

Steps & Lessons on Converting to a Competency-Based Hybrid Model Part 2

Presented by:

Tom Wylie, PI for HOME4TECHS & Scaling CBE Elements
Northwest State CC, Archbold, OH

Workshop Materials Available for Download:

https://ate.is/Scaling_CBE

Instructional Elements to Improve Technical Courses



Do we need to discuss your
annual report story?

NorthArk has a great story!



Two-year colleges are great at teaching separate technologies (silos of technology).

Students then go to industry and have to work on machines that have 4-6 technologies on them and they are all integrated together into a system.

We need to implement as many technologies into our courses that we can, in an effort to better prepare our students.



Industrial Control Systems

Traditional Lec/Lab Course Converted to a Competency-Based/Hybrid

Lecture

Moved to Canvas
Build **K**nowledge

Lab

Develop Skills
Skills Assessment



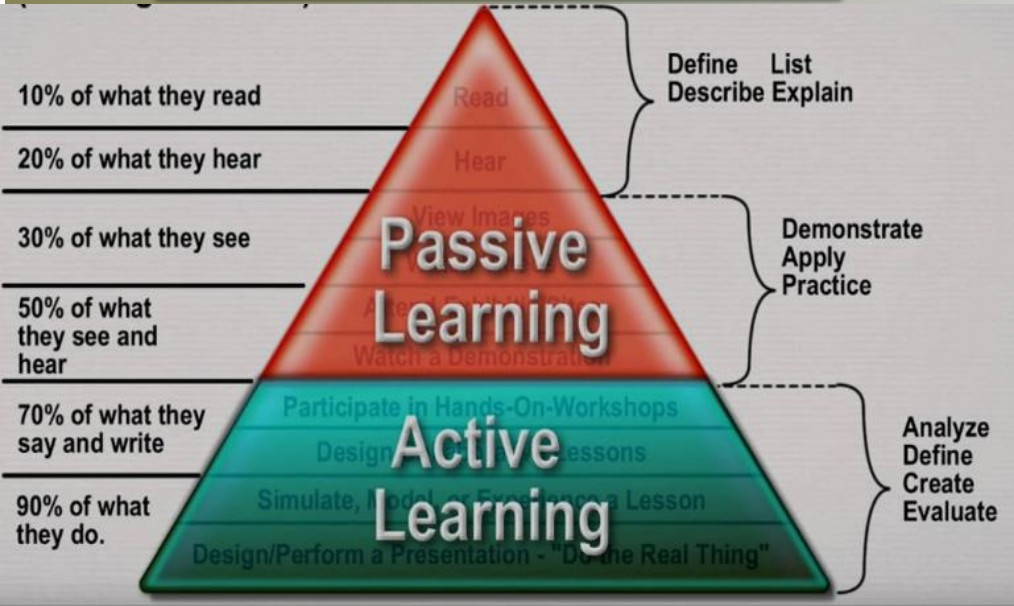
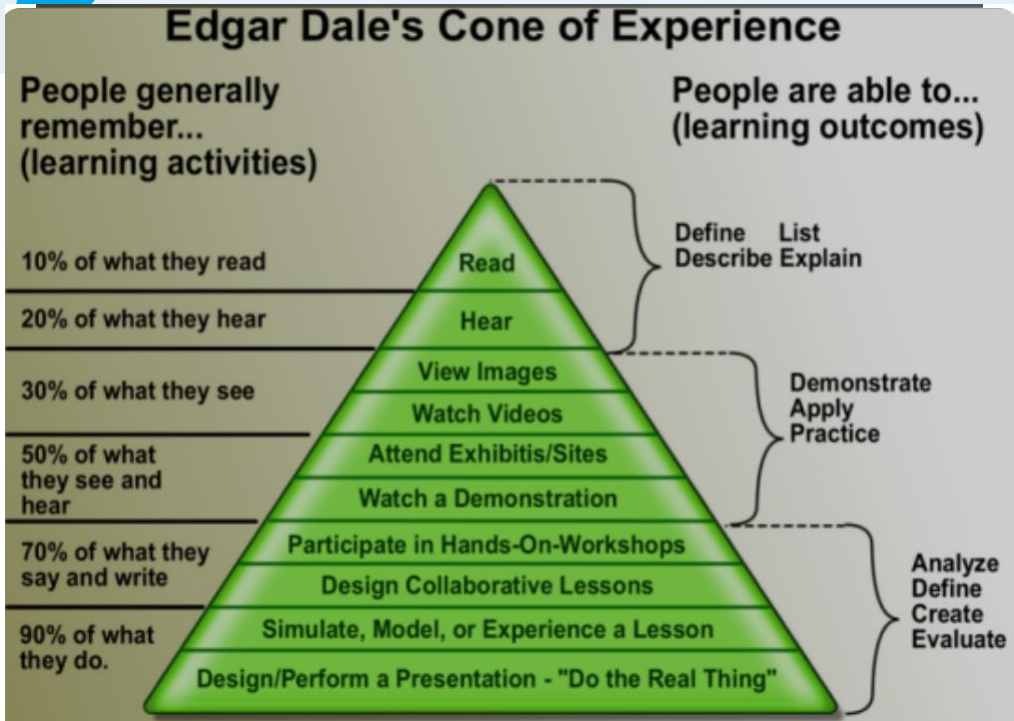
Ability

Perform the
Tasks on the Job

K

S

A

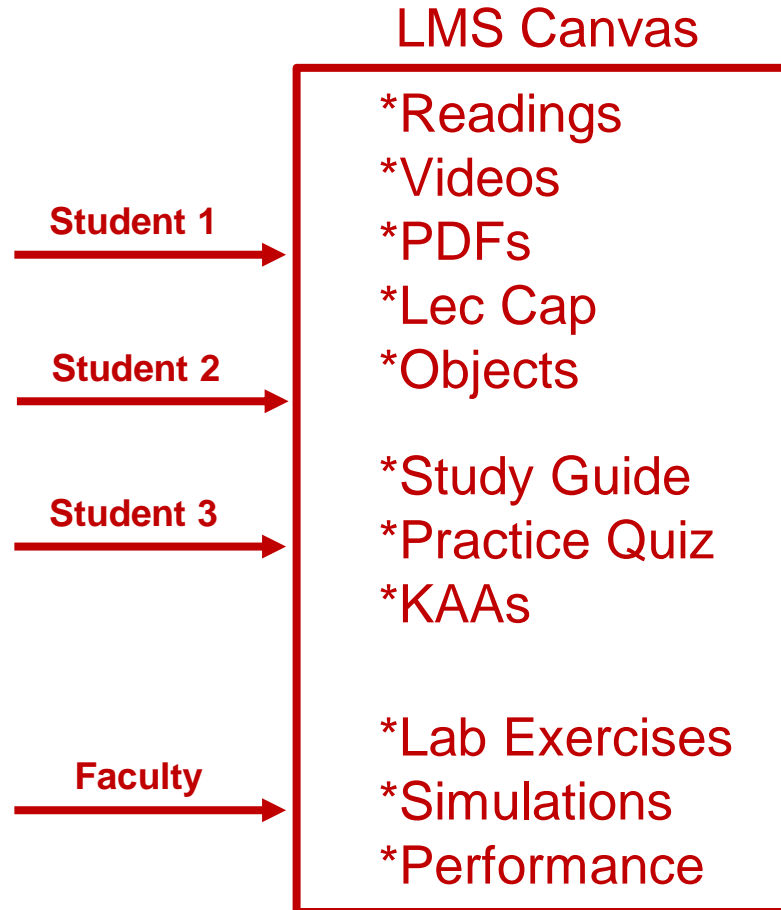


Lecturing and Reading a textbook are both Passive Learning. These are not effective methods of instruction in CTE courses.

Passive Learning is Instructor Centered.

Active Learning is Student Centered. In Active Learning, students will internalize materials such as hands-on, and interactive learning objects: simulations and interactive videos (Questions asked within a video using Canvas Studio).

Competency-Based/Hybrid Instructional Model



On-campus class time

Lab Exercises Hands-On Assessment

Lab Packs sold in Bookstore (required)

Faculty facilitates learning

Faculty assesses student skill/knowledge

Self-proctored Online Assessments

- The grades the students are awarded in the NSCC Ind. Tech hybrid courses are A, B or F.
- The hands-on assessment (HOA) must have 100% mastery, so students must get 100. This is not averaged into the grade. It is required.
- The knowledge & application assessment (KAA for short) is the cognitive, online assessment. Student have to get at least an 80% on this assessment to pass the module. They have two tries at taking KAA in each module.
- 12-16 assessments in each course (8 online, 4-8 hands-on)

Academic Standards

Competencies: Competency is a set of demonstratable characteristics and skills that enable, and improve the efficiency of, performance on a job. Competencies are not skills, but they are similar to skills. A competency is an over arching statement on a job description, which is many times not measurable. Outcomes are measurable, and thus outcomes are used to build a competency.

Knowledge: Knowledge is the theoretical or practical understanding of a subject. It is important to understand that a student cannot develop skills without first having knowledge.

Skills: Skill is the actual performance or demonstration of a technical task. Skills are the proficiencies developed through training or experience.

Abilities: Ability is defined as the capacity to perform. We are preparing the students to have the ability to transfer their learned skills in an industrial setting.

Job Description: Electrician

Electrician

Materion Brush Inc [🔗](#)

14710 West Portage River South Road, Elmore, OH 43416

\$42.55 an hour

Apply now



paid out at 30 days, \$750 paid out at 90 days.

Starting pay is \$33.73 at 6 months of employment you will you get a pay increase. Our top pay is \$42.55.

You will have the opportunity to:

- Install, troubleshoot, and maintain electrical systems and equipment.
- Work from circuit diagrams and SOP's, when available, and recommends alterations to Lead Electrician and appropriate departmental personnel
- May be asked to assume duties of Lead Electrician when absent.
- Recognize operational irregularities or unsafe processes, accurately determines the appropriate corrective actions.
- Assist Lead Electrician with providing technical support to departmental personnel/apprentices

This course will consist of 9 competencies (Objectives):

1. Explain the function of a PLC in an industrial environment
2. Set up communications between a PLC and a programming panel
3. Configure and program an Allen Bradley SLC-500 system.
4. Install and maintain basic control system based on the SLC-500
5. Troubleshoot an Allen Bradley SLC-500 system.
6. Configure and Program Allen Bradley CompactLogix with RSLogix5000
7. Interpret the basic instruction set of Allen Bradley CompactLogix system
8. Interpret AB PLC-5 hardware addressing & block transfer instructions
9. Explain the operation of an Allen Bradley Sequencer Output instruction

Module 5: Maintain & Troubleshoot an AB SLC-500 system: Hands-On Assessment Tasks:

1. Wire a PLC systems with at least 5 inputs and 3 outputs. Create the program to run a specific operation
2. Manipulate I/O with force commands (On, Off, Remove), as well as interpreting the Force indicator light
3. Modify a ladder program while online to the SLC-500 (online programming)
4. Utilize search commands to find instructions throughout a large program using RSLogix500
5. Troubleshoot a PLC system with an injected fault, using the software and hardware print
6. Upload a modified online program, back to the default directory
7. Determine why the user does not have address descriptions when going online to a PLC with RSLogix500

Competency: Use RSLinx to establish communications between a computer (with PLC programming software) and Allen Bradley PLCs (L5000, SLC-500, PLC-5 & ML1000).

Module Outcomes:

1. Configure RSLinx to communication with a ControlLogix 5571 controller.
2. Identify all the hardware components on a L5571 controller

Skills Assessment:

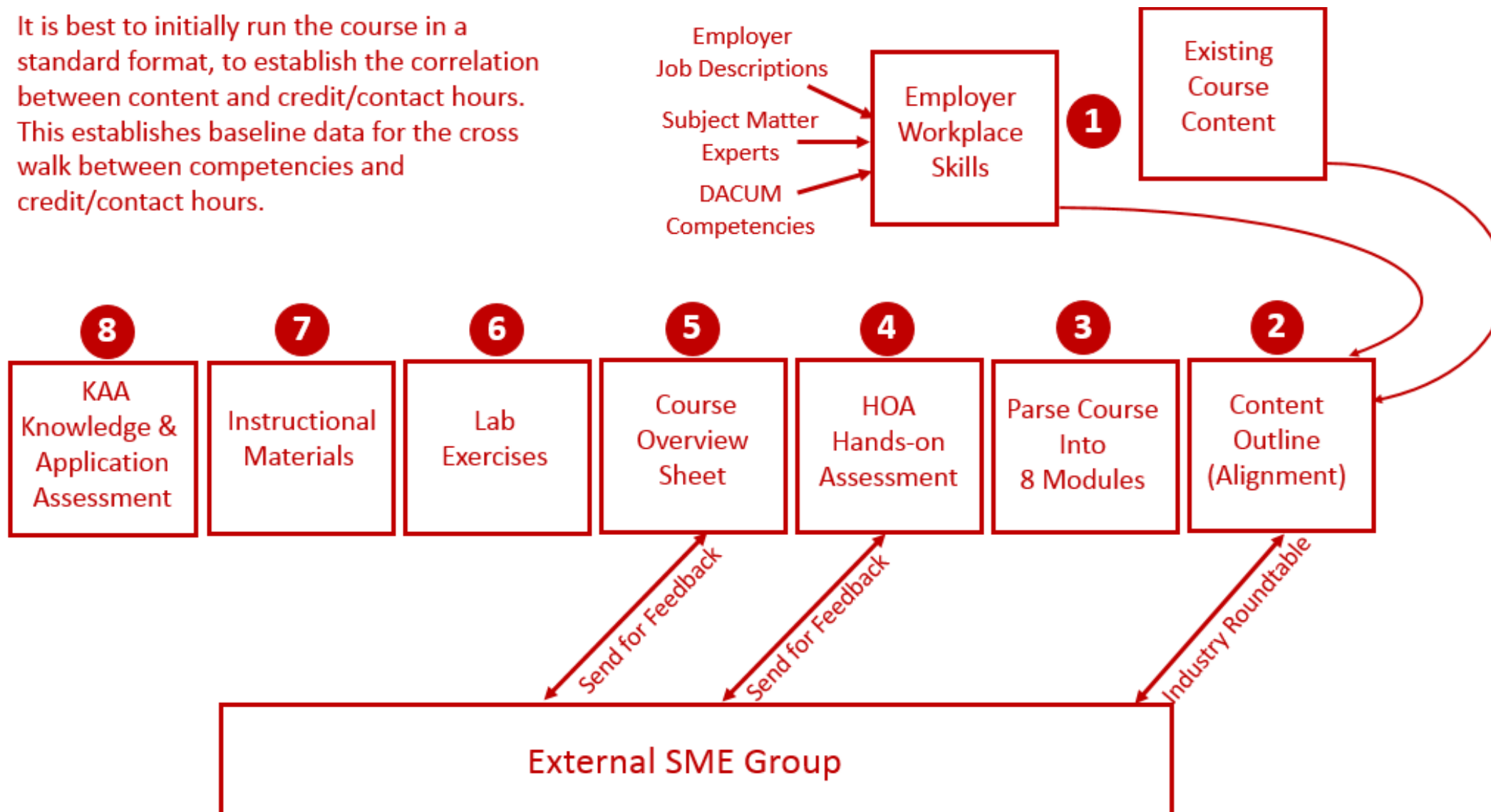
1. Create an Ethernet driver in RSLinx to communicate with a 1756-ENET module.
2. Create an Ethernet/IP driver in RSLinx to communicate with 1756-ENET module.
3. Create a USB driver in RSLinx to communicate with the controller.

Knowledge Required:

1. What is an IP address? What is a subnet mask? How does an Ethernet port get an IP address?
2. How to determine the IP address of a 1756-ENET module
3. How to drill down to a controller from a driver in RSLinx
4. How to use RSWho to view the drivers and communications within a ControlLogix system
5. How to create a driver in RSLinx

Reverse Design:







It is best to initially run the course in a standard format, to establish the correlation between content and credit/contact hours. This establishes baseline data for the cross walk between competencies and credit/contact hours.



- **Course Blueprint:** Course Blueprint is a document that will hold all the module information for the course: Module descriptions, module outcomes, topics, skills assessments, etc. The blueprint can be shared with the development team, allowing multiple people to edit the document.
- **IND221 Instrumentation and Controls:** This course at Northwest State CC in Ohio was converted to a CB/H model in Summer/Fall 2023.
- **Review the Development Process:** Electrical Instructor John Mueller was the faculty, we did a course overhaul, with some new lab equipment, and focused on tasks and equipment that is used in the local process industry.

Hands-On	Course Topics	Design
	Course Outcomes	Design
	Performance Assess.	Assessment
PPT/PDF Reading Videos	Lab Exercises	Preparation
	Instructional Mat.	Preparation
	Online Assessment	Assessment
	Practice Quizzes	Preparation


Fall 2023

- Home
- Announcements
- Attendance
- Course Evaluations
- Grades
- Modules**
- Submit Final Grades
- Syllabus
- People
- Assignments 
- Discussions 
- Files 
- Quizzes 
- Rubrics 
- Collaborations 
- ...

☰ ▶ **Course Overview | Start Here - This content is in order, and must be completed to unlock Assignments Week 1**


Complete All Items  + ⋮

☰ ▶ **MODULE 1: Basic PLC Operation and Communications - Due by the end of Week 2; This content opens once all content in "Course Overview..."**
Prerequisites: Course Overview | Start Here - This content is in order, and must be completed to unlock Assignments Week 1

Complete All Items  + ⋮


☰ ▶ **MODULE 2: AB SLC-500 and RSLogix 500 Basics - Due by the end of Week 4**


Prerequisites: MODULE 1: Basic PLC Operation and Communications - Due by the end of Week 2; This content opens once all content in "Course Overview" Module is complete.

Complete All Items  + ⋮

☰ ▼ **Performance Assessment #1 - Due by the end of Week 4; After completing Modules 1 and 2**

 + ⋮

☰  **Skill Mastery #1**
Sep 17, 2023 | 100 pts

 ⋮

Fall 2023

Home

Announcements

Attendance

Course Evaluations

Grades

Modules

Submit Final Grades

Syllabus

People

Assignments 

Discussions 

Files 

Quizzes 

Rubrics 

Collaborations 

BigBlueButton 


Outcomes 



Pages 

☰


▼ **MODULE 1: Basic PLC Operation and Communications - Due by the end of Week 2; This content opens once all content in "Course Overview...**


Prerequisites: Course Overview | Start Here - This content is in order, and must be completed to unlock Assignments Week 1



Complete All Items  + ☰

☰  **Module 1 Description, Outcomes & Learning Sequence Sheet**  ☰




View

☰  ☰



☰ **Basic Operation of a PLC System**  ☰

☰  **Instructional Material: Programmable Logic Controller Basics 102022.pdf**  ☰




View

☰  **Video: How a PLC Works using an Online Simulation**   ☰




View

☰  **Reading Assignment 1 (M1): Vendor Manual 1: Link to the MicroLogix 1000 Users Manual**  ☰


View


☰  **Vendor Manual 1: Link to the MicroLogix 1000 Users Manual**   ☰

View

☰  **Video: Bits, Bytes, and Words; PLC Language**   ☰

View

☰  ☰

☰ **PLC Hardware Overview**  ☰

Course Number and Title:	EET 2440 Programmable Controller I		
Module # and Topic Title:	Module #1: Basic PLC Operation and Communications		
Semester:	Any – Last updated – 10/31/22		
Learning Sequence			
ACTIVITY	DESCRIPTION	TIME ON TASK	POINTS
Reading Activity		Est. TOT 0.0 Hr.	
Learning Activity	<ul style="list-style-type: none"> * Instructional Material: Programmable Logic Controller Basics 102022.pdf * Instructional Material: Intro to MicroLogix1000 and SLC-500 Training Units 102422.pdf * Video: Hardware Overview MicroLogix 1000 PLC 102122 * Video: Hardware Overview SLC-500 102222 * Instructional Material: RSLinx and Communications Basics 102522.pdf * Video: Creating an RSLinx RS-232 driver for a MicroLogix 1000 102122 * Video: Creating RSLinx Ethernet Driver for SLC-5/05 102122 * Video: Creating an RSLinx Ethernet IP Driver for SLC-5/05 102122 * Video: Going Online to SLC-500 Multiple RSLinx Drivers and Address Display 102422 * Vendor Manual: Link to RSLinx Classic Getting Results Guide 	Est. TOT 12.0 Hr.	
CAA	CAA Study Guide for Module 1 CAA Practice Quiz for Module 1 CAA for Module 1	Est. TOT 4.0 Hr.	Min. of 80%
Lab Exercise	Lab Exercise 1.1 ML1000 SLC500 Hardware 102322.pdf	Est. TOT 2.0 Hr.	
Lab Exercise	Lab Exercise 1.2 RSLinx Communications 102622.pdf	Est. TOT 2.0 Hr.	
Hands-On Assessment	Hands-On Assessment Preparation	Est. TOT 2.0 Hr.	Min. of 100%
TOTAL		Approx. 24 Hrs	15-20 hrs. per week

How To Get Started?
Choose 1 course to start with
such as:
Industrial Control Systems

Project Planning

Some things that should be done right away:

Microsite: ATE Central offers every project their own microsite that is a multi-purpose website. Store common information for your team and share documents with internal and external constituents.

Create a development shell for each course in Canvas: Have the grant team all added as Instructors to each course. Development will start for one course, once the format is created, can be imported to the other shells.

Determine what student support material is needed in Canvas: Most colleges add links and documents to each course that will inform the student of the college services available to them.

Order Snagit/Camtasia bundle from Techsmith: Instructors should all have at least Snagit, Word and PPT, to develop their basic materials: (labs, assessments, etc.)

Cloud storage for sharing files between Arkansas and Ohio: There could be large files we need to share such as videos, which may be too large to email. Easier to drop them into a shared folder. Google Drive is a good option.

Determine how to handle videos in Canvas: Does the college want videos stored within Canvas, or on YouTube linked to Canvas? If YouTube, IT should create a managed channel for the project. Determine who will be uploading the videos.

Determine what training will need to occur to keep the project moving: Schedule the training as needed. Examples are: OER (finding, remixing, reusing), Using PPT for graphics, Creating videos in Canvas Studio and producing them, creating simulations, etc.

How to track tasks (progress) in the project, and who does this?: You could start with an Excel spreadsheet, or Google Sheets, or a commercial like Wrike or Trello.

Identify 2-3 Industry SMEs that information can be vetted through: These resources are critical. Initially they will review the topic list and the skills assessments. Former graduates are great, if they have 3-5 years of experience.

Set some timelines up for targets: An example would be Industrial Control Systems developed by July 15. The next 2 courses by December 2024. A target date is critical in a project.

Determine who will produce the videos and post in Canvas: Faculty will still create their own videos but may not have the time to produce them and post them.

How will students be oriented into this new model: This will take time and will consist of multiple tasks. I use Intro videos in the first few modules so student know what they must do. An in-person orientation and possibly an explanation with a quiz, to make sure they understand.

Curriculum Development

Identify the course and the development team: I will recommend we start with Industrial Control Systems, and John, Roger and Tom (more can be added) will focus on the development.

What will be the minimum in each module: 1-2 lab exercises, 20-25 question knowledge assessment, module description and outcomes, skills assessment (every 2 modules), instructional material may vary: vendor manuals, videos, PPT/PDF, OER, etc.

Will a textbook be used or OER & developed materials: If there is a great textbook, use it, but many books are written by educators, not practitioners. Many colleges have moved to OER materials and modify them to fit their needs.

Is Automation Studio used in any courses: If Automation Studio is used for virtual simulations, then build a strategy on what courses it will be used in, who will develop the simulations, and what training will be needed.

Materials to start with: Look at existing course materials from other colleges to see how they structured their courses. I sent John the PLC course info for our college, as well as another Ohio college who is working on an ATE project converting PLC courses.

Divide the course into 8 modules and list topics: 8 modules is the most common number for a competency-based/hybrid type of course, at multiple colleges.

Determine the hands-on skills in each module: What hands-on activities will the students be doing based on your lab equipment, or future lab equipment.

Build the Skills Assessment: What should the students be able to do at the end of the course. Keep in mind that these need to align to tasks they will perform in industry.

Build the module outcomes: Most of my outcomes are built after the skills assessment.

Getting Started with Development

Divide the course into 8 modules and list topics: There could be large files we need to share such as videos, which may be too large to email. Easier to drop them into a shared folder. We use Google Docs.

Determine the hands-on skills in each module: 1-2 lab exercises, 20-25 question knowledge assessment, module description and outcomes, skills assessment (every 2 modules), instructional material may vary: vendor manuals, videos, PPT/PDF, OER, etc.

Build the Skills Assessment: These will be based on the industry needs, as well as what equipment you have available.

Build the module outcomes: Module outcomes will be based on the skills assessments and the knowledge required to master these skills.

The End of the Presentation