

**Oregon Institute of Technology  
Medical Imaging Technology Department  
Echocardiography Program Assessment  
2012-2013**

## **I. Introduction**

Oregon Tech's Bachelor of Science in Echocardiography degree is one of only a few B.S. Degree programs in echocardiography in the United States. Oregon Tech will provide didactic instruction, clinical observations, and leadership and personal training, including basic and advanced training in imaging skills needed to properly perform the duties of a cardiac sonographer. Students are required to complete an 11-month externship at specifically chosen echocardiography laboratories. Externship will provide the hands-on training and patient load requirements necessary to meet the prerequisite requirements of the certifying board agency, the American Registry of Diagnostic Medical Sonographers (ARDMS), to be able to sit for the registry exam in adult echocardiography. Note: As the program evolves, a limited number of students may have the opportunity to complete a directed clinical externship in pediatric echocardiography, and be qualified to sit for the ARDMS pediatric echocardiography registry exam.

The first Oregon Tech cohort for Echocardiography began fall 2008, with 14 students, and additional cohorts of 17 students in the fall of 2009, 20 students in the fall of 2010, and 20 students in the fall of 2011. In the fall of 2012, 24 sophomore students were admitted to the program, anticipating improved employment opportunities upon graduation in 2015. Due to anticipated changes in departmental and over-all faculty staffing, the cohort selected for admission fall 2013 was 20 students.

From the beginning of the program in fall 2008 to the end of spring term 2013, retention rate in the Echocardiography program was 94%. 12 of the initial cohort of 14 students completed externship, and became the first graduating class in the Echocardiography program spring 2011. The class of 2012 graduated 15 of the 17 students admitted, and at the beginning of Fall term 2012, 21 students were on externship (one student was readmitted – phasing in from the 2009 cohort), 20 were continuing their on-campus didactic education, and 24 new students were admitted to the program for a total of 65 students in the over-all current Echo program enrollment. After graduation 2013, 48 of 51 entering students will have graduated. All 2011 and 2012 graduates have passed registry exams through either ARDMS, or CCI, and are working as cardiac sonographers, either per diem or in scheduled positions. Annual salaries reported varied from \$25,000 to \$84,000.

## **II. Program Purpose, Educational Objectives, and Student Learning Outcomes**

The Echocardiography faculty agreed to adopt the student learning outcomes as suggested by a programmatic accrediting body, the Joint Review Committee on Education in Diagnostic Medical Sonography (JRCEDMS).

Clinical Instructor input was accessed through late 2011 conference calls, and discussions covered the logistics of student documentation, areas of didactic concern, and overall success of the program. Modifications needed were minimal, and were incorporated in the 2012-2013 program year.

The program Advisory Board/Committee was still in the formative stage for 2012-2013, with an initial meeting planned for the 2013-2014 school year, once all members were acquired. The program's Medical Director was frequently updated on the progress of the program's development, and provided input as needed.

## **Echocardiography Program Purpose**

The Oregon Tech Bachelor of Science program in Echocardiography provides students with the knowledge, clinical skills, values and behaviors to become competent cardiac sonographers.

## **Echocardiography Program Educational Objectives**

1. The program prepares students to utilize diagnostic techniques, sound judgment and good decision making to provide patient services.
2. The program communicates the importance of becoming credentialed in the profession of echocardiography.
3. The program prepares students who think critically, communicate effectively and exemplify professional ethics.
4. The program conveys the importance of becoming life-long learners and responsible citizens.

## **Expected Program Student Learning Outcomes**

Graduates from this program will be able to:

1. Demonstrate the ability to communicate effectively in oral, written and visual forms.
2. Demonstrate the ability to work effectively in teams.
3. Demonstrate an ability to provide basic patient care and comfort.
4. Demonstrate professional judgment, discretion, and ethics.
5. Demonstrate knowledge and understanding of human gross anatomy, sectional anatomy, and normal and abnormal cardiovascular anatomy.
6. Demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.
7. Demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.
8. Demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.
9. Demonstrate an understanding of diverse cultural and humanistic traditions in the global society.

## **Additional Student Learning Opportunities**

Students will be encouraged to attend American Society of Echocardiography (ASE) conferences when held on the west coast or near their externship sites during the student's senior year.

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

The faculty also confirmed the assessment cycle planned, as listed in Table 1 below.

<b>Echocardiography Degree Student Learning Outcomes Assessment Schedule</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>
1. The student will demonstrate the ability to communicate effectively in oral, written and visual forms.			X
2. The student will demonstrate the ability to work effectively in teams.		X	
3. The student will demonstrate an ability to provide basic patient care and comfort.	X		
4. The student will employ professional judgment and discretion, including ethics.		X	
5. The student will demonstrate knowledge and understanding of human gross anatomy sectional anatomy and normal and abnormal cardiovascular anatomy.			X
6. The student will demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.	X		
7. The student will demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.	X		
8. The student will demonstrate knowledge and understanding of clinical echocardiography diagnostic procedures and testing		X	
9. The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.			X

Table #1 Echocardiography Degree Assessment Cycle

**Note: SLO's # 8 and #9 were switched in their assessment years, due to time devoted to unanticipated difficulties in scheduling externship sites for 2013-2014.**

#### IV. Summary of 2012-13 Assessment Activities

##### A. Student Learning Outcome #2. The student will demonstrate the ability to work effectively in teams.

The mapping of this outcome in the Echocardiography courses can be found in Appendix A, Student Learning Outcome-Course Matrices Table A1.

##### Direct Assessment #1

The faculty assessed this outcome in ECHO 333 in fall term. Student group presentations were assigned, with groups aware that the assignment would be graded utilizing the Oregon Tech ISLO Team and Group Work Rubric. Twenty-one Echocardiography juniors participated in the assessment. The faculty rated the proficiency of students using the performance criteria described in Table #2 below.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Identify and achieve goal/purpose	ISLO Rubric	Score of 1 – 4 (no/limited proficiency – high proficiency)	80% with 3 or higher	All students scored 3 or higher
Assume roles and responsibilities	ISLO Rubric	Score of 1 – 4 (no/limited proficiency – high proficiency)	80% with 3 or higher	All students scored 3 or higher
Communicate effectively	ISLO Rubric	Score of 1 – 4 (no/limited proficiency – high proficiency)	80% with 3 or higher	All students scored 3 or higher
Reconcile differences	ISLO Rubric	Score of 1 – 4 (no/limited proficiency – high proficiency)	80% with 3 or higher	All students scored 3 or higher
Shares work appropriately	ISLO Rubric	Score of 1 – 4 (no/limited proficiency – high proficiency)	80% with 3 or higher	All students scored 3 or higher
Develops strategies/actions	ISLO Rubric	Score of 1 – 4 (no/limited proficiency – high proficiency)	80% with 3 or higher	All students scored 3 or higher
Cultural adaptation	ISLO Rubric	Score of 1 – 4 (no/limited proficiency – high proficiency)	80% with 3 or higher	All students scored 3 or higher

Table #2. SLO #2, ECHO 333 ISLO results, fall 2012

Students performed at and above the expected level of performance. Students exhibited minimal variation in ratings assigned to themselves, and to others in their respective teams.

As a result of the data, the student presentations will continue to be incorporated, with additional emphasis on accurate self/peer evaluation. Individual student contributions need to be assessed utilizing a redesigned scoring rubric, and closer overview.

## Direct Assessment #2

The faculty assessed this outcome in ECHO 420 from the 2012–2013 academic year using spring 2013 student competencies for echocardiography as assessed by industry. Twenty students participated in the assessment. The faculty rated the proficiency of students using the performance criteria described in Table #3 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Student recognizes his/her role as a student and displays initiative in helping in the daily echocardiography lab team effort.	Echo 420 Spring Competency 7 a.	1 – 10 Scale	80% with 8 or higher	100%
Student is willing to gather appropriate data for the team effort of quality assurance.	Echo 420 Spring Competency 7 b.	1 – 10 Scale	80% with 8 or higher	100%
Student ability to function as a two person team with their clinical trainer.	Echo 420 Spring Competency 7 c.	1 – 10 Scale	80% with 8 or higher	100%

Table #3. SLO #2, ECHO 420 extern competencies results

Students performed at or above the desired level of proficiency in terms of team effort not only in the Echocardiography lab as a whole, but also as bedside imaging teams with observing clinical staff.

As a result of the data, an understanding of what constitutes team participation, and the expected performance in the clinical setting will continue to be emphasized in the Externship Preparation class, spring quarter. Individual student performance will be addressed based on input provided from Clinical Instructors and data obtained in the quarterly Competencies.

### Indirect Assessment #1

The faculty assessed this outcome in ECHO 420 from the student 2012-13 exit surveys asking them to rate how well the OIT Echocardiography program and their extern site prepared them for this learning outcome #2. The students rated their proficiency using the performance criteria described in Table #4 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Ability to work effectively in teams (OIT preparation)	Exit Survey	1 – 4 Scale	80% with a score of 3.0 or better	100%
Ability to work effectively in teams (site preparation)	Exit survey	1 – 4 Scale	80% with a score of 3.0 or better	100%

Table #4, SLO #2 ECHO 420 student self-assessment/exit survey results.

Students rated the program and site as providing adequate preparation for oral and written communication. All reporting students rated the program as providing training to effectively work in teams, while 1 of 17 rated the site preparation as only satisfactory.

As a result of this assessment activity, oral presentations will be continued, and additional reporting of case studies will be emphasized in the junior level courses. In the Externship Preparation class, the position of the staff sonographer (and the student) as a team member will be emphasized, with examples of behaviors that contribute to team efforts and goals provided during discussion.

**B. Student Learning Outcome #4: The student will employ professional judgment, discretion, and ethics.**

The Echocardiography faculty conducted an analysis of where this outcome is reflected in the curriculum. The mapping of this outcome in the Echocardiography courses can be found in Appendix A, Student Learning Outcome-Course Matrices Table A2.

**Direct Assessment #1**

The faculty assessed this outcome in ECHO 321 course during fall term using the OIT ISLO Ethics Assessment assignment, incorporating the American Society of Echocardiography Code of Ethics, and a scenario requiring application of provisions in that code. Twenty junior Echocardiography students participated in this assessment. The faculty rated the proficiency of students using the performance criteria described in Table #5 below.

Students	Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher	Table #5. SLO #4 ECHO 333 results, Fall 2012 overall
	Demonstrates knowledge of the professional code of ethics	ISLO Ethics Assignment	Level of Proficiency on scale of 1-4 (limited to high proficiency)	80% with 3 or higher		
	Using the code of ethics, describes ethical issue(s)	ISLO Ethics Assignment	.. ..	.. ..	95% scored 3 or higher	
	Describes parties involved and discusses their points of view	ISLO Ethics Assignment	.. .. ..	.. .. ..	100% scored 3 or higher	
	Describes and analyzes possible/alternative approaches	ISLO Ethics Assignment	.. .. ..	.. .. ..	95% scored 3 or higher	
	Chooses an approach and explains the benefits and risks	ISLO Ethics Assignment	.. .. ..	.. .. ..	100% scored 3 or higher	

performance was at or above the minimum acceptable level of performance.

As a result of the data, areas where there was uncertainty in identifying ethical issues possible alternatives were reviewed in class discussion. Ethical issues will continue to be emphasized in on-campus courses, and identified in particular in the Externship Preparation class, spring quarter.

## Direct Assessment #2

The faculty also assessed this outcome in ECHO 420 from the 2012–2013 academic year using winter term student competencies for cardiac ultrasound as assessed by industry. Twenty students participated in the assessment. Clinical Instructors rated the proficiency of students using the performance criteria described in Table #6 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Student demonstrates a professional bedside manner.	Echo 420 winter competency 6 a.	1 – 10 Scale	80% with a score of 8.0 or better	100%
Student recognizes when a patient's presenting symptoms are not in keeping with the exam ordered and contact the referring physician's office or the clinical instructor for exam type verification.	Echo 420 winter competency 6 b.	1 – 10 Scale	80% with a score of 8.0 or better	100%
Student avoids involvement in echocardiography lab politics and does not engage in negative conversation.	Echo 420 winter competency 6 c.	1 – 10 Scale	80% with a score of 8.0 or better	100%

Table #6. SLO #4 results for ECHO 420 student competencies.

All students performed at a high level professionalism during the performance of bedside and/or outpatient echocardiograms.

As a result of the data, expected performance in the clinical setting will continue to be emphasized in the Externship Preparation class, spring quarter. Individual student performance will be addressed based on input provided from Clinical Instructors and data obtained in the quarterly Competencies.



## Indirect Assessment #1

The faculty assessed this outcome in EHCO 420 from the student 2012-13 exit surveys asking them to rate how well the OIT Echocardiography program and their extern site prepared them for this learning outcome #4. The seventeen responding senior Echocardiography students rated their proficiency using the performance criteria described in Table #7 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Student rating of how OIT prepared them for outcome #4	2012–2013 Extern Exit Survey	1 – 4 Scale	80% with a score of 3.0 or better	94%
Student rating of how their extern site prepared them for outcome #4	2012–2013 Extern Exit Survey	1 – 4 Scale	80% with a score of 3.0 or better	100%

Table #7. SLO #4 results for ECHO 420 student self-assessment/exit survey

Students had rated preparation provided by both Oregon Tech, and the individual externship sites as preparing them for meeting the goals of working as a health care professional in a clinical setting.

As a result of the data, expected performance in the clinical setting will continue to be emphasized in the Externship Preparation class, spring quarter. Individual student performance will be addressed based on input provided from Clinical Instructors and data obtained in the quarterly Competencies. Echocardiography faculty will provide additional input to Clinical Instructors emphasizing timeliness in reporting student deficiencies, and the need for adequate documentation in order to institute any corrective action.

### **C. Student Learning Outcome #8: The student will demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.**

The performance criteria for this outcome are:

1. Correlates abnormal test results to the patient history, including demographics and physical data to answer the clinical question.
2. Not only considers general pathological assumptions as being the cause of abnormal test results, but also considers other possibilities or differential diagnosis.
3. Is able to evaluate diagnostic implications regarding what abnormal Doppler findings mean and/or could mean.
4. Is able to answer the clinical question.
5. Student ability to write the actual preliminary report accurately or write an accurate mock preliminary report.

**Direct Assessment #1**

The faculty assessed this outcome at externship sites spring term 2013 using spring term competencies for cardiac ultrasound as assessed by industry. The Clinical Instructors rated the proficiency of nineteen senior Echocardiography students using the performance criteria described in Table 9 below.

<b>Performance Criteria</b>	<b>Assessment Methods</b>	<b>Measure Scale</b>	<b>Minimum Acceptable Performance</b>	<b>Results -% with Target or higher</b>
Correlates test results with clinical information & question	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	100 %
Identifies alternate causes of pathology	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	100%
Recognizes abnormal Doppler findings & implications	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	100%
Writes accurate preliminary report	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	100%

Table #9 Student Competency Evaluation Results for SLO #8, spring 2013.

Students performed at or above the minimum level of performance, as judged by industry.

As a result of the data, the Clinical Externship experience, by the spring term evaluation period, has provide an extremely adequate amount of professional preparation. Competency forms will be evaluated during the 2013-2014 year, and modifications will be made based on industry recommendations. All Competency Evaluations (three per quarter minimum) are reviewed by faculty, and scores reflect a continuum of an increasing knowledge base, clinical performance, and an understanding of clinical echocardiography as the externship year progresses.

### Indirect Assessment #1

The faculty assessed this outcome in ECHO 420, from the student 2012-2013 exit surveys. 17 senior Echocardiography students rated how well the Oregon Tech Echocardiography program and their extern site prepared them for learning outcome #8. Student rating from the responding students is described in Table #9 below.

<b>Performance Criteria</b>	<b>Assessment Methods</b>	<b>Measurement Scale</b>	<b>Minimum Acceptable Performance</b>	<b>Results -% with Target Av. or higher</b>
Student rating of how OIT prepared them for outcome #8.	Exit Survey	% scale per category used	90% with a score of 3.0 or better	100%
Student rating of how their extern site prepared them for outcome #8.	Exit survey	% scale per category used	90% with a score of 3.0 or better	100%

Table #10 Student Self-assessment for SLO #8, spring 2013

Students reported that both the Oregon Tech Echocardiography Program, and their respective clinical externship sites prepared them with the knowledge and understanding of clinical echocardiographic diagnostic procedures and testing required in the clinical environment.

As a result of the data, the program will continue to add additional didactic material as testing procedures, ultrasound equipment, and standards of practice continue to evolve. Major input for new material is provided by attendance at regional echocardiography society meetings and annual American Society of Echocardiography Scientific Sessions, through adopting the latest texts as course requirements, and through review of current literature.

## **V. Evidence of Student Learning**

During the 2012-2013 academic year, the program faculty formally assessed the student learning outcomes summarized below. Additional details on these assessment activities can be found in this assessment report and in department records.

### **Student Learning Outcome #2: The student will demonstrate the ability to work effectively in teams.**

Strengths: In the clinical setting during the student senior externship year, Clinical Instructors uniformly reported that students met their expectations, particularly as the year progressed.

Areas needing improvement: Teamwork assessment within the two on-campus years was assessed through assigned group presentations. Students showed a reluctance to accurately indicate varying levels of individual student performances by the rubric used.

Plans for improvement: The scoring rubric will be improved, and the importance of accurate self and peer scoring will be emphasized.

### **Student Learning Outcome #4: The student will employ professional judgment, discretion, and ethics.**

Strengths: The American Society of Echocardiography has a Code of Ethics that is incorporated in the didactic course material. Professional Evaluations are conducted throughout the on-campus years, providing input that can address individual deficiencies as they arise. Significant discussion occurs during the Externship Preparation class spring term, prior to the clinical externship year.

Areas needing improvement: An earlier explanation of the various clinical roles that will be encountered when students are at externship sites needs to be integrated in programmatic courses.

Plans for improvement: A more thorough explanation of working echocardiographic lab structure will be given earlier in the programmatic courses, and emphasized in the Laboratory Management class during the junior year.

### **Student Learning Outcome #8: The student will demonstrate knowledge and understanding of clinical echocardiographic diagnostic procedures and testing.**

Strengths: Students performed well as they entered the final two quarters of the externship year.

Weaknesses: Procedures and testing varied somewhat between externship sites. Students have a period of significant growth and knowledge acquisition during their initial quarters of externship. Locally, the sizes of the medical facilities available preclude clinical experience that would provide direct patient care within the echocardiography labs prior to externship. Students are limited in the diversity of scanning subjects in the campus lab setting.

Plans for improvement: The faculty in the Echo program will increase the number of actual echocardiograms available for review on the CoreSound Echo PACS system, and utilize them for image review, pathology review, testing methods, and reporting practice in the core echocardiography classes.

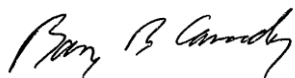
## VI. Changes Resulting from Assessment.

1. The Echocardiography Program moved to the utilization of an on-line externship reporting and documentation program – Trajecsyst – that will begin on the 2013-2014 externship year. Clinical Instructors will enter Competency Evaluations and Echo Professional Evaluations electronically. Students will also electronically document clinical logs and clinical time sheets. This will increase overview and timeliness of reporting from the clinical sites. Reports and evaluations will be stored electronically, and be easily accessible by faculty for assessments, and for proposed programmatic accreditation documentation.
2. The credit hours in the Externship Preparation class, held spring term prior to going on externship, was increased from 2 to 3 credit hours. The additional class hour will be dedicated to review and discussion of complete echocardiograms from working echocardiography labs.
3. The current pattern in which SLO's are assessed and evaluated makes it difficult to compare year-to-year improvements in specific areas. Direct comparison requires that current findings are compared with results obtained from Assessments performed 3 years prior. In the case of the evolving Echocardiography Program, during the 2009-2010 academic year, the program was still being formed/structured, and courses developed, and the first class was yet to enter externship.

What would be more useful in tracking modifications, and resultant changes in reported results, would be to select a certain number of SLO's that are tracked yearly, which will show evolution and response of the program to evaluations from both the faculty, and industry representatives. Faculty will discuss this area of reporting after the changes noted in **1** and **2** above have been implemented.

A second area where the current reporting structure could be modified is in the addition of tracking of student progress on externship within the externship year itself. While faculty follow student progress over the four-quarter externship year, assessment results can be skewed multiple directions, entirely dependent on the results of the quarter reported. This will be also be discussed by faculty.

4. In reviewing the assessment results over-all, assessment scores from student competencies and professional evaluations reflect a general trend towards improvement in the level of preparation by the program, and training/education on the part of the clinical externship sites themselves.



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## Appendix A

### Student Learning Outcome-Course Matrices

**SLO #2: The student will demonstrate the ability to work effectively in teams.**

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 the performance on the SLO.

I = Introduced; R = Reinforced; E = Emphasized

	<b>Sophomore</b>			<b>Junior</b>			<b>Senior</b>		
<b>Fall</b>	BIO 220	Cardio Phys		BUS 317	HlthCare Mgmt		ECHO 420	Extern	E
	ECHO 320	Cardio Methods		ECHO 333	Echo III	ER			
	PHY 217	Physics of MI		ECHO 321	TEE & Stress				
	WRI 227	Tech Writing		SPE 321	Small Group Comm	ER			
<b>Win</b>	ECHO 231	Echo I		BUS 316	TQM		ECHO 420	Extern	E
	BIO 346	Patho I		CHE 210	Clinical Pharm				
	MIT 231	Sono principles I		ECHO 376	Survey of Vas Tech				
	Soc Sci	Elective		ECHO 325	Pediatric Echo	R			
				Hum	Elective				
<b>Spr</b>	ECHO 225	Pt Mgmt		ECHO 385	Lab Mgmt	ER	ECHO 420	Extern	E
	ECHO 232	Echo II	IE	ECHO 334	Echo IV				
	ECHO 332	Invasive Cardio		ECHO 388	Extern Orient				
	BIO 347	Patho II		Comm	Elective				
	MIT 232	Sono principles II		Hum	Elective				

Table A1. Student Learning Outcome #2-Course Matrix

\*\*Subject to change as courses are designed and developed.

## Appendix A

### Student Learning Outcome-Course Matrices

**SLO #4: The student will employ professional judgment and discretion, including 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 the performance on the SLO.

I = Introduced; R = Reinforced; E = Emphasized

	Sophomore			Junior			Senior		
<b>Fall</b>	BIO 220	Cardio Phys		BUS 317	HlthCare Mgmt	R	ECHO 420	Extern	E
	ECHO 320	Cardio Methods		ECHO 333	Echo III	ER			
	PHY 217	Physics of MI		ECHO 321	TEE & Stress	R			
	WRI 227	Tech Writing		SPE 321	Small Group Comm	R			
<b>Win</b>	ECHO 231	Echo I		BUS 316	TQM		ECHO 420	Extern	E
	BIO 346	Patho I		CHE 210	Clinical Pharm				
	MIT 231	Sono Principles I		ECHO 376	Survey of Vas Tech				
	Soc Sci	Elective		ECHO 325	Pediatric Echo	R			
				Hum	Elective				
<b>Spr</b>	ECHO 225	Pt Mgmt		ECHO 385	Lab Mgmt		ECHO 420	Extern	E
	ECHO 232	Echo II	R	ECHO 334	Echo IV				
	ECHO 332	Invasive Cardio		ECHO 388	Extern Orient	ER			
	BIO 347	Patho II		Comm	Elective				
	MIT 232	Sono principlesII		Hum	Elective				

Table A2. Student Learning Outcome #4-Course Matrix

\*\*Subject to change as courses are designed and developed.

## Appendix A

### Student Learning Outcome-Course Matrices

**Student Learning Outcome #8: The student will demonstrate knowledge and understanding of clinical echocardiography diagnostic procedures and testing.**

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 the performance on the SLO.

I = Introduced; R = Reinforced; E = Emphasized

	Sophomore			Junior			Senior		
<b>Fall</b>	BIO 220	Cardio Phys		BUS 317	HlthCare Mgmt		ECHO 420	Extern	E
	ECHO 320	Cardio Methods	I E	ECHO 333	Echo III	I E			
	PHY 217	Physics of MI		ECHO 321	TEE & Stress	I E			
	WRI 227	Tech Writing		SPE 321	Small Group Comm				
<b>Win</b>	ECHO 231	Echo I	I E	BUS 316	TQM		ECHO 420	Extern	E
	BIO 346	Patho I		CHE 210	Clinical Pharm				
	VAS 210	VAS Physics I	I E	ECHO 376	Survey of Vas Tech				
	Soc Sci	Elective		ECHO 325	Pediatric Echo	I E			
				Hum	Elective				
<b>Spr</b>	ECHO 225	Pt Mgmt		ECHO 385	Lab Mgmt		ECHO 420	Extern	E
	ECHO 232	Echo II	I E	ECHO 365	Abd/Renal				
	ECHO 332	Invasive Cardio	R	ECHO 388	Extern Orient				
	BIO 347	Patho II		Comm	Elective				
	VAS 211	VAS Physics II	I E	Hum	Elective				

Table A3. Student Learning Outcome #8-Course Matrix

\*\*Subject to change as courses are designed and developed.