

Evaluation Plan for *Design Thinking: Additive Manufacturing Summer Institute* Year 2

Overview of the Project

Columbus State Community College, in collaboration with the PAST Foundation, community, and industry partners will develop a career pathway in Additive Manufacturing. The Design Thinking: Additive Manufacturing Summer Institute (AMSI) will simultaneously train high school teachers and students in additive manufacturing using industry-based problems. (The PAST Foundation is major project sub-recipient that was founded in 2000 to make ongoing scientific research across a broad spectrum of professions accessible to the public. It has extensive experience with informal and formal secondary STEM educational programs.)

This project will address the need for technicians in the manufacturing sector. By 2026, 3.5 million U.S. jobs will be needed in advanced manufacturing, and 2 million are expected to go unfilled. Manufacturing is particularly important in Ohio where 16.9% of Ohio's economy is in manufacturing. In central Ohio, employers in will need 802 additional technicians (a 9.2% growth rate) earning wages averaging \$36.51 per hour (2015 rates). Two-thirds of manufacturers already use additive manufacturing and the global market for 3-D printers and services will grow by 45.7%.

The project's theory of change: The Design Thinking: Additive Manufacturing Summer Institute project will lead to an increase in the supply of qualified technicians who have expertise in additive manufacturing.

There are three (3) project objectives:

Objective 1: To develop and implement an Additive Manufacturing Institute Model to provide high school students with the opportunity to explore the variety of careers associated with advanced manufacturing leading to earning industry-recognized certifications.

Objective 2: Develop and implement an interactive High School Faculty Professional Development Initiative in additive manufacturing that prepares teachers to design relevant and rigorous curriculum.

Objective 3: To develop a model education pathway that integrates the Additive Manufacturing Summer Institute with Columbus State manufacturing courses.

Overview of the Evaluation

The evaluation is guided by the following six (6) evaluation questions:

1. How effectively is the project being planned and implemented? What aspects of planning and implementation have gone well, and what challenges have been experienced? How have challenges been addressed? (Formative)
2. How are teachers and students reacting to the program in terms of perceived effectiveness? For teachers, how satisfied are they with the support and resources that are being provided to help them develop and incorporate problem-based additive manufacturing modules into their classroom?
3. Is the program improving teachers' and students' knowledge and skills?
4. Is the program increasing student interest in advanced and additive manufacturing careers?
5. Is the program increasing:
 - a. The number of students ready to enter 3rd and 4th year Learning Labs high school programs that provide early college opportunities?
 - b. The number of students enrolling in CSCC's advanced and additive manufacturing programs?
 - c. Number of students obtaining SME Additive Manufacturing Fundamental certifications?
 - d. The number of students finding positions in additive manufacturing?
6. Are teachers incorporating the problem-based additive manufacturing modules into their curriculum? What is going well? What are the challenges?

Output/outcome indicators and measures/data collection strategies

Evaluation Question #1: How effectively is the project being planned and implemented? What aspects of planning and implementation have gone well, and what challenges have been experienced? How have challenges been addressed? (Formative)

Output indicators	Measures/data collection strategy
<ul style="list-style-type: none"> Type and number of project activities completed 	<ul style="list-style-type: none"> Collection and review of project level documents
<ul style="list-style-type: none"> Attendance at events 	<ul style="list-style-type: none"> Periodic meetings with the project team

Evaluation Question #2: How are teachers and students reacting to the program in terms of perceived effectiveness? For teachers, how satisfied are they with the support and resources that are being provided to help them develop and incorporate problem-based additive manufacturing modules into their classroom?

Output indicators	Measures/data collection strategy
<ul style="list-style-type: none"> Students' perceptions of program effectiveness 	<ul style="list-style-type: none"> Custom-designed survey
<ul style="list-style-type: none"> Teachers' perceptions of program effectiveness 	<ul style="list-style-type: none"> Custom-designed survey Semi-structured interview
<ul style="list-style-type: none"> Teachers' satisfaction with support and resources 	<ul style="list-style-type: none"> Custom-designed survey Semi-structured interview

Evaluation Question #3: Is the program improving teachers' and students' knowledge and skills?

Output indicators	Measures/data collection strategy
<ul style="list-style-type: none"> Increases in teachers' knowledge and skills 	<ul style="list-style-type: none"> Custom-designed counterfactual or pre-post exam.
<ul style="list-style-type: none"> Increases in students' knowledge and skills 	<ul style="list-style-type: none"> Custom-designed counterfactual or pre-post exam. Scores on Additive Manufacturing Certification Exam

Evaluation Question #4: Is the program increasing student interest in advanced and additive manufacturing careers?

Output indicators

- Self-reported interest levels

Measures/data collection strategy

- Custom-designed survey

Evaluation Question #5: Is the program increasing the following:

- a. The number of students ready to enter 3rd and 4th year Learning Labs high school programs that provide early college opportunities?
- b. The number of students enrolling in CSCC's advanced and additive manufacturing programs?
- c. Number of students obtaining SME Additive Manufacturing Fundamental certifications?
- d. The number of students finding positions in additive manufacturing?

Output indicators

- Number of students entering 3rd and 4th year Learning Labs.
- The number of students enrolling in CSCC's advanced and additive manufacturing programs
- Number of students obtaining SME Additive Manufacturing Fundamental certifications?
- The number of students finding positions in additive manufacturing?

Measures/data collection strategy

- Data provided by the project team

Evaluation Question #6: Are teachers incorporating the problem-based additive manufacturing modules into their curriculum? What is going well? What are the challenges?

Output indicators

- The proportion of teachers incorporating modules into their curriculum.
- What is going well with the modules? What are the challenges

Measures/data collection strategy

- Data provided by the project team
- Semi-structured interviews

Timing of Evaluation Activities (Year 2 focus)

Month	Activity
On-going	<ul style="list-style-type: none">• Periodic meetings with project team• Review of relevant documents
Sept 2018	<ul style="list-style-type: none">• Year 2 evaluation plan
May 2019	<ul style="list-style-type: none">• Year 2 evaluation report