Empowering the learner

Disrupting technical education through competency-based education

Eric A. Roe, Ph.D. & Naomi R. Boyer, Ph.D.
NSF-ATE PI Conference
October 21-23, 2015
Project Overview

Funding
Core Concepts
Institutional Context
Regional Need
Definitions and Exigencies

- Competency Based Education (CBE)
- Units of learning aligned to skills or concepts
  - Not contact hours
  - Nor Carnegie credit hours
- Direct Assessment
  - Non instructor led
  - Not assessed by faculty
- Hybrid
  - Delivery: online/face-to-face
  - Combined traditional and CBE
  - Direct assessment and credit-based

- Improve learning outcomes & success
- Affordability
- Student mastery
- Flexibility
- Time to completion
- Empower the individual learner
I thought it might be good to do definitions and the "why" at the beginning. This seemed to be missing in my last presentation.

Naomi Boyer, 10/17/2015
The Shift to Competency-Based Education

Polk State College’s

• Modular
• Self-Paced
• Non-term
• Competency-based
• Open Lab
• Faculty Mentored
• Open-Entry / Open-Exit

Engineering Technology Degree
NSF ATE Funding

• Implement an OEOE program
• Build a collaborative relationship between the secondary system and the college
• Providing pathways to baccalaureate degrees
• Professional development
• Outreach initiatives

Inspired by the FVTC Electro-Mechanical Modular Semester-based Model
CBE & OEOE Challenges

- Financial Aid
- Faculty
- Registration
- Equipment
- OEOE/OEEE
- Scheduling
- Accreditation
- Courses
- Advising
STUDENT DEMOGRAPHICS

**ANNUAL UNDuplicated HEADCOUNT:** 16,490
**DUAL ENROLLMENT HEADCOUNT:** 2,997

**PART-TIME STUDENTS:** 24%
**FULL-TIME STUDENTS:** 76%

ENROLLMENT BY AGE GROUP

- Younger than 20: 38%
- 20-24: 26%
- 25-34: 20%
- 35 and older: 16%

**26** Average student age

ANNUAL DEGREE COMPLETIONS
(SUMMER 2014, FALL 2015, SPRING 2015)

- Certificates: 404
- AS/AAS: 371
- BS/BAS: 331
- AA: 1,089

**TOTAL OF 2,195**
TWO CAMPUSES
Lakeland
Winter Haven

FOUR CENTERS
Airside
Center for Public Safety
JD Alexander Center
Lake Wales Art Center

ONE CORPORATE COLLEGE
Clear Springs
Advanced Technology Center

THREE CHARTER HIGH SCHOOLS
Polk State Chain of Lakes Collegiate High School
Polk State Lakeland Collegiate High School
Polk State Lakeland Gateway to College Collegiate High School
OUR SUCCESS INDICATORS *

- **20,500**
  Number of individuals served at Polk State Corporate College (2015)

- **91.68%**
  Job placement and continuing education rate

- **84.21%**
  Student success rate

- **63.26%**
  Student retention rate

- **32.86%**
  Completion rate (Fall 2010 cohort)

Started at Polk State, Accepted to FOUR state universities

Fabian

*13 ASSOCIATE IN ARTS, POLK STATE COLLEGE
*15 BACHELOR OF ARTS, UNIVERSITY OF FLORIDA
ADVERTISING INTERN, NEW YORK CITY

* FLDOE, FETPIP and Florida Department of Economic Opportunity  |  ** 2014/15 Student Data  |  *** US Census Bureau: State and County Quick Facts 2013
Graduating debt-free means I can put more money in his college fund.

78% of our first-time-in-college students need academic support to succeed

41.9% of our students receive need-based financial aid

61% of our students are first generation-in-college students

2x Polk State graduates’ initial annual wages are nearly twice the average annual wage for Polk County

Oscar
UNDECLARED, '32

Vanessa
BACHELOR OF APPLIED SCIENCE IN SUPERVISION AND MANAGEMENT, '14
LAKE WALES
<table>
<thead>
<tr>
<th></th>
<th>Polk State College</th>
<th>Polk County</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td>36%</td>
<td>49%</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>64%</td>
<td>51%</td>
</tr>
<tr>
<td><strong>White</strong></td>
<td>53%</td>
<td>62.8%</td>
</tr>
<tr>
<td><strong>Black</strong></td>
<td>18%</td>
<td>15.6%</td>
</tr>
<tr>
<td><strong>Hispanic</strong></td>
<td>18%</td>
<td>19%</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>11%</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

* FLDOE, FETPIP and Florida Department of Economic Opportunity  |  ** 2014/15 Student Data  |  *** US Census Bureau: State and County Quick Facts 2013
Polk County - Industry

**General Regional Facts**
450 Manufacturers
36,000 Mfg. Jobs
Ranked #4 in US for Mfg jobs as a percent of all jobs at 15.3%
Top 3 Mfg Industries:
  • Food: 33%
  • Chemical: 15.5%
Fabricated Metals: 8.2%
Average Wages:
Polk Mfg.: $50,424
All Polk Jobs: $38,385

**Types of Companies**
Beverage and Food Processing and Packaging
Mining & Chemical Processing
Fabricated Metal Products
Printing

**Neighboring Regions**
Tampa Bay: 58,000 Mfg. Jobs
Orlando: 37,500 Mfg. Jobs

Brookings – Locating American Manufacturing:
http://www.brookings.edu/research/reports/2012/05/09-locating-american-manufacturing-wial

We are Polk.
Industry Trends

• Need for more education/technical competency (especially in automation, bio-technology / biomedical device mfg skills, supply chain management, engineering and process technology, problem-solving skills, etc.)

• Evolving Business Models: Need agile/flexible production Break down silos between admin, management & production (teams)

• Generational Differences

• Need Real World (hands-on) Learning

Manufacturing TDI:
http://www.manufacturingtdi.com/Publications
Open Entry/
Early Exit

Engineering Technology
Program Demographic
How It Works
Curriculum and Policies

- Applied Engineering Degree
- Internship Opportunities
- Certification alignment (MSSC CPT, ASQ, AutoDesk...)
- Courses in:
  - Automation
  - Industrial Safety
  - CADD
  - Metrology
  - Quality, Lean and Six Sigma
  - Industrial PLC’s and Robotics
  - Fluid Power...
- College Credit for Industry Certification Articulation
Post-Traditional
• > 22 years of age
• Working
• Potential for shift & swing shift schedules
• Rapid Increase in needed job skills
• Child care responsibilities
• Veterans
• Training to Academic pathways
• Employer networking
The OEOE / CBE Solution

- Self-paced
- Learner centered
- Faculty mentored
- Competency-based
- Modular
- Non-term
- Hybrid
Non-term / Open Lab

OEOE
Start any day of the year (Open Entry)
Complete at your pace (Open Exit)
Individualized critical registration dates
Calculated based on the individual (not the term)
Drop (n+4)
Withdrawal (n+15)
End of “term” (n+35)

Open Lab
9:00am – 8:00pm Monday - Thursday
9:00am – 6:00pm Friday
Online Scheduling (Appointy)
### Courses

**GENERAL EDUCATION and ENGINEERING TECHNOLOGY CORE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENC 1101</td>
<td>College Composition I</td>
<td>3 cr.hr.</td>
</tr>
<tr>
<td>MAC 1105</td>
<td>College Algebra</td>
<td>3 cr.hr.</td>
</tr>
<tr>
<td>ETI 1181C</td>
<td>Manufacturing Internship</td>
<td>3 cr.hr.</td>
</tr>
<tr>
<td>EET 1084C-2</td>
<td>Intro to Electronics (A)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETM 1010C-1</td>
<td>Mech. Meas. &amp; Instrumentation (A)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETM 1010C-2</td>
<td>Mech. Meas. &amp; Instrumentation (A)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETM 1010C-3</td>
<td>Mech. Meas. &amp; Instrumentation (A)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETS 1542C-1</td>
<td>Intro to PLC’s (♦)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETS 1542C-2</td>
<td>Intro to PLC’s (♦)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETM 2315C-1</td>
<td>Hydraulics and Pneumatics (♦)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETM 1011C-1</td>
<td>Upper Level Pneumatics (♦)</td>
<td>1 cr.hr.</td>
</tr>
</tbody>
</table>

**ENGINEERING TECHNOLOGY CORE (18 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETD 1320C-1</td>
<td>Computer Aided Drafting</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETD 1320C-2</td>
<td>Computer Aided Drafting</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETD 1320C-3</td>
<td>Computer Aided Drafting</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>EET 1084C-1</td>
<td>Intro to Electronics (A)</td>
<td>1 cr.hr.</td>
</tr>
</tbody>
</table>

**ADVANCED MANUFACTURING SPECIALIZATION COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETS 1542C-1</td>
<td>Intro to PLC’s (♦)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETS 1542C-2</td>
<td>Intro to PLC’s (♦)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETM 2315C-1</td>
<td>Hydraulics and Pneumatics (♦)</td>
<td>1 cr.hr.</td>
</tr>
<tr>
<td>ETM 1011C-1</td>
<td>Upper Level Pneumatics (♦)</td>
<td>1 cr.hr.</td>
</tr>
</tbody>
</table>

**TECHNICAL ELECTIVES (Choose 11 credits from below)**

- **ETS 1540C-1** Ind. Applic. of PLCs and Robotics (♦) 1 cr.hr.
- **ETS 1540C-2** Ind. Applic. of PLCs and Robotics (♦) 1 cr.hr.
- **ETS 1540C-3** Ind. Applic. of PLCs and Robotics (♦) 1 cr.hr.
- **ETS 1535C-1** Automated Process Control (♦) 1 cr.hr.
- **ETS 1535C-2** Automated Process Control (♦) 1 cr.hr.
- **ETS 1535C-3** Automated Process Control (♦) 1 cr.hr.
- **ETI 1181C-1** Quality Systems & Workplace Dynamics 1 cr.hr.
- **ETI 1181C-2** Quality Systems & Workplace Dynamics 1 cr.hr.
- **ETS 1539C-1** Instrumentation Systems Safety 1 cr.hr.
- **ETS 1539C-2** Instrumentation Systems Safety 1 cr.hr.
- **ETS 1539C-3** Instrumentation Systems Safety 1 cr.hr.
- **ETI 1949** Manufacturing Internship 2 cr.hr.
- **ETI 1931** Special Topics in Modern Manufacturing 3 cr.hr.
- **MAN 2500** Operations Management 3 cr.hr.
- **MAC 2233** Applied Calculus I 3 cr.hr.
- **CGS 1510C** Spreadsheet Fundamentals 3 cr.hr.
- **CGS 1061C** Intro to Computers 3 cr.hr.
- **ENC 2210** Technical Writing 3 cr.hr.

**Program Courses:**
- Modular 1 cr.hr.
- Non-term
- Hybrid (Online in LMS and Required Hands-on in Open Lab)

General Education Courses: (Traditional Semester-based F2F, Online, or Hybrid)
Modularizing Courses

Traditional Courses (3-4 cr.hr.) were mapped to 1 cr.hr. modular CBE courses.

1 cr.hr. modular CBE courses were organized into logical topical completion blocks.

Curricula source material was identified for each new modular course.
Course Resources

Unit Outline

- Objectives
- Competencies
- Key Terms

Course Structure

- 1 Credit Hour (Unit)
- 3 Modules (typical)
  - Online theory
  - Hands-on practical
  - Module Quiz
- Unit Assessment / Exam

Module Study Guide

1. Read textbook pages
2. View video
3. Perform Lab activities
4. Complete worksheet(s)
5. View multimedia materials
   a. Learning Objects
   b. Circuit Challenge
   c. MultiSim
6. Demonstration
7. Discussion Board
8. Last assignment - Take examination

(Desire2Learn LMS)
How does this format work?

Student Robert Patch
Policies

• 5 Week Window for individual course (1 cr.hr.) completion
  – Open Exit becomes Early Exit (OEEE)
  – Designed to deal with student procrastination

• Finishing Early
  – Grades Roll Nightly
  – Students can register for the next course(s) after 24 hours

• Standard penalties for not completing courses

We are Polk.
Outcomes and Progress

Successes
Student Outcomes
Challenges
What’s next
Current Student Profile

- 70 Students in Technical Courses
  - Enrolled in 2 Credits on Average
  - With Gen Ed 7.5 Credits on Average
  - Black: 23%, White: 55%, Asian: 3%, Latin: 1%, American Indian: 3%, Other: 15%

- 145 Students Identified Program Objective
  - Min: 1 Max: 6
  - Course Duration on Average: 3 Weeks
  - Financial Aid: 47%
  - Veteran’s Benefits: 1%
  - Female: 85%
  - Male: 14%
Challenges: Students

• No structured lectures
• Undisciplined learners (procrastination)
• Group learners
  – Encourage collaboration
• Camaraderie
• Comfort with virtual discussions

Embed video link
Challenges: Instructors

• New loading model due to open lab & no scheduled courses
• Required to know all course content (mitigated by online scheduling system)
• Course development & labs take longer to create
• Poorly written courses have a large impact (rough carpenter vs. finish carpenter)
• Asynchronous Student Monitoring
• Turn around on EVERYTHING must be quicker
Challenges: Administration

• **Management**
  – Total Acceptance Necessary
  – Not Understanding the Operation / Complexity
  – Wide Areas of Impact

• **Systems**
  – Registration - Personal/Individualized unique dates
  – Financial Aid [Member of the DOE: Experimental Sites]
    • Personal/Individualized unique calculations based on start data
    • Complex and manual tracking (FA and instructor)
    • [US-DOE Reference Guide for those in experiments](#)
  – Veterans’ Benefits
    • VA benefits have same challenges/impacts on BAH benefit
  – Advising – Greater faculty responsibility
Accreditation
Southern Association of Colleges and Schools
Commission on Colleges

Initial Issues
• Unclear definitions
• Federal approval requirements with no direction
• Expressed concerns
  • Instructor student interaction
  • Content/competency articulations
  • Time/credit equivalents to degree award (25% rule)

Current Status
• Policy statement
  • Experimental Sites guidelines
  • Screening Form
• Program approval submissions
  • CBE Design and Implementation Documentation

We are Polk.
Successes: Things Accomplished

- Shifted to 1 credit hour OEEE in Fall 2014
  - Offered 22 of the 1 cr.hr. Program Courses
- Shifted advising/mentoring to program faculty
- Added a registration hold that had to be cleared by the program
- Financial Aid & Veterans Benefits determination & administration were time consuming and complex
- Bookstore
- OEEE rolled across the semester break into Spring 2015
  - Offered all 42 1 cr.hr. Program Courses
- Registration programming issues continued to be refined
Successes: Student Enrollment

Bill Masters-Student

**UNDUPLICATED STUDENTS IN THE TERM TAKING AT LEAST ONE ET COURSE**

<table>
<thead>
<tr>
<th>Term</th>
<th>Enrollments</th>
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<tr>
<td>20112</td>
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<tr>
<td>20113</td>
<td>7</td>
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<tr>
<td>20114</td>
<td>4</td>
</tr>
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<td>20115</td>
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<td>20122</td>
<td>54</td>
</tr>
<tr>
<td>20123</td>
<td>34</td>
</tr>
</tbody>
</table>

- Enrollments
- Best Fit Trend in Growth
Successes: Acceleration

<table>
<thead>
<tr>
<th>Week</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
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<tr>
<td>2</td>
<td>19</td>
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<td>5</td>
<td>10</td>
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<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Mean completion time for a 1 cr.hr. course
We believe that one of our most important assets is our highly skilled workforce. But finding workers with the advanced manufacturing skills needed in this industry is not easy...

...the OEEE Engineering Technology program addresses the need for employees with the technological skills to operate, maintain, and repair complex manufacturing equipment while providing a format that is more accessible to the working learner, allows for self-paced learning, and shifts the instructor/student relationship to one of mentoring rather than lecture.

Based on these tenets, we would encourage other colleges with technical program to explore competency-based student-centered learning models.
**U.S. Dept. of Educ. – ExSites**

- **Experimental Sites Initiatives**

- **Competency Based Education ExSites:**

<table>
<thead>
<tr>
<th></th>
<th>College Name</th>
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<th>College Name</th>
<th>College Name</th>
<th>College Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Sentinel</td>
<td>Colorado State University - Global Campus</td>
<td>Ivy Tech Community College</td>
<td>Mount Washington College</td>
<td>Richard Bland College</td>
<td>University of Louisville</td>
</tr>
<tr>
<td>University</td>
<td></td>
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</tr>
<tr>
<td>Austin Community</td>
<td>Danville Community College</td>
<td>Jefferson Community and Technical College</td>
<td>National American University</td>
<td>Rio Salado College</td>
<td>University of New England</td>
</tr>
<tr>
<td>College District</td>
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</tr>
<tr>
<td>Big Sandy Community</td>
<td>Davis Applied Technology College</td>
<td>Jones County Junior College</td>
<td>Northern Arizona University</td>
<td>Salt Lake Community College</td>
<td>University of Phoenix</td>
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<tr>
<td>and Technical College</td>
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<td>Brandman University</td>
<td>El Centro College</td>
<td>Kaplan University</td>
<td>Northern Essex Community College</td>
<td>Somerset Community College</td>
<td>University of Wisconsin Colleges</td>
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<tr>
<td>Broward College</td>
<td>Elizabethtown Community and Technical College</td>
<td>Lincoln Land Community College</td>
<td>Northern Virginia Community College</td>
<td>Southern New Hampshire University</td>
<td>University of Wisconsin-Milwaukee</td>
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<tr>
<td>Bryant &amp; Stratton</td>
<td>Fielding Graduate University</td>
<td>Lipscomb University</td>
<td>Polk State College</td>
<td>The New School</td>
<td>West Kentucky Community and Technical College</td>
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<tr>
<td>College</td>
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<tr>
<td>Capella University</td>
<td>Francis Tuttle Tech Center</td>
<td>Miami Dade College</td>
<td>Rasmussen College</td>
<td>Trident University International</td>
<td>Western Kentucky University</td>
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<tr>
<td>Central Arizona</td>
<td>Indiana Wesleyan University</td>
<td>Monroe Community College</td>
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<td>College</td>
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</table>
What’s Next?

• Online lab simulations
• General ed CBE course options
• Prior learning assessment upon program entry
• Mastery thresholds
• Program expansion, cost sharing for labs, further program distribution
• Developmental education concurrent CBE courses

We are Polk.
The Team

- Dr. Eric Roe, Ph.D. – P.I. (eric.roe@utexas.edu)
- Terry Bartelt – Co-PI
- Dr. Naomi Boyer – Co-PI (nboyer@polk.edu)
- John Small – Co-PI

- Robert Frank – Project Manager / Lead Instructor / Curriculum Dev.
- Lara Sharp – Project Coordinator / Instructor / Curriculum & Lab Dev.
- Jonathan Little – Project Coordinator / Lab Assistant
- Dr. Christopher Schilling – Adjunct Instructor / Curriculum & Lab Dev.
- Kathy Bucklew – Registrar / Director of Student Enrollment Services
- Marcia Conliffe – Director of Student Financial Services
- Patricia Jones – District Dean of Academic Affairs
- Donald Painter – Dean of Academic Affairs

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