Using a Competency-Based Hybrid Model to Improve Technical Courses and Impact Outcomes

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“[Stories] can help problem solve, provide guidance, build confidence, or share the wisdom of those who have walked these steps previously. Stories can be used to help others overcome challenges and invite them to embark upon the next steps in their own journeys.”

- Compliments reporting
- Reaches a broad audience
- Quickly digestible
- Opportunity for reflection

“Employers told us, I need x amount of employees. If they can’t find them in Ohio, we might have to move operations somewhere else.”
Presenters

Sarah Stubblefield
Training Coordinator, Industrial Technologies

Tom Wylie
Associate VP of Special Projects

Northwest State Community College
1. Explain how a 2-year community college moved 17 industrial technology courses to a competency-based hybrid model

1. The impact & data results of the new model

1. Learning acceleration strategies

1. Lessons learned from the journey
Why Change?

1. Employers discussing the possibility of relocating

1. Potential loss of business to other providers

1. Employer awareness of Open-entry/Open-exit models

Employer Initial Feedback

1. Curriculum needed realignment

1. Inconsistent skill levels of students they hire

1. Students need more hands-on skills

1. Traditional college schedules no longer work

1. Completion of certificates/degrees take too long
NSCC was awarded two federal grants:

*TAACCCT Round 4 individual TAACCCT: IAM iSTAR ($2.5M) (2014)

*National Science Foundation-Advanced Technology Education grant: HOME4TECHS ($200K) (2015)
### Original Technical Course Model at NSCC

<table>
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<th>Course Outcomes</th>
<th>Student Materials</th>
<th>Delivery Method</th>
<th>Student Pacing</th>
<th>Hands-on Experience</th>
<th>Assessment</th>
<th>Delivery Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on Textbook</td>
<td>Based on Textbook</td>
<td>F to F Lecture Instructor</td>
<td>Based on Instructor</td>
<td>Lab Exercises to support lecture</td>
<td>Grade based on 3 tests</td>
<td>16 week semester</td>
</tr>
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A traditional technical course offered at many 2-year colleges

### Competency-Based, Hybrid, Flexible-Lab Course Model (NSCC)

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<tr>
<td>Aligned with Industry Skills Requirements</td>
<td>Active Learning: Videos, Voice over PPT, Simulations. PDF, OER, Textbooks</td>
<td>Hybrid, Lecture Online, Labs on Campus</td>
<td>Flexible: Student masters module then moves to next module</td>
<td>Labs used to develop skills and prepare for HOA</td>
<td>Hands-on Assessment (HOA) 100% skills mastery (8 HOAs &amp; 8 LMS Assessments/course)</td>
<td>8 week mini-semester (Part of Term)</td>
</tr>
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Impact: First 3 Converted Courses

Data results for the first 3 courses converted to the new model (Programmable Logic Controller, Motors & Controls and Robotics):

1. Enrollment increase of 44% (324 to 466 enrollments)

1. 7% increase in student GPA attainment

1. 10% increase in course completions
Storytelling in Action!

Accelerating Graduation Pathways and Strengthening Ohio’s Workforce

In Ohio, the answer is found in collaboration.
Storytelling in Action!

TAACCCT Strategies

- Hybrid Model
- Virtual Trainers
- Open Labs
- Career Coaching

- BEFORE GRANT: 13% graduation rate
- AFTER GRANT: 31% graduation rate

58% INCREASE!
- More graduates = stronger workforce + community
From 16 weeks to 8 weeks

IND120 Industrial Electrical I, Fall 2015

Full 16 week semester

IND120 Industrial Electrical I, Fall 2018
1st 8 week mini-semester

IND121 Industrial Electrical II, Fall 2018
2nd 8 week mini-semester

Week 1
Meets 8am-Noon on Tuesday mornings

Week 16
The new assessment model has had the greatest impact on this project:

1. Individual student assessment
   1. Students develop more hands-on skills

1. Role of the faculty

1. Employer engagement
Types of Assessments

There are 2 assessment types:

1. **Knowledge & Application Assessment** – KAAs - which are taken through the LMS system. Students must get at least an 80%.

2. **Hands-On Assessment** – HOAs – which is a one-on-one between the faculty and the student. The student must get 100% (mastery)

Students receive an A, B or F for a course. There are no C or D issued.
Assessment Model 3

Student must get at least an 80% score on the KAA to pass the module.

Knowledge & Application Assessment (KAA)
Consists of 20 multiple choice, true/false, matching an extended matching. Student take in the LMS Must align with HOA

Student must get 100% (mastery) on HOA to pass. This grade is not averaged.

Hands-On Assessment (HOA)
Consists of individual demonstration of wiring, programming, using software explanation, procedures, etc. Alignment with employer job descriptions

Student must do learning activities: videos, readings. Pdf files. Prepares for KAA

KAA

Complete Module 1

Then move to Module 2

Student must pass The KAA prior to taking the HOA

Student must do the Lab Exercises that prepare them for the HOA

HOA

Student must pass The HOA prior to moving to the next module
Moving the Lecture Online

• Learning activities were created in the LMS to replace the lecture

• Students have 24/7 access to all course materials

• Online classes were standardized in terms of look and feel

• Faculty had to develop online LMS skills to enhance student learning

• Faculty support students’ online learning through the LMS, online office hours, and interactivity during the open lab time.
Flexible Lab Model

- Courses have schedule lab times every week for faculty to assess the students (HOA).

- Extra lab time if added so students can develop hands-on skills

- Accomodations are made for students moving between day and evening courses due to workshifts
Online & Flexible Lab

Course Schedule in an 8-week mini-semester

<table>
<thead>
<tr>
<th>Week 1 Module 1</th>
<th>Week 2 Module 2</th>
<th>Week 3 Module 3</th>
<th>Week 4 Module 4</th>
<th>Week 5 Module 5</th>
<th>Week 6 Module 6</th>
<th>Week 7 Module 7</th>
<th>Week 8 Module 8</th>
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<tbody>
<tr>
<td>Online Content</td>
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<td>KAA</td>
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<td>Open Lab Time</td>
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<td>HOA</td>
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Asynchronous Available 24/7

Scheduled On campus

SKILLS COMMONS
The Design Process

- Instruct. Material (6)
- Practice Quiz (5)
- KAA (4)
- Lab Exercises (3)
- HOAs (2)
- Course Competencies (1)
- Workplace Skills

Hands-on skills must transfer to the workplace skill requirements
Curriculum Alignment

Information was gathered from 3 sources:

1. DACUM (Develop A Curriculum) validated competencies

1. Faculty who did corporate training in industrial technologies

1. Job descriptions obtained from local employers
An example of a student HOA for an electrical course would be:

1. Build an operational circuit from an electrical print

1. Explain the operation of the circuit to the instructor

1. Demonstrate the knowledge of an electrical print

1. Predict the operation of circuit based on certain criteria

1. Troubleshoot a faulty circuit
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<tr>
<td>7.</td>
<td>Assemble this circuit in the lab, and make it operational.</td>
</tr>
<tr>
<td>8.</td>
<td>Demonstrate the operation of the circuit to the instructor.</td>
</tr>
<tr>
<td>9.</td>
<td>Explain the operation of the circuit to the instructor.</td>
</tr>
<tr>
<td>10.</td>
<td>Explain to the instructor what the pressure reading should be on the blind side port, when Valve A is actuated.</td>
</tr>
<tr>
<td>11.</td>
<td>Explain to the instructor what the pressure reading should be on the rod side port of the cylinder, when Valve C is actuated.</td>
</tr>
<tr>
<td>12.</td>
<td>Troubleshoot a fault the instructor will put into the circuit, after a brief absence of the student.</td>
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Lab Exercises

• Lab exercises are structured, hands-on learning experiences

• Students develop skills that are transferable to workplace skills

• Prepare the students for the Hands-On Assessment
Lab Procedure 4.1: A.S. Automatic Return Circuit and Flow Control

Upon completion of this lab procedure, the student should be able to:

1. Download the simulation file from the Message Center in Sakai, in the Virtual Machine.
2. Open the simulation file in Automation Studio, and start the simulation.
3. Identify and explain the purpose of each component on the pneumatic print.
4. Explain the basic operation of the pneumatic circuit.
5. Explain the purpose of using flow control valves in an automatic circuit.
6. Determine which flow valve affects the extension and retraction of the cylinder.
7. Predict the pressure that would be measured at any port in the circuit.

Figure 1. An Auto Return circuit, Lab 4.1 Circuit 1.
Knowledge & Application Assessment

• The KAAs are typically 20 multiple-choice or true/false questions, taken through the Sakai LMS system.

• Every module has a KAA, which must be passed (80%) in order to take the HOA in the module.

• These questions are applied, or situational, versus memorization

• There must be a correlation between the KAA and the HOA
14. What is the purpose of the Extend Relay in the electrical circuit?
   a. To let the user know that the cylinder is extending
   b. To prevent the extend and retract from occurring at the same time
   c. To speed up the extend cycle
   d. To create a hold-in circuit to keep power on the Extend Solenoid
9.  T  F  From this illustration, there will be 4 wires ran (not including the ground wire) to Start/Stop 2 (push button station), from the combination starter.
Explanation: As shown in this illustration, there will need to be 4 wires run to Start/Stop station #1. There will need to be 3 wires run to Start/Stop station #2. The reason for one less wire on PB station 2, is that there is a jumper done on the pushbutton.
Instructional Materials

- Textbook sometimes do not align with employer needs
- Faculty created Powerpoints, PDFs, Simulations and Videos
- OER and manufacturers’ literature is also implemented
- Build the objects to view on portable devices
1. 24/7 student access to licensed software through the student VM (Virtual Machine)

1. Interactive virtual simulations, available 24/7 through the VM

1. Active learning objects in the online portion of a course

1. Additional lab times beyond the scheduled lab times
PLC Simulators

Hardware Simulator

Virtual Simulator
Virtual PLC Simulator
Hydraulic Simulators

Hardware Simulator

Virtual Simulator

SKILLS COMMONS
Finish Early, Keep Moving

• Students can finish a course in less than 8 weeks (25% do this)

• Students can start of the next course if they finish early

• All learning objects including practice quizzes are accessible

• The KAAs and HOAs cannot be taken until the start of the next term
Impact on Students

Student survey feedback - 96% very satisfied (200 students):

1. “I really appreciate the 24/7 access to all of the material”

1. “I could not go to college for these courses under the old model”

1. “I can actually finish early and start on my next course”

1. “I know what is expected on me in each course”

1. “I really like more hands-on type of learning”

1. “I really like the videos you guys have created”
Impact on Employers

Feedback from an employer survey (15 companies):

1. 100% of the employers are satisfied with the new model

1. Employers see a higher skill level in graduates they hire

1. Employers appreciate the flexibility of the lab scheduling
Impact on Faculty

Here are some comments from Faculty:

“The major advantage of this model is the consistency of instruction in all of the courses. All students end with the same skills even with different faculty.”

“Faculty do not have to grade tests, create labs or create lectures, all of this has been developed and is in the LMS.”

“There is more time available to do corporate training, than what we had in the old model.”
Lessons Learned

1. To change the student learning behavior, change the assessment model.

1. The student AND faculty culture must be changed

1. Faculty do not need to become instructional designers, they must learn to develop assessments & labs, and learn to facilitate online learning

1. Video is king, when it comes to students learning a concept
A Final Thought: Start Small

There is nothing wrong with starting small by scaling an element or two of this model into a traditional course model.

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A traditional technical course offered at many 2-year colleges

A traditional technical course scaled to include the Course Outcomes & Assessment from the Competency-based Model
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