DEPARTMENT REPORT
OF
PROGRAM LEARNING OUTCOMES ASSESSMENT

Department: Manufacturing Engineering Technology

Program (Degree): Manufacturing Engineering Technology

Type of Degree: X AAS ____ AA ____ AS ____ ATS ____ AIS

Chairperson: Shep Anderson Date: April 27, 2000

Person(s) Interviewed: Shep Anderson

I. **Program Curriculum:** A description of the basis for the program curriculum (i.e., how it is derived and validated). Include accreditation organizations, advisory committees or external groups that influence curriculum. Describe curriculum review activities including the review of course master syllabi.*

The creation of this degree program was prompted by work done at the AIM Center through the NSF grant. The grant focuses on development of curriculum materials for a Manufacturing Engineering Technology program with a modular design. This curriculum is being distributed nationally; Sinclair is a test sight for this development. The outcomes were developed by the Advanced Integrated Manufacturing (AIM) center, but with a national focus in mind.

At the local level, the program outcomes were verified by an advisory committee and were refined for this region. Local outcomes have not been incorporated back into the national model; instead, they focus on manufacturing needs specific to the Dayton area. Variances at the regional levels are dependent upon what is being manufactured (i.e., furniture, automotive). In the Dayton area, the majority of the manufacturing focuses on assembly and metal cutting or plastics. Some variations in content were also found; for example, costing and cost analysis were emphasized at the local level, but not at the national level. This emphasis area is built into the local program at Sinclair. An advisory board participated in a full Developing a Curriculum (DACUM) project in October of 1997 to refine and perfect the national recommendations for the local area. This DACUM was conducted prior to reviewing the national outcomes; Sinclair was very pleased that the local analysis could verify the national outcomes. The local advisory board reviewed the work of the AIM center and the national agenda, then incorporated both, along with the DACUM results, into the program outcomes.

The Advisory Committee meets three to four times a year. The Committee has a formal relationship with the Society of Manufacturing Engineers (SME). The local chapter of SME provides scholarships to support students in the program and officially endorses the degree program as well as providing input to the program

curriculum. Sinclair hosts the executive board meeting of SME. Shep Anderson serves as Chair of the Education Committee for the local chapter of SME.

The Fall of 1999 Advisory Committee meeting led to approval of these program changes:

- Add DRT 217, Introduction to Geometric Dimensioning and Tolerance. MET 281 was removed as a degree requirement but remains an elective.
- Add IET 125, Introduction to World-Class Manufacturing. This course replaced IET 110.
- Reduce IET 278, the Capstone course, from 4 credit hours to three.

The Advisory Committee also discussed integrating safety into all course curriculums rather than handling it as a separate area.

A short-term certificate has been developed in Manufacturing Management through recommendation of the Advisory Committee. The certificate consists of eight courses and can be completed by a part-time student within a year. The certificate provides training to operators and/or technicians who have been recently promoted to supervisory positions on the shop floor. The program has a management focus rather than a technical focus.

II. <u>Program Learning Outcomes</u>: A description of what you intend for students to know (cognitive), think/feel (affective), or do (psychomotor), when they have completed your degree program. A suggested manageable number of outcomes should be in the range of five to ten. Describe Program Learning Outcomes review activities.*

No changes have been made to the program learning outcomes. Course changes are reflected in the chart below.

An entry-level graduate with an Associate of Applied Science Degree in Manufacturing Engineering Technology from Sinclair Community College will be able to:

	Learning Outcomes	Related Courses
1.	Demonstrate science and mathematical skills required for occupational needs.	MAT 131, 132, 133; PHY 131; CHE 131
2.	Demonstrate the principles of computer applications in technology.	MET 198; DRT 198
3.	Demonstrate appropriate technical communication skills (written, verbal and drawing).	ENG 111, 121, 122; COM 211; DRT 106, 217
4.	Use sound business practices in relation to people management.	IET 126; PSY 229
5.	Demonstrate technical engineering skills appropriate to program requirements.	QET 101, 201; MET 203; EET 119

Learning Outcomes	Related Courses
6. Demonstrate applied and theoretical techniques in the areas of machining, plastics and automation.	INT 109, 113; PLA 106; EGR 128; QET 132; IET 205
7. Demonstrate applied and theoretical techniques in the areas of production management.	IET 101, 115, 125, 130
8. Analyze engineering problems and make appropriate decisions.	IET 278, 97; QET 101

III. <u>Assessment Method(s)</u>: A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

a. Formative Assessment Method(s) and Description: a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

Formative assessment is on a course-by-course basis, with emphasis on the module design. The degree program uses existing courses, but works to incorporate modules into the curriculum. For example, Quality Foundations is a module which fits part of the outcomes of QET 101, Survey of Total Quality Management. The module has been implemented within the course. The department would like to eventually offer stand-alone modules. Each module (about fifteen are currently in place) has its own modular assessment piece. Module assessment includes formative assessment, mostly in terms of faculty-led discussions and probing questions. The modules are activity based. At the end of the module, there is a "transfer activity" which summarizes what has been learned in the module. Students are then asked to apply those competencies in a different context. Modular assessments are competency-based and practice specific. The transfer activity uses a rubric to identify and score student competencies. The results have been good in terms of students' abilities to move from the focused activity to the transfer activity. Transfer is an important step; if the students are learning only in one context (the focus area) then the skills aren't as transferable as they need to be. The model of the "Robotics Gripper Company" is the context for the transfer activity.

b. Summative Assessment Method(s) and Description: a measurable indicator of end-of-program success in attaining the stated program learning outcomes(s).

IET 278, Manufacturing Capstone Experience, is used for summative assessment. The advisory committee helps to supply students with industry projects to complete.

Students enrolled in IET 278 during spring of 1999 worked on projects from BF Goodrich Aerospace and AIDA. The BF Goodrich project consisted of analysis and recommendation for a manufacturing procedure. The AIDA project focused on the development and implementation of a tool management system. Students were required to complete the project, write a paper and make a formal presentation.

Eight employees from AIDA and two from BF Goodrich attended the class presentations.

Students enrolled in IET 278 spring of 2000 are working on a collaborative project with students from Ohio State University and Wright State University to design a robotic arm for a wheelchair.

IV. Results: A description of the actual results of overall student performance gathered from the summative assessment(s). (see III.b.)

Results from formative assessment activities are very positive. Most students seem to enjoy the modules and benefit from that style of learning. "Beta" testing of modules will be finished this year.

MET 281, Certified Manufacturing Technician Review, was offered for the first time in the Spring Quarter, 1999. Students enroll in the course as preparation for the SME certification exam leading to the designation of Certified Manufacturing Technician. The program had three graduates in spring of 1999; two passed and one failed the certification exam. The data that Sinclair received back from SME after the exam indicated that students performed low in computer applications.

The student project completed in IET 278 for AIDA led to adoption of the new tool management system by the company.

V. Analysis/Actions: From analysis of your summative assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

Results and feedback from the SME certification exam indicated that students did not perform well in computer applications because all areas tested were not included in the curriculum. The department is now in the process of building more computer applications into courses. Three courses have been identified with no C programming applications. Software will be integrated into those three courses by having the students go to the teleports.

MET 281, Certified Manufacturing Technician Review, was removed from the degree program as a requirement and designated an elective upon recommendation of the Advisory Committee because no new material was covered in course. See Section I of this report for more information on curriculum changes.

VI. General Education: Are you using any tool(s) to assess any of the three primary general education outcomes* (communication, thinking, values/citizenship)? If so, describe.

Guiding principles are written for student performance in each module. Oral and written communication, global and societal awareness, and critical thinking and problem solving are built into each module with corresponding skill assessment. The oral and written communication checklists have been given to the module

development staff. The checklists have been modified to be used in the project at the national level.

a. Where within the major do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

   Courses that include writing assignments and/or papers include IET 125, 126, 130, 205 and 278.

b. Where within the major do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available.

   Oral presentations are required in IET 126 and 278.

   Teamwork is used in all modules and all labs. Teamwork develops interpersonal communication.

c. Where within the major do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

   Thinking skills are used in all IET courses. Thinking skills are particularly important in IET 101 and 125 and QET 101. Students in this program utilize a variety of thinking skills including problem solving, brainstorming, critical thinking, trouble shooting, and continuous improvement and/or process improvement analysis.

d. Where within the major do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

   The Engineering core competencies that were adopted in spring of 1999 include citizenship and community. A division analysis of all programs indicates that "citizenship" is the most often omitted the curriculum. The division is committed to working with the General Education Committee to develop or recommend ways to assess these areas.

***** Note: The oral communication checklist and the written communication checklist developed by the General Education Committee were adopted for college-wide use during the 1997-98 academic year by Academic Council. Thinking Guidelines developed by the General Education Committee are being piloted by faculty during the 1998-99 academic year.