	1 – 4 proficiency	90% at 3 or 4	100%

Table 3. Assessment results for SLO 2, RDSC 301, fall 2009, student ratings on teamwork

After the faculty reviewed the results of the students' assessment of their teamwork, they concluded that although the students agree with the faculty ratings in general, the faculty felt that students tend to score their peers higher than faculty might. Faculty feel that students generally score their peers higher because of the added interpersonal social element.

**Direct assessment #2**

As a supporting direct assessment the faculty compiled externship data on teamwork using clinical supervisor professional evaluation reports in May 2010, using the following performance criteria:

- Works well with and assist others
- Communicates effectively with the group
- Sets aside personal differences for the team's success

The clinical instructors gave a single score encompassing the above criteria. All students received ratings at proficiency or higher, with 55.3% receiving ratings of "exceeds all expectations," 40.4% receiving ratings of "progressing beyond expectations," and 4.3% receiving ratings of "as expected."

*Ethics*

**Direct Assessment #3**

The faculty assessed ethics in RDSC 320 Surgical, Trauma, and Mobile Radiography using a rubric scored homework assignment. Forty-one juniors participated in this assessment. The performance criteria and results are shown in Table 4.

Performance criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results
Ethical provisions	Rubric scored assignment	1 – 4 proficiency	90% at 3 or 4	100%
Ethical issues	Rubric scored assignment	1 – 4 proficiency	90% at 3 or 4	100%
Parties involved	Rubric scored assignment	1 – 4 proficiency	90% at 3 or 4	100%
Alternative approaches	Rubric scored assignment	1 – 4 proficiency	90% at 3 or 4	100%
Benefits and risks	Rubric scored assignment	1 – 4 proficiency	90% at 3 or 4	100%

Table 4. Assessment results for SLO 2, RDSC 320, fall 2009, ethics

All students met faculty expectations in this area. The faculty were pleased with their performance both in understanding the ARRT Code of Ethics and applying the codes to an ethical scenario.

## Professionalism

### Direct Assessment #4

The faculty assessed junior students by rating them on 12 student professional behaviors in the academic setting in spring 2010, following the institution's criteria for professionalism. The criteria and results are shown in Table 5.

Performance criteria	Assessment method	Measurement scale	Minimal acceptable performance	Results % at 1 or 2
Timeliness	Professional Rating	0 to 2 scale	90% will score 1 or 2	87.2
Quality; Course Expectations	Professional Rating	0 to 2 scale	90% will score 1 or 2	87.2
Quality; Work Products	Professional Rating	0 to 2 scale	90% will score 1 or 2	87.2
Attitude Towards Feedback	Professional Rating	0 to 2 scale	90% will score 1 or 2	98.4
Attitude Towards Tasks	Professional Rating	0 to 2 scale	90% will score 1 or 2	89.4
Punctuality	Professional Rating	0 to 2 scale	90% will score 1 or 2	95.7
Attendance	Professional Rating	0 to 2 scale	90% will score 1 or 2	95.7
Academic Integrity	Professional Rating	0 to 2 scale	90% will score 1 or 2	100
Interpersonal Skills	Professional Rating	0 to 2 scale	90% will score 1 or 2	93.6
Policies and Procedures	Professional Rating	0 to 2 scale	90% will score 1 or 2	100
Work Ethic	Professional Rating	0 to 2 scale	90% will score 1 or 2	97.9
Appearance	Professional Rating	0 to 2 scale	90% will score 1 or 2	97.9

Table 5. Assessment results for SLO 2, professionalism, spring 2010

The Radiologic Science faculty followed the institutional assessment for professionalism, which focused on student behavior in the academic environment. Extern students, however, leave the institution for their senior year. This presented some confusion on how to best evaluate extern students. The first three criteria in this assessment fall slightly below the benchmark set by faculty, but it primarily reflects student performance on the campus and not on the externship. Externship students did not demonstrate problems in these areas. For this reason it was the judgment of the faculty that senior extern students meet all criteria for this assessment.

### Indirect assessment # 2

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 46 extern students reporting, the results showed that 87.0 % indicated that they were highly prepared, while 10.90% indicated that they were adequately prepared, for a total of 97.9% at prepared or better.

### PSLO #4: 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

To assess patient care skills, the faculty administered practical positioning exams to 48 junior students in RDSC 301 Radiographic Positioning in fall 2009. The faculty directly observed and scored mock Radiologic patient care procedures performed by students on simulated patients. Table 6 shows the performance criteria and results for this assessment.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Patient Identification	Practical Exam	-1pt on practical	90% would have zero point reductions	100%
Patient Preparation (explain exam – remove artifacts)	Practical Exam	-2pts on practical	90% would have zero point reductions	100%
Patient Communication	Practical Exam	-1pt on practical	90% would have zero point reductions	100%
Patient History	Practical Exam	4 pts out of 4 on practical	90% would have 4 out 4 correct	100%
Pregnancy Issues	Practical Exam	-10 on practical	90% would have zero point reductions	100%
Shielding	Practical Exam	-5 on practical exam	90% would have zero point reductions	95%
Patient care and safety	Practical Exam	-5 on practical	90% would have zero point reductions	98%

Table 6. Patient Care Assessment Results, RDSC 301, fall 2009

After reviewing the results of the patient care data, the Radiologic Science faculty concluded that the students met all criteria for this assessment.

**Indirect Assessment #1**

In an indirect assessment, the Externship Coordinator surveyed 47 senior extern students in spring 2010 as to how well the program prepared them in the area of patient care. With 46 extern students reporting, the results showed that 78.3 % indicated that they were highly prepared, while 19.6% indicated that they were adequately prepared, for a total of 97.9% at prepared or better.

**Direct Assessment #2**

Finally the faculty examined the student scores in Patient Care Knowledge on the American Registry of Radiologic Technologist (ARRT) registry exam. The results indicate that the mean scaled score for OIT 2009 ARRT examinees was 9.2 which exceeds the national mean score of 8.9.

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

**PSLO #7: Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standard**

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-3.

**Direct Assessment #1**

To examine this outcome the faculty observed and assessed 41 junior students during practical exams in RDSC 301 Radiographic Positioning III during fall term 2009. The faculty assessed radiation safety in regards to shielding, collimation and repeat rate. Table 7 below shows the performance criteria and results for this assessment.

<b>Performance Criteria</b>	<b>Assessment Methods</b>	<b>Measurement Scale</b>	<b>Minimum Acceptable Performance</b>	<b>Results</b>
Standard 8: Provide Radiation Protection for the Patient shielding	Final Practical Exam	0 equals no point deductions	90% of the students should score 0	95%
Provide Adequate Patient safety by providing proper collimation	Final Practical Exam	0 equals no point deductions	90% of the students should score 0	100%
Provide Adequate Patient Safety and Care by eliminating repeat radiographs	Final Practical Exam	0 equals no point deductions	90% of the students should score 0	88%

Table 7. Assessment results for SLO 7, RDSC 301, fall 2009

The faculty overall are pleased with the results of the radiation safety assessment. While the students were slightly below the benchmark on repeat radiographs, i.e., quality recognition, they demonstrated a significant improvement in this area when compared to last year's assessment. Please see section VI of this report for further details. The faculty teaching this course have recently added a repeat analysis section to the beginning positioning course, RDSC 210, so future RDSC 301 students will have additional content in this area prior to taking the course.

**Direct Assessment #2**

As a second measure on this outcome, the faculty assessed 48 extern students by administering a 100 question pre-registry practice exam on the biological effects of radiation on the human body. The faculty identified ten questions from the exam that demonstrate very specific knowledge that a senior student should know at this point in their clinical externship. The faculty set a per-test item standard of 80% for the group of students taking the test. Table 8 below shows the results on questions pertaining to the biological effects of radiation exposure.

Question Number	Percentage of Students answering correctly	The question
19	37.5	What factor primarily differentiates the probability of occurrence of the various interactions of x-radiation
30	77.08	Which of the following factors can be multiplied to determine equivalent dose (EqD)?
33	89.58	Which terms below define the following statement: any dose of radiation can theoretically cause an effect and the probability of occurrence of effects increase in proportion to the radiation dose of the entire population.
38	68.75	The lowest amount of biological damage in human tissue is produced by ionizing with a _____:
47	87.50	Which of the following is the least radiosensitive?
52	89.58	Which of the following has the major stages of an acute Radiation Syndrome in order?
53	95.83	The loss or change of a base in the DNA chain is known as a:
57	97.92	The product of water ionization that is thought to cause two-thirds of all radiation damage is the:
58	93.75	Ionizing radiation can damage the cell's nucleus and inadvertently the cell may do which of the following?
61	81.25	Which of the following is the most radiosensitive?

Table 8. Assessment results for SLO 7, RDSC 410, winter 2009

The faculty found three questions that did not meet the 80% item standard. These questions were in the following areas: interactions of radiation with human tissue including tissue damage (#38,

#19), and equivalent dose (#30). The instructor involved determined that all question were fair and the students should know the answers.

### Direct Assessment #3

As a third measure on this outcome, the faculty again assessed 48 extern students by selecting another ten questions from the same test this time focused on radiation protection. Table 9 below shows the results on questions pertaining to the radiation protection.

Question Number	Percentage of Students answering correctly	The question
15	89.58	Which product of x-ray interactions present the greatest hazard to the radiographer?
27	81.25	Which of the following is the correct annual occupational dose equivalent limit for the lens of the eye as stated by NCRP Report #116?
29	83.33	Public exposure (annual) to radiation of infrequent exposure is limited to _____ according to NCRP Report #116.
39	77.08	A 24 year old radiography student, exposed as part of their educational experience, should NOT exceed an effective dose of _____ annually.
40	87.50	A staff radiographer that is 28 years old may receive a cumulative exposure of how many SI units according to NCRP Report #116?
83	83.33	Fluoroscopic tubes shall not exceed _____ where the central beam enters the patient.
85	95.83	The cord leading to the exposure switch of a mobile radiographic unit should be at least _____ in length.
88	87.50	Gonadal shields must have a <b>MIMIMUM</b> of _____ mm Pb equivalent.
90	89.58	If a radiographer stands four feet away from the tube and receives 1 mR/hr., what will the exposure if the same radiographer stands two feet away from the tube?
96	62.50	The minimum source to skin distance for a fixed fluoroscopic unit is:

Table 9. Assessment results for SLO 7, RDSC 410, winter 2009

The faculty found two questions that did not meet the 80% item standard. These questions were in the following areas: Calculating equivalent dose for a student (#39), and radiation safety (#96). The instructor felt that the first question was a fair question that the students should know, however question #96 was eliminated as a possibly confusing question.

#### **Direct Assessment #4**

Finally the faculty examined the students score in Radiation Protection on the American Registry of Radiologic Technologist (ARRT) registry exam. The results indicate that the mean scaled score for OIT 2009 ARRT examinees was 8.7 which exceeds the national mean score 8.6.

#### **Indirect Assessment # 1**

In an indirect assessment, the Externship Coordinator surveyed 47 senior extern students in spring 2010 as to how well the program prepared them in the area of radiation safety. With 46 extern students reporting, the results showed that 93.5 % indicated that they were highly prepared, while 6.5% indicated that they were adequately prepared, for a total of 100% 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 2010 to review the assessment work for the year and drew the following conclusions.

#### **PSLO #2: Demonstrate professional conduct and ideals essential to the profession including teamwork and ethics.**

Strengths: Students met performance criteria for teamwork, ethics and professionalism.

Weaknesses: None identified at this time.

Actions: None required at this time.

#### **PSLO #4: Demonstrate effective patient care skills**

Strengths: Students met all performance criteria for patient care.

Weaknesses: None at this time.

Actions: No further action required.

#### **PSLO #7: Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standard**

Strengths: Students met faculty expectations for providing radiation protection for patient shielding, providing proper collimation, and eliminating repeat radiographs.

Weaknesses: Students did not meet faculty expectations for some pre-registry testing questions in the areas of interactions of radiation with human tissue, including tissue damage, and calculating equivalent dose.

Actions: Because students do well on actual ARRT registry examinations, the faculty feel that no further action is required. In addition, the faculty have decided to discontinue the use of home-grown practice tests and switch to radrevieweasy.com, an on-line testing company created by Elsevier. This textbook company provides practice tests for the ARRT registry exam.

## **VI Changes Resulting from Assessment**

**Student learning Outcome #6: 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.**

During the 2008-09 assessment cycle the faculty identified a weakness in students recognizing quality images from non-diagnostic images. The faculty decided to create a scoring guide with more definitive measures of the criteria and provided these to students for future practical exams. The faculty also decided to present a variety of poor quality images on the Blackboard learning tool and during practicals. These activities were accomplished and students were reassessed in RDSC 301 in fall 2009. In the 2008-09 assessment, only 71% of the students demonstrated proficiency in quality recognition of radiographs. During the fall 2009 reassessment, 88% of the students demonstrated proficiency. The faculty are very pleased with this significant improvement.

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

**Student Learning Outcome PSLO # 2.** Demonstrate professional conduct and ideals essential to the profession including teamwork and ethics.

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

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

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

**SLO # 4.** 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

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

**Appendix A-3  
Radiologic Science  
SLO-Curriculum Map**

**SLO # 7.** 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	E	RDSC 410	Extern	E
	RDSC 235	Equipment Operation & Maintenance		RDSC 320	Surgical, Trauma & Mobile Radiography	E			
	BIO 335	Cross-Sectional Anatomy		BIO 336	Pathophysiology				
<b>Win</b>	RDSC 202	Imaging Techniques II	I						
	RDSC 205	Patient Care		RDSC 366	Radiographic Pathology		RDSC 410	Extern	E
	RDSC 210	Radiographic Positioning I	R I	RDSC 356	Magnetic Resonance				
	RDSC 272	Radiation Protection							
<b>Spr</b>	PHY 217	Physics of Medical Imaging		RDSC 355	Computed Tomography	E	RDSC 410	Extern	E
	RDSC 211	Radiographic Positioning II	R	RDSC 326	Cardiovascular/ Interventional Technology	E			
	RDSC 233	Contrast Media Procedures		RDSC 354	Mammography				
				RDSC 365	Advanced Quality Assurance/Quality Control				
				RDSC 388	Externship Prep				