6.16 ASSESSMENT

Assessment Plan and Integration: An assessment plan shall be comprised of, but not limited to, the following for each program: (1) program mission statement, (2) the desired program outcomes/student competencies, (3) evidence that the program incorporates these outcomes/student competencies, (4) the assessment measures used to evaluate student mastery of the student competencies stated, (5) compilation of the results of the assessment measures, and (6) evidence that these results are used to improve the program.

1. Program Mission Statement

The Department of Industrial Education and Technology at Iowa State University prepares technically oriented professionals to provide leadership in manufacturing technology and occupational safety through an undergraduate industrial technology program.

2. Desired Program Outcomes/Student Competencies

The Industrial Technology faculty has identified a group of competencies that are required of all Industrial Technology majors and validated that listing of competencies through successive follow-up studies. In addition to the general competencies, more specialized competencies have been identified for each of the options, manufacturing technology and occupational safety. The lists of competencies are re-examined each time a follow-up study is conducted or curriculum revisions are undertaken.

General Competencies

Using computers
Oral communications
Written communications
Human relations
Manufacturing processes
Safety in manufacturing
Team building
Internship/co-op
Material processes
Industrial management
Design/CAD
Industrial organization
Quality assurance
Total quality management
Material properties
Electricity/electronics
Intro to training and development
Statistics
Hazardous material handling
Research/development
Physics
Psychology
Chemistry
Calculus
Appreciate individual and group differences
Organizing/using professional materials
Locating and soliciting job related materials

Manufacturing Competencies **Occupational Safety Competencies**

Computer aided design
Cost estimating and accounting
Automated manufacturing
Computer aided manufacturing
Production control
Facility planning
Industrial electronics
Programmable logic controls
Lean and agile systems
Fluid systems
CNC machining
Computer programming
Digital electronics
Robotics
Polymer and composite processing
Using community resources
Statics

Safety training
Ergonomics
Hazard recognition and analysis
Legal issues
Industrial hygiene
Industrial hygiene
Fire safety
Accident investigation
Safety administration
First aid/CPR
Construction safety
Physiology/Anatomy
Organic Chemistry

3. Evidence that the Program Incorporates Outcomes/Student Competencies

The courses that assume primary responsibility for developing each competency are indicated in three tables found in Section 6.3. They are 6.3.11.1, 6.3.11.2, and 6.3.11.3. Those courses that provide additional opportunities for the development of the competencies are designated as secondary courses in the respective tables.

4. Assessment Measures Used to Evaluate Student Mastery of the Student Competencies

The primary assessment measures used to evaluate student mastery of desired competencies are the evaluations, by the instructor, of student work assigned during a semester. The grading policy for each course is outlined in the course syllabus. In addition, surveys of program graduates and employers of program graduates provide a longer-term measure of student mastery of the target competencies.

5. Compilation of the Results of the Assessment Measures

Examples of student work, along with assigned grades for that work, are available in course folders in the Support Material file. Studies of graduates have been conducted by the Department, the Research Institute for Studies in Education (RISE) and the University on a four to five year basis. The most recent study was completed in 2001. Graduates from 1985-2000 were surveyed to determine the value of certain content areas and to solicit suggestions for curricular improvement. The results of this study are reported in section 6.3.12.
Another formal instrument used by the department was the 2001 Employers of Graduates Follow-up study. This study requested information from supervisors

concerning the graduates' preparation for his or her job. The results of the study are shown below. Thirty-nine responses were returned. Supervisors were asked to rate the graduate's preparation in 16 different content areas. The following scale was used: No Preparation (1); Poor (2); Adequate (3); Good (4); Outstanding (5).

TABLE 6.16.1 2001 Employers of Graduates Follow-up Study

	Mean	St.Dev	Count
Computer Skills and Application	4.50	0.60	38
Overall Technical Knowledge of Manufacturing	4.24	0.68	37
Drafting, Design, and CAD	4.19	0.82	36
Quality Assurance	4.10	0.85	39
Mathematics (Trigonometry, Calculus, Statistics)	4.08	0.64	37
Overall Knowledge of OSAF	4.05	0.66	38
Communications (Oral, Written, Listening)	4.05	0.97	39
Manufacturing Processes	4.03	0.68	38
Overall Knowledge of Training and Development	3.97	0.71	39
Principles of Management	3.92	0.82	38
Automation and Systems	3.92	0.72	37
Properties of Materials and Testing	3.91	0.82	35
Electronics (General, Industrial, Digital)	3.88	0.84	34
Fundamentals of Economics and Accounting	3.86	0.82	37
Social Sciences (Humanities, Sociology, Psychology)	3.75	0.77	36
Physical Sciences (Physics, Chemistry, etc.)	3.72	0.74	36

The following are comments that employers reported on the 2001 Employers of Graduates Follow-up study conducted by the Department of Industrial Education and Technology. As part of this study, open-ended questions were asked of employers. The following is an example of responses:

General Strengths

- His knowledge of this factory and all that goes into producing our product. His knowledge of the OSHA standard and the application of such. Has complete expertise on workers compensation.
- Computer skills, manufacturing principles, processes.
- In a very short period of time, [name] has demonstrated that he has the skills to be a very effective general manager in our corporate organization. He was recently promoted to cover multiple geographic markets, which will bring new challenges.
- [Name] is a tremendous team leader - I really enjoy working with him.
- Computer skills, grantsmanship, organization, planning, communication and

financial management.

- Solid communication skills.
- [Name] is a good dedicated worker. He always gives 100% and is always eager to take on more. He adapts to our different processes very quickly.
- Strong practical application skills. Very strong thought processes.
- Good technical background.
- [Name] has the ability to pick up and learn anything he puts his mind to. He has excelled at automation by learning PLCs to a degree he is an expert.
- [Name] is an excellent project manager; attributable to his nature, education and higher learning. [Name] is an outstanding communicator - written and oral. He grasps the "big picture."
- Communication skills, maturity, natural leadership skills.
- [Name] is a solid performer. He has a great background for the many opportunities we present to him.
- [Name] was prepared well; he has been promoted to Loss Control Manager.
- [Name] computer skills and his analytical ability are his strong points.
- Great attitude about work. Enjoys making changes and seeing improvements. Very logical thinker, good problem solving skills. Pursued advanced degree, which was very important in his role.
- [Name] is extremely good at communicating with both coworkers and employees he manages. Excellent in all aspects as far as manufacturing is concerned.
- Technical ability strong, charismatic, can do attitude, improvement focused and innovative.
- [Name] is an outstanding contributor to Primavera. He is responsible for managing large customer implementations and ensuring customer services.
- Very good manufacturing skill set. Quick to understand a problem and then solve. Good with people.
- [Name] uses his technical background in a very professional manner. He does not give up easily. He is persistent and above all has a rare sense of "completion". He finishes everything he starts.
- [Name] has shown great dedication and commitment to meeting his goals. He has a clear understanding of how to solve any type of manufacturing engineering challenge presented to him. He is not afraid of trying new methods.
- [Name] has excellent communications skills and can deliver the message to any targeted group.
- [Name] has an excellent background and can deal with a multitude of different systems.
- A great team leader.
- Good CAD background, exposure to SPC.
- [Name] is self-motivated and very energetic. He is developing into a very good Manufacturing Engineer.

- Very good working with others. Has also been effective in conducting training sessions for others.

Areas Where Improvement is Needed

- People skills/communication.
- [Name] has excellent skills. Writing skills could better.
- Communication skills!
- Statistical Process Control. We do use this quite a bit in our process. He did have some concepts but not to the level we use. We do, however, provide this training in house.
- Real team interaction experience and human relationships.
- [Name] has a good "tool box" of knowledge. I don't know how much was due to his education or due to his desire to learn. He does bring an understanding of a lot of different concepts.
- Not that [Name] necessarily needs further development in this area (at this point), more emphasis on the supply chain and how IE can play a key role - present and ongoing process improvements.
- More emphasis on people leadership ("soft skills").
- His understanding of using "teams" and other's strengths for better solutions is probably a weakness. More exposure and emphasis on team decisions may have helped.
- Difficult to comment because of [Name] advanced education and work experience. I don't know the source of his skills and knowledge.
- Focus on application of dealing with different types of people. [Name] is learning that one style isn't always the best with all people and that the secret to management is being a quick study of people or situations and adjusting accordingly.
- Probably more “management skills” would have been an area that requires emphasis. Nevertheless, [Name] excels in attitude and enthusiasm.
- More up to date CAD knowledge - latest versions of the most popular CAD programs (AutoCAD and Pro E).
- More focus on activity based accounting.
- More process planning - give the students a part to be made, let them plan the manufacturing steps and see the economic affects of quality criteria, mass production, automation vs. manual processes, etc. Show them manufacturing documentation.
- To target someone for applications type work - there is much customer contact - communications is as important as technology.
- If I had to suggest an area/skill that could be improved, it would be in the use of Microsoft Visual Basic with MS Excel and MS Access, which would enable more efficient analysis.
- Problem solving skills and technical writing are 2 areas that need some

improvement.

Other Comments

- [Name] makes my job much easier as he requires very little management from me
- [Name] has moved from Quality Assurance into our customer service center where he is Manager of the entire Door Division Customer Service Center. He does a very good job in all areas.
- Emphasis should be placed on "how to communicate in a professional environment". Both written and verbal.
- I really cannot say enough about this young man except that he has a very bright future with our company.
- My exposure to ISU graduates (although a bit limited) leads me to conclude that you have an excellent curriculum
- Combination of education at Iowa State University and internship with Sauer Danfoss has produced remarkable results! [Name] is an outstanding member of our team.
- Great employee. I hope he will have a long career at our company.
- I agree with your statement…. feel proud of this former student. He will be a very competitive professional (as a manager), in the near future.
- Having just completed his year-end review I found that all his peers and people he works with are impressed with [Name] abilities and are very happy we hired him. [Name] experience at injection molding will be very useful to us.
- It appears that ISU prepared [Name] very well for the manufacturing industry.
- [Name] is very well rounded and does an excellent job as our Product Development Manager.

Other measures indicate that graduates of the Industrial Technology program are advancing in their careers. Salary, job classification, responsibility for other employees, and responsibility for budget are typical measures. Table 6.6.3.6 on page 6.6-21 is a presentation of the results of the 2001 survey on these measures.

6. Evidence that These Results Are Used to Improve the Program

Evaluation of academic programs and curriculum at Iowa State University over the past five years has consisted of both formal and informal assessments. The economic constraints at ISU are becoming more restrictive, which is typical of most universities and state institutions throughout the United States. This condition has prompted the need for more accountability in the use of all resources. Iowa State University is engaged in the development of strategic plans at all levels (University, College, and Department) to more clearly focus the mission of each. The

Department of Industrial Education and Technology has participated in this effort and developed its own strategic plan. The plan has been implemented in most of the department's deliberations regarding academic focus and re-allocating of resources. A value-added assessment of programs and students' performance throughout their educational experience has been an ongoing process that drives curriculum deliberations and financial allocations. Two examples of significant programmatic changes include the discontinuation of the Training and Development option within the last two years, and the establishment of a Technology Learning Community in the Department.

The Training and Development option was discontinued to better focus limited departmental resources; there simply were not enough students enrolled in this option, nor enough full-time faculty, to justify sustained availability of this option.

The Technology Learning Community was established in response to a major component of the 2000-2005 strategic plan for Iowa State University. The University seeks to expand and emphasize student-centered learning environments (such as Learning Communities) engaging academic variety and student diversity, with the goal of providing a holistic and collaborative approach to learning; learning through discovery, experience, and innovation; and effective use of information. Learning communities are a university-wide initiative that provide new students with an opportunity to connect with peers who have similar academic goals. Advantages include seeing familiar faces in classes, making a smooth transition from high school to college by developing academic and social networks, developing links between in-class and out-of-class learning opportunities, and communicating with instructors. The Department of Industrial Education and Technology has had a formal Learning Community in place since 1999. The number of students that have participated in program, by semester, is: (a) Fall 1999, 28; (b) Spring 2000, 26; (c) Fall 2000, 38; (d) Spring 2001, 30; (e) Fall 2001, 36; and (f) Spring 2002, 48. Yearly assessment reports are required as a condition of central funding from the President's learning community allocation.

The specific goals of the Technology Learning Community (TLC) initiative include:

- Orient freshman and transfer students to the industrial technology discipline and profession to maximize learning.
- Connect new students to each other using cooperative learning groups to provide support, encouragement, and assistance.
- Connect new students with faculty and upper-class students and professionals in industrial technology.
- Introduce the variety of professional roles available through an industrial technology degree.
- Assist students in developing realistic self-assessments, career goals, and academic goals.

The specific learning outcomes of the TLC initiative include:

- Student and faculty social interaction skills.
- Awareness of key information resources and access mechanisms.
- Realization of the importance/value of out-of-class experiences.
- A clear concept of industrial technology as a program and discipline.
- Knowledge of the department's advisement process.
- Increased student self-responsibility for their progress.
- Development of, and benefit from, contacts with industrial mentors.
- Student familiarity with upper division peers for purpose of benefiting from their experience.
- Awareness of, and an opportunity to participate in, student chapters of professional associations.
- Introduction to all faculty in the department.
- Awareness of the multiple career options available through industrial technology.
- Development of a holistic view of their progress towards industrial technology competence.
- Interaction with faculty outside of the classroom–professionally, socially, and academically.
- A sense of "community" with fellow undergraduate students.
- enhanced teamwork skills.
- A portfolio of academic and professional experiences/activities.
- Awareness of their preferred learning style.

During the last week of the semester, a survey is administered to the students asking them to evaluate the ability of the TLC faculty and mentors to meet the five goals of the TLC initiative. They are asked to rate the ability as excellent, good, fair, or poor. The goals along with the student response results for F99-S00 are presented in the following table:

TABLE 6.16.2 Rating of TLC Faculty and Mentors

TLC Goal	**Student Response**
Orient freshman and transfer students to the industrial technology discipline and profession to maximize learning	90% - Good/Excellent
To connect new students to each other using cooperative learning groups to provide support, encouragement, and assistance.	90% - Good/Excellent
To connect new students with faculty and upper-class students and professionals in industrial technology.	90% - Good/Excellent
To introduce the variety of professional roles available through an industrial technology degree.	80% - Good/Excellent
To assist students in developing realistic self-assessments, career goals, and academic goals.	90% - Good/Excellent

Assessment of the TLC experience was modified during the 2000-2001 academic year to include a variety of components. The first component was the ISU Learning Community Survey at the beginning and end of each semester. In addition to the common questions, additional questions were added to the post survey to address specific aspects of the TLC. The second assessment component was the weekly summaries turned in by each TLC student. The third assessment component was the evaluation of each TLC student by his or her peer mentor. The fourth assessment component occurred with a few weeks left when the TLC students were ask to make a self-assessment of how well the TLC experience had helped them accomplish the five specific goals of the TLC. This process helped to define the content and structure of the introductory Industrial Technology course during the semester. The fifth assessment component was the end of the semester course evaluation.

As regards the ISU Learning Community Survey, TLC students were ask to rate their satisfaction with their overall learning community experience on a scale of one (Strongly Dissatisfied) to nine (Strongly Satisfied). Student responses of seven, eight, or nine on the scale were interpreted as *High Satisfaction*. The results are shown in the following table:

TABLE 6.16.3 Student Satisfaction with Their Overall TLC Experience

Student Satisfaction with Their Overall TLC Experience	
Fall 2000	74% - High Satisfaction

At the end of each semester, TLC students were asked to evaluate the ability of the TLC experience to meet the goals of the TLC initiative. They were asked to

rate the ability as excellent, good, fair, or poor. The goals along with the student response results are presented in the following table:

TABLE 6.16.4 Student Assessment of Achieving TLC Goals: Spring 2001

TLC Goal	Student Response
Orientation to the Industrial Technology discipline and profession	80% - Good/Excellent
Connections with faculty, other students, and industry professionals	80% - Good/Excellent
The process of introducing the variety of professional roles available through an industrial technology degree	80% - Good/Excellent
The process of developing realistic self-assessments career goals, and academic goals	88% - Good/Excellent

Below are some comments by TLC students selected from their weekly summaries:

- This week in class, [Name] once again visited us to give us the results of the technology skills evaluation that we filled out several weeks ago. We discussed what the results actually showed in a number of different categories. He gave each one of us individual feedback, which was really nice. Usually on a campus this large you don't expect to be given feedback on an individual basis because there are just too many students.
- In our peer group we discussed our résumés. Even though I have had a résumé for the past three years I am still learning new ways to improve it and make it a better representation of my skills. I have made several changes to my résumé that I would have never thought of prior to this class.
- In peer groups: we went and took a tour with our peer mentor to our industrial mentor's facility. That was very exciting. Then we talked about our résumés and getting a job.
- In peer mentor groups: there were actually a lot of people at our last meeting. We were able to take a tour of the metals development building. That was one of the coolest trips that I have ever taken while in school. We got to learn about all the different kinds of things that they are doing down there. They also said that they have openings for students to help out there. I think that I might go down there and apply for one of those openings.
- We had to come up with as many things as we could that we thought should be in our portfolios. Then we put each group's paper on the wall so everyone could see it. We then compared what each group put down. There were several similarities but there were also a few differences too. I thought that

the exercise was pretty helpful because up until then I didn't know what exactly I was going to put in mine, but now I have a pretty good idea.

- I have never really had to put together an extremely professional looking resume before so I tried to make the best one that I could but it still didn't compare to some of the other guys'. You could tell that I was obviously younger and had far less work experience, but I figure that will come.
- In our peer mentor meeting we took a trip to Precision and toured the factory with our industrial mentors. They seemed pretty knowledgeable in the day-to-day operations of the factory. Whenever we stopped and talked to the workers on the line, they seemed to get along with them very well and that is very important to me. I think that the tour gave us some good knowledge and I'm thinking about applying there this summer.
- We had the pleasure of listening to different people talk about their organization. I was very interested in a couple of these organizations. The two organizations that I was really interested in were SME, and SPE. I had thought of joining one of these prior to the class but I hadn't decided as to which one I would like to join. In the presentations I was told many different interesting things about the two organizations and I was also told when they had their meeting. Last week I went to a SME meeting, and a SPE meeting. I am sure that I am going to join SPE and I might join SME. I learned a lot in the last weeks class and hope that the rest of the semester I learn as much in 111x as I did on February 13.
- Last week my peer mentor group met. We drank pop and talked about many different topics: resumes, industrial mentors, classes, social event, and a few other miscellaneous topics. I really enjoyed my peer mentor group.
- Last week in class, [Name] spoke about portfolios. First we got into groups and all made a list of things to put in a portfolio. My group had the best list of any of the groups. I developed some great ideas for my portfolio, and I hope I follow through with those ideas because with them I will have a great portfolio.
- We finally got more personal and learned each other's names. [Name] also told us about the college of Industrial Technology a little bit more and [Name] told which professors were difficult and those who are easy to get along with. [Name] asked what the classes each of us were taking and showed us who we share certain classes with. [Name] also familiarized us with the Learning Community room and explained what we could use it for. Our time spent together proved to be very helpful and I feel like [Name] will be a great help to me as the semester goes by.
- I can honestly say that I am enjoying Industrial Technology much more than engineering. I've never felt like my teachers are against me, all of my teachers thus far have been more than happy to help me out. Also, I feel that I am enjoying the courses because I can actually understand what my teachers are talking about.

- The best part of our peer mentor meeting was when the group asked questions of our peer mentor and of another per mentor in the room. We asked them questions about what to expect from certain teachers and the classes they teach. The information that we got in return is going to help out tremendously on some of my upcoming tests. I hope that we can continue to do this in the future.
- We also looked at the definition of Industrial Technology during class this week. Knowing the definition will really help out when I am trying to explain to potential employers what it is that I have been trained to do and why I would be useful to their company. It will also be very helpful in more informal social settings when I am trying to explain to people exactly what I Tec is really all about.
- We also discussed the different clubs and organizations that are available for I Tec majors to become involved with. There are definitely more opportunities than I had ever imagined. I would like to try and go to at least one meeting of every group so that I can make a better decision about which option I would like to pursue in the I Tec department. I am starting to question my decision to go in to the manufacturing option.
- Last week in class we were treated to a lecture about teamwork skills in the workplace. This was an especially useful lecture because the ability to work in a team has become one of the most important skills in today's business world.
- Last week in our peer mentor meeting we discussed ways for our group to become better acquainted with the members of our group. We talked about doing some fun activities during our peer mentor meetings to increase the interaction. I think that this will be an excellent way to decrease any inhibitions or shyness amongst our group members.
- [Name] and [Name] came in and talked to us about ECS [Engineering Career Services] online and career services. This was good because I went and registered for ECS on Monday. I knew ECS was important but I didn't know it could do so much for me. I'm glad they came in. I'm not ready for an internship yet but when I am it will come in handy.