Oregon Tech
Medical Imaging Technology Department
Echocardiography Program
2015-2016 Assessment

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 individual, hands-on training - including basic and advanced training in imaging skills needed *"To prepare competent entry-level adult cardiac sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains"*.

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. Occasionally, a student may have the opportunity to complete an additional directed clinical externship in pediatric echocardiography, and be qualified to sit for both the ARDMS adult and pediatric echocardiography registry exams.

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, 20 students in the fall of 2011, 24 admitted fall 2012, 20 admitted fall 2013, 20 admitted fall 2014, and 20 admitted fall 2015. June 2016 student selections for fall 2016 MIT enrollment in Echocardiography will add the latest cohort of 20 students.

Upon 2016 graduation, total current enrollment is 56 students, including those anticipated as being accepted for fall 2016 entry into the Echocardiography Program. All graduates who are known to have applied for registry exams through either ARDMS or CCI have passed the Adult Echocardiography Registry, several have additionally passed and become registered in Pediatric Echocardiography, and Vascular Ultrasound. 99% of graduates (through the 2014 graduates) have worked or are working as cardiac sonographers, either per diem or in scheduled positions. Annual salaries reported varied from $25,000 to $84,000.

One of the major goals of the Echocardiography program (along with Diagnostic Medical Sonography, and Vascular Technology) has been to seek JRC-DMS/CAAHEP Programmatic Accreditation. The JRC-DMS self-study was submitted fall 2014, the JRC-DMS site visit occurred May 2015, and finalized submission of documentation for the accreditation process was completed by the end of June 2015, and all three ultrasound programs received CAAHEP Initial Accreditation in September 2015.

Retention/Attrition, credentialing success, and placement outcomes for the last three years are reported in Table 1.

The Echocardiography (ECHO) program is programmatically accredited through the Commission on Accreditation of Allied Health Education Programs (CAAHEP), upon review of the Joint Review Committee on Education in Diagnostic Medical Sonography (JRC-DMS). Feedback from industry affiliates confirms that the ECHO program not only meets the bar established by CAAHEP, but also produces graduates ready to work in any hospital or clinical lab setting with minimal orientation or instruction. Information on program accreditation can be found at www.caahep.org. The following metrics reflect the program outcomes as reported to CAAHEP:

Credentialing success, exams taken and passed with first year of completion			
	2013	2014	2015
ARDMS Pass rate for Sonography Physics and Instrumentation (SPI) - within class cohort	100% (19/19)	100% (19/19)	100% (16/16)
ARDMS/CCI pass rate for Echocardiography (Adult Echo)	100% (20/20)	100% (19/19)	100% (15/15)
Placement			
Employment within first 6 months of graduation.	95% (19/20)	100% (19/19)	100% (16/16)
Retention/Attrition			
Retention	95% (20/21)	95% (19/20)	72.7% (16/22)
Attrition	5% (1/21)	5% (1/20)	27.3% (6/22)

Class of 2016 will be reported after January 2017.

Table 1. Echocardiography – Programmatic Outcomes 2013 – 2015

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

The Echocardiography faculty agreed to adopt the student learning outcomes as suggested by the Joint Review Committee on Education in Diagnostic Medical Sonography (JRCDMS).

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.

Minimum Expectations: The program will meet the following goal, defining minimum expectations:

"To prepare competent entry-level adult cardiac sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains"

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, and Programmatic Input

Students have been encouraged to attend meetings sponsored by northwest regional chapter of the American Society of Echocardiography (the Willamette Valley Society of Echocardiography - WVSE) held quarterly in Portland, and try to attend other regional society conferences held near their externship sites throughout the year.

Clinical Instructor input was accessed through late 2016 conference calls, and discussions covered the logistics of student documentation and updated verbal evaluation of the Trajecsys externship reporting system, areas of didactic concern, modifications to the current externship Competencies, and overall success of the program. Continuing modifications will be directed towards an update of the Competency Evaluations used on externship, better reflecting current practice models, and towards elimination many of the scoring areas that more properly fit within the Echocardiography Professional Evaluation. CME's will be made available through SDMS for clinical site staff directly involved in the hands-on training for students on their Clinical Externship, starting with the 2016 – 2017 Externship year.

The program Advisory Board/Committee will meet via teleconference spring/summer 2016. Results and input from the discussions will be made available as needed. The program's Medical Director was frequently updated on the progress of the program's development, provided input as needed, and visited campus and gave lectures to the junior and sophomore classes spring 2016. The Medical Director's overview and assessment of the program was a part of the JRC-DMS accreditation site visit, May 2015.

Much of the externship assessment material has been incorporated within the Trajecsys reporting system, and full details of all externship scoring is available on-line as needed.

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

The faculty also confirmed the assessment cycle planned, as listed in Table #2 below.

Echocardiography Degree Student Learning Outcomes Assessment Schedule	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1. The student will demonstrate the ability to communicate effectively in oral, written and visual forms.			X(1)			X(1)	
2. The student will demonstrate the ability to work effectively in teams.			X(4)			X(4)	
3. The student will demonstrate an ability to provide basic patient care and comfort.	X			X			X
4. The student will employ professional judgment and discretion, including ethics.		X(3)			X(3)		
5. The student will demonstrate knowledge and understanding of human gross anatomy sectional anatomy and normal and abnormal cardiovascular anatomy.			X			X	
6. The student will demonstrate knowledge and understanding of cardiovascular physiology, pathology, and pathophysiology.	X			X(2)			X(2)
7. The student will demonstrate knowledge and understanding of cardiovascular physical principles and instrumentation.	X			X(5)			X(5)
8. The student will demonstrate knowledge and understanding of clinical echocardiography diagnostic procedures and testing		X			X		
9. The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.		X(6)			X(6)		

Table #2. Echocardiography Degree Assessment Cycle – (number) indicates a SLO that incorporates proposed ESLO's. The pattern is subject to modification.

IV. Summary of 2015-16 Assessment Activities

A. 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 A1.

Direct Assessment #1

The faculty assessed this outcome in ECHO 388 course during spring term using an ISLO Ethics Assessment assignment, incorporating the American Society of Echocardiography Code of Ethics, and a scenario requiring application of provisions in that code. Seventeen junior Echocardiography students participated in this 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
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	.. ..	.. ..	100% 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	.. .. ..	.. ..	100% scored 3 or higher
Chooses an approach and explains the benefits and risks	ISLO Ethics Assignment	.. .. ..	.. .. ..	100% scored 3 or higher

Table #3. SLO #4 ECHO 388 assignment results, Spring 2016

Students overall 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 2015-2016 academic year using winter term student competencies for cardiac ultrasound as assessed by industry. Twenty students participated in the assessment. Within the Trajecsys reporting system, Clinical Instructors rated the proficiency of students using the performance criteria described in Table #4 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: "The student will employ professional judgment and discretion."	1 – 10 Scale	80% with a score of 8.0 or better	95%
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.	…… …… …… ….. ……	1 – 10 Scale	80% with a score of 8.0 or better	95%
Student avoids involvement in echocardiography lab politics and does not engage in negative conversation.	….. …… ……	1 – 10 Scale	80% with a score of 8.0 or better	95%

Table #4. 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. Based on the spring 2016 Clinical Instructor tele-conference, students will be encouraged to seek more difficult scanning subjects while performing on-campus assignments.

Indirect Assessment #1

The faculty assessed this outcome in ECHO 420 with data from the 2015-16 Student Program, and Clinical Site Evaluations in the Trajecsys reporting system, asking them to rate how well the OIT Echocardiography program and their extern site prepared them for learning outcome #4. The twenty responding senior Echocardiography students rated their proficiency using the performance criteria described in Table #5 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	2015-2016 Echo Program Evaluation	1 – 4 Scale	80% with a score of 3.0 or better	95%
Student rating of how their extern site prepared them for outcome #4	2015-2016 Clinical Site Evaluation	1 – 4 Scale	80% with a score of 3.0 or better	95%

Table #5. SLO #4 results for ECHO 420 Student Program and Site Evaluations

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.

The one significant below minimum score was attributed to time constraints placed on the student by the clinical site and staff.

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.

B. 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.

The mapping of this outcome in the Echocardiography curriculum can be found in Appendix A, Student Learning Outcome-Course Matrices Table A2.

Direct Assessment #1

The faculty assessed this outcome at externship sites spring term 2016 using spring term competencies for cardiac ultrasound as assessed by industry. Within the Trajecsys reporting system, the Clinical Instructors rated the proficiency of twenty senior Echocardiography students using the performance criteria described in Table #6 below.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Correlates test results with clinical information & question	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	95 %
Identifies alternate causes of pathology	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	95 %
Recognizes abnormal Doppler findings & implications	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	95 %
Writes accurate preliminary report	Student Competency Evaluation Form #8	0 – 100%	90% with a score of 90 or better	95 %

Table #6. Student Competency Evaluation Results for SLO #8, spring 2016.

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

The one significant below minimum score was attributed to time constraints placed on the student by the clinical site and staff.

As a result of the data, the Clinical Externship experience as detailed by the spring term evaluation period has provided an extremely adequate amount of professional preparation. Competency forms will be evaluated during the 2016-2017 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 2015-2016 Student Program, and Clinical Site Evaluations within the Trajecsys reporting system. 20 senior Echocardiography students rated how well the Oregon Tech Echocardiography program and their extern site prepared them for learning outcome #8. Rating from the responding students is described in Table #7 below.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results -% with Target Av. or higher
Student rating of how OIT prepared them for outcome #8.	Student Program Evaluation	% scale per category used	90% with a score of 3.0 or better	95%
Student rating of how their extern site prepared them for outcome #8.	Student Clinical Site Evaluation	% scale per category used	90% with a score of 3.0 or better	95%

Table #7. ECHO 420 Evaluation Results for SLO #8, spring 2016

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. The one significant below minimum score was attributed to time constraints placed on the student by the clinical site and staff.

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. The specific clinical site that was identified as placing time constraints on the student will be evaluated the next time a student has the site for externship, and an

evaluation of whether it's a site issue, CI/student miss-match, or student preparation issue. (The site is not being utilized during the 2016-2017 Externship year.)

C. Student Learning Outcome #9: The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.

Direct Assessment #1

This outcome was assessed by faculty spring term 2016. 18 junior students in the ECHO 385 Lab Management class were lectured on international prevalence, concerns, and management of cardiovascular disease. Particular emphasis was made on international and cultural variability in access to cardiovascular testing. The emergence of outreach services to underdeveloped countries and regions was introduced as part of a comprehensive solution to the discrepancies seen between countries on a global scale. A quiz was administered to assess retention of presented information. Proficiency is described in Table #8 below.

The mapping of this outcome in the Echocardiography curriculum can be found in Appendix A, Student Learning Outcome-Course Matrices Table A3.

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
Reflects understanding of global distribution of cardiovascular disease (CVD)	Echo 388 Awareness Quiz Questions 3,5,6,7	1-4 evaluation scale	90% with a score of 3 or better	100% scored 3 or higher
Reflects understanding of cultural distribution and discrepancies of CVD	Echo 388 Awareness Quiz Questions 2,4,8	1-4 evaluation scale	90% with a score of 3 or better	94% scored 3 or better
Reflects understanding of testing resources available globally	Echo 388 Awareness Quiz Questions 1,9,10	1-4 evaluation scale	90% with a score of 3 or better	94% scored 3 or better

Table #8. Testing results SLO #9, spring 2016

Strengths: Students reflected an understanding of cardiovascular disease and testing on a global scale, with variations due to cultural diversity and resources.

Weaknesses: While cultural diversity can be taught, the Oregon Tech student body does not reflect the wide diversity that students will encounter when going on clinical externship.

As a result of the data, additional presentations of both pathophysiology and imaging resources as viewed globally will be provided. In the Externship Preparation class spring term, students will be presented information on cultural differences that will be encountered on externship.

Indirect Assessment #1

This outcome was also assessed in Evaluations completed by both senior students and clinical sites as students approached completion of their clinical externship in ECHO 420, spring term 2016. 15 externship sites participated in the program evaluation, 20 students completed Clinical Site Evaluations and 20 completed Program Evaluations. The criteria and results are provided in Table #9 below.

Evaluation scale: (1) Poor (2) Satisfactory (3) Good (4) Excellent (n/a) Not applicable

Performance Criteria	Assessment Methods	Measure Scale	Minimum Acceptable Performance	Results -% with Target or higher
The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society	Student Program Evaluation	1-4 evaluation scale	90% with a score of 3 or better	100% rated the program 3 or higher
The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society	Student Clinical Site Evaluation	1-4 evaluation scale	90% with a score of 3 or better	100% rated the clinical site 3 or higher
The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society	Clinical Site Program Evaluation	1-4 evaluation scale	90% with a score of 3 or better	100% rated the program 3 or higher

Table #9. ECHO 420 Program and Site Evaluation results for SLO #9, spring 2016

Strengths: Externship provides many students with cultural diversity on a scale not experienced if the student originates from many of the smaller communities in the Northwest.

Weaknesses: Similar to those noted in SLO #9 Direct Assessment #1 above.

V. Overall Strengths and Weaknesses:

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 encountered when students are at externship sites needs to be integrated in programmatic courses.

Plans for improvement:

- Membership in the American Society of Echocardiography is one of the course requirements for ECHO 333 and ECHO 321 fall courses. As part of the application for membership, applicants must indicate that they agree to conform to the ASE Code of Ethics. A more thorough review of the Code of Ethics, explanation of working echocardiographic lab structure, ethical issues that may arise, and methods of resolution will be given earlier in the programmatic course curriculum
- Ethical and professional issues will be emphasized in the Laboratory Management and Externship Preparation classes just prior to going on Externship.

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.
- Students will also be encouraged to select scanning subjects that may be more difficult to scan, as the students progress in scanning ability throughout the on-campus curriculum.

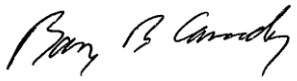
Student Learning Outcome #9: The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.

Strengths: Clinical externship provides an introduction to many levels of society, and many cultures as students encounter a wide-diversity of patients in the clinical setting.

Weaknesses: The isolation of the Oregon Tech campus – geographical, cultural, and geopolitical – presents a challenge in terms of patient management and application of imaging with respect to cultural variation that will be encountered in the workforce.

Plans for improvement:

- Encourage recruitment of imaging volunteers from the entire spectrum of ethnicities and cultures that are present in the Oregon Tech community.
- Research professional literature and present information on challenges represented or seen in active echocardiography labs.
- Continue to highlight culture awareness throughout the core echo classes, with particular emphasis during the Externship Preparation class spring term of the junior year.
- Develop student assessments of their knowledge and perceptions of diversity at Externship locations, that will be performed both early on, and at the end of the Externship year. This will be utilized to not only assess the availability of culturally diverse populations at the various clinical sites, but also assess changes that occur in individual student perception and understanding of diversity in working in a world with increasing cultural complexity.



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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		
Fall	BIO 220	Cardio Phys		BUS 317	HlthCare Mgmt	R	ECHO 420	Extern	E
	ECHO 231	Echo I		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			
Win	ECHO 232	Echo II	R	BUS 316	TQM		ECHO 420	Extern	E
	BIO 346	Patho I		CHE 210	Clinical Pharm				
	MIT 231	SPI I		ECHO 376	Survey of Vas Tech				
	Soc Sci	Elective		ECHO 325	Pediatric Echo	R			
				Hum	Elective				
Spr	ECHO 225	Pt Mgmt		ECHO 385	Lab Mgmt		ECHO 420	Extern	E
	ECHO 320	Cardio Methods		ECHO 334	Echo IV				
	ECHO 332	Invasive Cardio		ECHO 388	Extern Orient	ER			
	BIO 347	Patho II		Comm	Elective				
	MIT 232	SPI II		Hum	Elective				

Table A1. Student Learning Outcome #4-Course Matrix
**Subject to change as courses are designed and developed.

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		
Fall	BIO 220	Cardio Phys		BUS 317	HlthCare Mgmt		ECHO 420	Extern	E
	ECHO 231	Echo I	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				
Win	ECHO 232	Echo II	I E	BUS 316	TQM		ECHO 420	Extern	E
	BIO 346	Patho I		CHE 210	Clinical Pharm				
	MIT 231	SPI I	I E	ECHO 376	Survey of Vas Tech				
	Soc Sci	Elective		ECHO 325	Pediatric Echo	I E			
				Hum	Elective				
Spr	ECHO 225	Pt Mgmt		ECHO 385	Lab Mgmt		ECHO 420	Extern	E
	ECHO 320	Cardio Methods	I E	ECHO 334	Echo IV	R E			
	ECHO 332	Invasive Cardio	R	ECHO 388	Extern Orient				
	BIO 347	Patho II		Comm	Elective				
	MIT 232	SPI II	I E	Hum	Elective				

Table A2. Student Learning Outcome #8-Course Matrix
**Subject to change as courses are designed and developed.

Student Learning Outcome #9: The student will demonstrate an understanding of diverse cultural and humanistic traditions in the global society.

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		
Fall	BIO 220	Cardio Phys		BUS 317	HlthCare Mgmt	I E	ECHO 420 (includes summer term)	Extern	E R
	ECHO 231	Echo I	I E	ECHO 333	Echo III	R			
	PHY 217	Physics of MI		ECHO 321	TEE & Stress	E			
	WRI 227	Tech Writing		SPE 321	Small Group Comm	R			
Win	ECHO 232	Echo II	I E	BUS 316	TQM	E R	ECHO 420	Extern	E R
	BIO 346	Patho I	R	CHE 210	Clinical Pharm				
	MIT 231	SPI I		ECHO 376	Survey of Vasc Testing	R			
	Soc Sci	Elective		ECHO 325	Pediatric Echo	E R			
				Hum	Elective	R			
Spr	ECHO 225	Pt Mgmt	E R	ECHO 385	Lab Mgmt	E R	ECHO 420	Extern	E R
	ECHO 320	Cardio Methods	E R	ECHO 334	ECHO IV	E R			
	ECHO 332	Invasive Cardio	R	ECHO 388	Extern Prep	E R			
	BIO 347	Patho II	R	Comm	Elective	R			
	MIT 232	SPI II		Hum	Elective	R			

Table A3. Student Learning Outcome #9-Course Matrix
**Subject to change as courses are designed and developed.

Note: As revised Oregon Tech ESLO requirements and assessments are deployed during the next two academic years, matrices will be modified to reflect changed patterns.