Annual Report for the Assessment of Outcomes 2012 -13

SAC: Department of Trades and Industry

AAS Degree: Facilities Maintenance Technology

Contact: Richard Willebrand, SAC Chair

Changes That Have Been Implemented:

Because of recent assessment activities of outcomes, we have made the following changes within five of our courses. They are ELT 220 – OSHA 30 Hour Safety, FMT 202 – Direct Digital Controls, ELT 125 – Basic Programmable Logical Controllers, FMT 102 - Refrigeration II, and FMT 100 – Introduction to Facilities Maintenance Technology

For ELT 220 – OSHA 30 Hour Safety Training:

ELT 220 is a unique course because there is a Federal Certification tied to this course. The Instructor must be an approved by the Federal Occupational Safety and Health Administration, and a student must meet the OSHA requirements for attendance and completion of the final exam in order for a student to earn an OSHA Certification for 30 hours of the correct safety training. An assessment of the final exam results for this course indicated that students were missing some specific instruction around Construction Safety. Thanks to an allocation from our Division professional development funding, the ELT 220 instructor attended several OSHA Instructor Certification Courses at the University of Washington over the summer and upgraded the level of his OSHA Instructor qualifications. As a result, the ELT 220 course has been changed and more students are regularly meeting the OSHA standards for issuance of the 30 Hour Safety Card, which is the real assessment for this course.

For FMT 202 – Direct Digital Controls (DDC):

Recent assessment of students' ability to actually navigate real world DDC systems showed that students mostly understood the theory and design of systems but not how to efficiently use the system as a troubleshooting tool in real world facilities work. Formerly taught by an electrical design engineer, the course was taken over by an actual DDC technician who still works in the field for a commercial HVAC/R company. He has incorporated hands on components into the classroom as well as brought access to operating building DDC systems and how they operate in the real world. As a result, students are able to use a DDC system as a tool to determine problems in facilities and to effect repair.

For ELT 125 – Basic Programmable Logical Controllers (PLCs):

ELT 125 requires students to complete a minimum of seven supervised Lab Assignments in the classroom. The classroom is equipped with an Allen Bradley 1000 series PLC at each computer station. Assessment of the Lab Scores and the length of time to complete each Lab

demonstrated that the students understand the theory but not the application. We added a full time PLC Lab assistant to ELT 125 and also built three classroom simulators to demonstrate application of the PLC programming to a real world system. An example is the operation of a street-intersection, traffic control system including a cross walk control. The result was that the lab scores improved showing better application of the theory.

For FMT 102 – Refrigeration II:

Assessment using Instructor observation and a sequential work order, or checklist form, showed that an unacceptable number of students did not understand and did not correctly follow the hands-on procedure for pressure testing, evacuation, moisture elimination, and charging of high pressure, vapor-compression refrigeration systems that use a variety of refrigerants. We have upgraded our instruction in Refrigeration II to include more current evacuation/charging techniques that require the use of newer types of vacuum pumps with larger hoses that provide quicker and better moisture elimination. We have also enhanced our instruction around the proper use of vacuum gauges and refrigerant gauge sets. We also continued to have a lab assistant in the classroom during the lab sessions. The result has been better, more correct, observed completion of the work orders during the lab sessions.

For FMT 100 – Introduction to Facilities Maintenance:

Recent assessment of the employer evaluation checklist and narrative forms that are completed by the site supervisor for each of our FMT 280 A- Cooperative Work Experience students, showed too much unfamiliarity with, and misunderstanding of, proper installation and adjustment of sheaves and belt drives for electric motors, especially for one horsepower and above. We have enhanced the demonstration section of FMT 100 of motor drives, brought a larger variety of motors into the classroom and added more belt and sheave adjustment tools to the demonstration. The results are better scores on the site supervisor evaluation checklists.

For the Academic Year 2102-2013, The Department of Trades and Industry has elected to assess four out of the nine Degree Outcomes for our AAS in Facilities Maintenance Technology including the assessment results:

For "Practice safety measures in all areas to prevent occupational incidents":

The assessment tool and procedure was to evaluate the increase or decrease in the number of OSHA Hour Safety Certifications that are awarded at the end of the ELT 220 OSHA Safety Course. As a side note, this year the Federal OSHA conducted a compliance review of our Instructor and of the ELT 220 Course. Both were found to be in complete compliance with the OSHA standards. The student sample was all students who started ELT 220 during Fall, Winter, Spring terms 2011-2012 versus all students who started ELT 220 during Fall, Winter, and Spring terms 2102-2013.

For 2011-2112, 96 students began and 77% of the ELT 220 starters were issued the OSHA 30 Hour Safety Certification Card. For 2012-2013, 100 students began and 94% of ELT 220 starters were issued the OSHA 30 Hour Safety Certification Card. There was a successful increase of 17% after the changes referenced above for ELT 220 were implemented.

For "Determine problems in facilities systems":

Because we had implemented most of our changes to FMT 204 – Direct Digital Controls we continued used the final exam scores from this class prior to the change of Instructor versus after the change of instructor as the evaluation tool (referenced above). The prior failure rate in the exam was 17%, the after failure rate fell to 7%. Because we had also implemented changes in ELT 125 – Basic PLCs, we continued to use the series of in class lab assignments observed by the instructor and lab assistant as the assessment tool. The failure rate prior to the addition of a lab assistant and in class simulators in ELT 125 (reference above) for the series of labs was 16%, the failure rate after these changes dropped to 5%. We also continued to collect and analyze the final exam results from on section FMT 113 – Refrigeration Electrical III from our State Certificate of Completion Program as an assessment tool. The training in this course is almost all hands-on. Students must actively solve problems using a Volt, Ohm/Amp Clamp-On Electrical Meter under close supervision of the instructor. The class is limited to 16 students because instructor observation and students reporting trouble shooting findings to the Instructor are key to proper assessment of student skill. The classroom tasks are the same as the tasks performed on real world facilities equipment. Of the 13 students, 8 were "A", 4 were "B" and 1 was "C".

For "Perform corrective maintenance in facilities systems":

We collected and analyzed the site supervisor final evaluation forms and the goal statement forms from three consecutive terms of FMT 280A – Cooperative Work Experience students as the assessment tool. FMT 280A is an 8 Credit Course where an FMT Student must locate a facility or HVAC/R company that will hire him/her, usually unpaid, to perform 240 hours of supervised work on facilities and/or HVAC/R equipment. The student receives 1 Credit for every 30 hours of work performed. The student has constant supervision by a manager or technician while at the Coop site. At the beginning of the work experience, the student and manager/technician collaborate to set up a series of goals (outcomes) that the student will try to attain during his 240 hours at the site. At the end of the Coop experience the manager/technician submit a checklist and narrative evaluation form to the Department and the student is debriefed and graded. For most students FMT 280A is a capstone course for the FMT Degree where the student applies his/her classroom/lab experience to a real world location. A favorable Cooperative Workplace Employer Evaluation is a validation of a Facility Maintenance Technology Student's skill and knowledge.

Twenty five students completed all 240 hours their Cooperative Work Experience for Fall, Winter, and Spring terms 2012-2103. The Employer Evaluations were analyzed along with the

Goal Statements for the 25: 72% received a rating of “Outstanding” and an “A”; 22% received a rating of “Very Good” and a “B”; and 8% received a rating of “Average” and a “C”.

For “perform preventative maintenance in facilities systems”:

We are using the same assessment tool and results as above (“corrective maintenance”) for this fourth FMT Degree Outcome.

Changes that should be implemented:

This Academic Year the Department of Trades and Industry has implemented changes in instruction, addition of lab assistants, lab equipment, and even a change in an instructor for several of our courses due to our assessment activities. We conclude that these changes have moved our students toward better, more comprehensive, attainment of our FMT Degree outcomes. We also conclude that there are several other courses, specifically our advanced Facilities and HVAC/R control system courses such as FMT 207 – Pneumatic Controls and ELT 225 – Advanced PLCs that need the same scrutiny, especially because of rapid advancements in technology.

There are other technological changes in service tools, instruments, and equipment especially for the HVAC/R Industry. We need to keep up with those changes and bring these tools to the classroom, but we need to pursue more funding.

Reflect on assessment effectiveness:

At the end of this Academic Year, we do not think that the assessment tools and processes need to be revised. However, we continue to review the Employer Evaluation Form for the FMT 280A Course and we will decide at our Fall SAC Meeting. Some of our SAC members think it may not be specific enough and we will review this form in detail then.

CTE Assessment Plan

AAS or Certificate: AAS: Facilities Maintenance Technology

Submit to learningassessment@pcc.edu by November 15, 2010

1. Outcome	2. Maps to a Core Outcome?	3. Assessment Setting/Method	4. When will assessment take place?
Practice safety measures in all areas to prevent occupational incidents.	• Communication • Community and Environmental Responsibility • Critical Thinking and Problem Solving • Professional Competence	All students are required to take ELT 220 – OSHA 30 Hour Safety Training and to pass an Industry Certified Final Examination.	Year 1
Determine problems in facilities systems	• Community and Environmental Responsibility • Critical Thinking and Problem Solving • Professional Competence	All students are required to take a combination of Labs and Final Examinations in Refrigeration I, II, and III; Refrigeration Electrical I,II, and III; Motor Controls; Direct Digital Controls; Programmable Logical Controls; Boilers; Chillers. Assessment is accomplished on "real-world" facilities equipment in the Lab settings. Collect and check final exam results for FMT 113 – Refrigeration Electrical III. Develop and implement a skills checklist for the Lab in FMT 102 – Refrigeration II.	Year 1
Perform corrective maintenance in facilities systems	• Community and Environmental Responsibility • Critical Thinking and Problem Solving • Professional Competence	All Students are required to take FMT 280A – Cooperative Work Experience in a Facility or with an HVAC/R Service Company for 240 hours. "Employers" evaluate student performance using a checklist and narrative.	Year 1

Perform preventative maintenance in facilities systems	• Community and environ metal responsibility • Critical Thinking and Problem Solving • Professional Competence	All Students are required to take FMT 280A – Cooperative Work Experience in a Facility or with an HVAC/R Service Company for 240 hours. "Employers" evaluate student performance using a checklist and narrative.	Year 1
Recognize interrelationships of facilities systems to avoid negative impact	• Critical Thinking and Problem Solving • Professional Competence	All students are required to take FMT 280A – Cooperative Work Experience in a Facility or with an HVAC/R Service Company for 240 hours. "Employers" evaluate student performance using a checklist and narrative.	Year 1
Properly install equipment and systems to specifications	• Communication • Community and Environmental Responsibility • Critical Thinking and Problem Solving • Professional Competence	All students are required to take FMT 280A – Cooperative Work Experience in a Facility or with an HVAC/R Service Company for 240 hours. "Employers" evaluate student performance using a checklist and narrative.	Year 2
Operate facilities equipment in accordance with manufacturers' specifications to meet varying conditions	• Communication • Community and Environmental Responsibility • Critical Thinking and Problem Solving • Professional Competence	All students are required to take and pass a combination of Labs and final examinations for Refrigeration Electrical I, II, III; Refrigeration Electrical III, Direct Digital Control, Variable Speed Drives, and Programmable Logical Controllers Series using "real world" facilities equipment in the Lab settings. Collect and check final exam results for FMT 113 Refrigeration Electrical III.	Year 1

		Develop and implement a skills checklist for the Lab in FMT 102 – Refrigeration II.	
Communicate Effectively through appropriate media with co-workers, customers, contractors, suppliers, and supervisors	• Communication • Critical Thinking and Problem Solving • Cultural Awareness • Professional Competence	All students will write and present a mock "work order and invoice" and communicate its intent verbally to an instructor in FMT 102 or FMT 103, Refrigeration II or Refrigeration III. Develop and use a checklist to track student skills.	Year 2
Actively search for continuous improvement by analyzing the workplace for effectiveness and efficiencies	• Communication • Critical Thinking and Problem Solving • Professional Competence	All students are required to take final examinations in the Refrigeration Electrical I, II, III series of courses; Direct Digital Control; and Programmable Logical Controllers, with a background in the Refrigeration Mechanical Series. Collect and check final exam results for FMT 113 – Refrigeration Electrical III, and for ELT 126 – Intermediate Programmable Logical Controllers.	Year 2

5. For Programs that are beneficiaries of Perkins funding: Identify assessments that will comprise the TSA.

N/A

Dry Bulb Refrigeration

Invoice #: 75319

R-410 St
Freon, OR

Voice: 555-555-5555
fax: 666-666-6666
WEB: www.flybynightindustries.com

Date: _____

Name _____ EQUIPMENT: _____
Address: _____ Manufacturer: _____
_____ Model: _____
_____ Serial: _____

____ Service Call Time Start:
____ PM Call Time End:
____ Install

Item #	Part #	QTY		Work performed:	TOTAL
	Labor rate	Hours		1/2 hour minimum, hourly thereafter	
	$ 72.00/Hour				
				TOTAL DUE:	$0.00

_____
Customer Signature

BUSINESS OFFICE USE ONLY

DATE RECEIPT	CHECK #	AMOUNT REC'D	BALANCE

Portland Community College
P.O. Box 19000 Portland, Oregon 97280-0990

Cooperative Education

Learning Objectives

Due Date _____

Student		*Supervisor/ Title*	
Program Major	*Job Title*	*Agency/Company*	*Phone*
Term	*email*	*Address*	
Student Work Phone	*Home Phone*	*City*	*Zip* *Fax*

Work Schedule: Mon _____ Tues _____ Wed _____ Thur _____ Fri _____ Sat _____ Sun _____

The Learning Objectives/Activities listed here will describe the student's job related goals and the work site activities to meet those goals. See the **Cooperative Education Student Handbook** for details.

OBJECTIVE: What do you want to learn?	**Activities:** What will you do to learn it?
1 a. Objective:	
b. Activities:	
2 a. Objective:	
b. Activities:	
3 a. Objective:	
b. Activities:	
4 a. Objective:	
b. Activities:	
5 a. Objective:	
b. Activities:	

Work schedule and duties may be subject to change. Contact your Cooperative Education Specialist should any major changes occur.

Student Signature	*Date*	*Employer Signature*	*Date*
Instructor Signature	*Date*	*Cooperative Education Specialist*	*Date*

Distribution: White - Coop. Ed Specialist Yellow - Student Pink - Employer

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Portland Community College
P.O.Box 19000 Portland, OR 97280-0990

Cooperative Education
Employer Evaluation

Student	*Employer/Supervisor*
Term	*Company/Agency Name*
	Address
Please Return This Evaluation To *On or Before*	*Employer Phone*

OUTSTANDING / VERY GOOD / AVERAGE / NEEDS IMPROVEMENT

ATTITUDES TOWARD WORK
- ❑ ❑ ❑ ❑ Uses time effectively.
- ❑ ❑ ❑ ❑ Keeps busy, looks for work to do.
- ❑ ❑ ❑ ❑ Looks for ways to improve - is alert to new methods.
- ❑ ❑ ❑ ❑ Practices businesslike habits.

RELATIONS WITH OTHERS
- ❑ ❑ ❑ ❑ Cooperates with Supervisors, is respectful.
- ❑ ❑ ❑ ❑ Works well with others, shares in workload.
- ❑ ❑ ❑ ❑ Accepts suggestions.
- ❑ ❑ ❑ ❑ Is courteous and helpful with public/customers.

ATTENDANCE
- ❑ ❑ ❑ ❑ Is on time to work, remains until required hours are completed.
- ❑ ❑ ❑ ❑ Alerts supervisor if absent or late for work.
- ❑ ❑ ❑ ❑ Plans ahead to re-arrange work schedule.

OUTSTANDING / VERY GOOD / AVERAGE / NEEDS IMPROVEMENT

JOB LEARNING/SKILL IMPROVEMENT
- ❑ ❑ ❑ ❑ Shows continual improvement and speed in completing work.
- ❑ ❑ ❑ ❑ Can work independently.
- ❑ ❑ ❑ ❑ Exhibits adequate knowledge learned in class room to perform tasks.

QUALITY OF WORK
- ❑ ❑ ❑ ❑ Uses care with equipment and materials.
- ❑ ❑ ❑ ❑ Completes job in minimal time.
- ❑ ❑ ❑ ❑ Able to follow and understand direction.
- ❑ ❑ ❑ ❑ Is accurate and careful in work, will ask questions when needed.
- ❑ ❑ ❑ ❑ Can adapt to working conditions, is flexible.

APPEARANCE
- ❑ ❑ ❑ ❑ Dress appropriate for job setting.
- ❑ ❑ ❑ ❑ Exhibits cleanliness, good hygiene.

OVER-ALL PERFORMANCE:
❑ OUTSTANDING ❑ VERY GOOD ❑ AVERAGE ❑ NEEDS IMPROVEMENT

Directions:

When completing this section of the evaluation, refer to the list of Learning Objectives the student was assigned for the term.

Did the student meet the objectives? _____

What are the student's strengths? _____

What areas of work does the student need to improve? _____

Would you recommend this student for employment in your own or another firm? _____

This evaluation has been completed comparing this student to:
❑ Other students ❑ Other employees ❑ What you feel this student is capable of doing ❑ Other

Has this report been discussed with the student? ❑ Yes ❑ No

Portland Community College is an Equal Opportunity Employer and committed to a policy of non-discrimination for all people regardless of race, color, religion, sex, age, disability or national origin.

Signed: Supervisor *Date*

White - Co-op Ed Specialist
Canary - Student
Pink - Employer

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