



OAKLAND
COMMUNITY
COLLEGE

Memo

TO: NEW PROGRAMS AD HOC COMMITTEE
of the ACADEMIC SENATE

FROM: Ann Craigmile, Chair *ac*

SUBJECT: Packet for Review for Friday's Meeting

DATE: December 5, 1995

Enclosed is an information packet for your review prior to our *Friday, December 8 meeting at 12:00 in the Board Room at D.O.*

The packet contains the following:

- ☛ "Charge" to the Committee
- ☛ Original 7-year list of proposed new programs
- ☛ Executive summaries and other pertinent data from programs
- ☛ Excerpts from The User Handbook for Curriculum Development
- ☛ Meeting Agenda

Marty Orlowski's Office has provided me with the full Needs Assessment Reports. If you desire additional information, they will be available at the meeting.

See you Friday. Lunch will be provided.

/bjw

Attachments

☼NEW PROGRAMS☼

COLLEGE SENATE COUNCIL

AD HOC COMMITTEE

ON

NEW PROGRAMS

CHAIR: Ann Craigmile (+) plus two representatives from each campus as nominated by the respective Campus Senate Chairs (ex-officio members to include the Director of Institutional Research, the chief financial officer of the district or her designee, and Vice Chancellor Jaksen).

CHARGE: To review the proposed programs indicated in the Millage Campaign to:

- A. Determine the status of the needs assessment for each program.
- B. Prioritize each program for its submission to the Curriculum Process.
- C. Identify an Individual who will guide each program through the Curriculum Process.

TIME LINE: Establish meetings so as to provide a written report at the College Senate's December, 1995 meeting (indicate membership and meeting times in the first report to the Senate).

ASSESSMENT: Production of the December report.

ENVIRONMENTAL TECHNOLOGY NEEDS ASSESSMENT

EXECUTIVE SUMMARY

- The Environmental Technology Needs Assessment was initiated by the Emerging Technology Environmental Science Consortium as part of a grant funded by the Michigan Department of Education. This Consortium sponsored an earlier needs assessment in the area of Water and Wastewater Treatment Technology. The Consortium members represent Schoolcraft College, Oakland Community College, Delta College, Grand Rapids Community College, Lansing Community College, Wayne County Community College, Northwestern Michigan College, and Kellogg Community College. Although this first needs assessment was conducted statewide, the second assessment of Environmental Technology was only for southeastern Michigan.
- Several sources were used to determine the employment outlook for an Environmental Technology Program. Federal, state, and local employment sources provided information regarding job requirements, position descriptions, employment opportunities, salary ranges, employer names and addresses, and four-year programs. In addition to secondary research, a survey was conducted to determine the need of local employers for environmental technicians.
- The program holds promise for graduates in that the literature indicates that more dollars will be available from the federal and state levels to assist in environmental clean-up and monitoring. On a national level, it's predicted that 22,500 environmental engineers are needed in the next few years to deal just with toxic chemicals, and the federal Department of Energy estimates it will need 10,000 to 20,000 environmental professionals in the next decade.
- Almost half of the employers wanted, at a minimum, an associate degree and 30% wanted at least a bachelor degree. Another 25% wanted a high school diploma or its equivalent.
- The 61 employers who were surveyed currently employ a total of 547 technicians. There were 38% of the employers who have an immediate need to hire and 90% who see a need in the near future. In total, the surveyed employers indicated that they would need 99 full-time technicians in the next year and 312 in the next five years.
- The salary for environmental technicians ranges from \$17,780 to \$22,500 per year. There are virtually no part-time positions with the employers surveyed.
- The key skills needed by employers include OSHA 40/24 Hour Hazardous Material Training, Federal and State Environmental Laws and Regulations, and Environmental Field Testing. Many employers indicated that advancement opportunities were best for those employees who, with an associate degree and work experience, continued on to finish a bachelor degree.
- A full 82% of the companies stated that they provide in-house training. In addition, 63% of the respondents indicated that they use external training. Approximately three-quarters of the respondents would send current employees to Schoolcraft or Oakland Community College for training in environmental technology continuing education.

EMERGING TECHNOLOGIES ENVIRONMENTAL SCIENCE CONSORTIUM

ENVIRONMENTAL TECHNOLOGY NEEDS ASSESSMENT

INTRODUCTION

In March of 1993, a survey was conducted to determine the employment need for environmental technicians in southeastern Michigan. This report combines that survey of local employers with a national literature search to provide data and information regarding the demand, salary levels, skill requirements and in-service requirements of environmental technicians. The report will be provided to college administrators to assist them in decision making and planning regarding new program development.

In the fall of 1992, a consortium was formed between Schoolcraft College and Oakland Community College. The two schools submitted a proposal to the Michigan Department of Education to assess the need for an Environmental Technology program. The Michigan Department of Education approved the grant and sent a letter to all community colleges in Michigan inviting them to participate in the consortium. The consortium members represent the following schools:

- Schoolcraft College
- Oakland Community College
- Delta College
- Grand Rapids Community College
- Lansing Community College
- Northwestern Michigan College
- Kellogg Community College
- Wayne County Community College

The Consortium supported a study in wastewater treatment technology, which was completed in April of 1993. The wastewater needs assessment included input from employers throughout the State of Michigan. The full report is available through Oakland Community College's Office of Planning and Analysis.

BACKGROUND

There were several sources that were used in preparing this report. The Dictionary of Occupational Titles was used to define the scope and description of the position. A complete ERIC search was conducted on recently published articles. Data from the

Michigan Occupational Information System (MOIS) was reviewed. Sixty-one area companies and firms were surveyed via the telephone and their input and remarks are an important component of this report.

OCCUPATIONAL INFORMATION: ENVIRONMENTAL TECHNICIAN

National Data

The Dictionary of Occupational Titles lists the title "Pollution-Control Technician" with an alternative title of environmental technician. The Dictionary describes the position as such:

029.261-014 POLLUTION-CONTROL TECHNICIAN (profess. & kin.) alternative titles:
Environmental Technician

Conducts tests and field investigation to obtain data for use by environmental, engineering, and scientific personnel in determining sources and methods of controlling pollutants in air, water, and soil, utilizing knowledge of agriculture, chemistry, meteorology, and engineering principles and applied technologies: conducts chemical and physical laboratory and field tests according to prescribed standards to determine characteristics or composition of solid, liquid, or gaseous materials and substances, using pH meter, chemicals, autoclaves, centrifuge, spectrophotometer, microscope, analytical instrumentation, and chemical laboratory equipment. Collects samples of gases from smokestacks, and collects other air samples and meteorological data to assist in evaluation of atmospheric pollutants. Collects water samples from streams and lakes, or raw, semi-processed or processed water, industrial waste water, or water from other sources to assess pollution problems. Collects soil, silt, or mud for testing, records data, and prepares summaries and charts for review. Sets monitoring equipment to provide flow of information. Installs, operates, and performs routine maintenance on gas and fluid flow, chemical reaction systems, mechanical equipment and other test instrumentation. May operate fixed or mobile monitoring or data collection station. May conduct bacteriological or other tests related to research in environmental or pollution control activity. May collect and analyze engine exhaust emissions to determine type and amount of pollutants and be designated Engine Emission Technician (profess. & kin.). May specialize in one phase or type of environmental pollution or protection and be identified according to specialty.

The Occupational Outlook Handbook provides full detail on information regarding this position. The following are excerpts from the total article:

Definition: Pollution-control technicians, also known as environmental technicians, are principally concerned with conducting tests and field investigations to determine ways to control contamination of air, water, and soil.

Nature of the Work: Five job titles describe the major types of environmental technicians: Water pollution-control technicians, estuarine resource technicians, air technicians, noise technicians, and hazardous waste technicians. Pollution-control technicians, regardless of specialization or type of position, need basic manual skills. They should like to work with their hands and be at home with a variety of

equipment and instruments. In some jobs, pollution-control technicians need good eye-hand coordination, vision, or manual dexterity. Pollution-control technicians need to be good at reading and interpreting maps, charts, diagrams, instruction manuals and other such materials. They must be able to make accurate and objective observations, maintain clear and complete records of data, perform certain types of computations, and prepare technical reports, both written and oral, to be used in further analyses by engineers and scientists.

Requirements: It is best to begin career preparation early, in high school if possible. The prospective technician should take advantage of as many mathematics and laboratory science courses as possible. This means a minimum of two years of high-school math, including algebra and geometry. Chemistry, physics, biology, and computer courses are all highly desirable, as are any courses in conservation or ecology that the high school may offer. Of vital importance are courses where the students can sharpen their written and oral communication skills. If courses are available in drafting, or statistics, they too should be included.

Two years of post high-school training is the average basic requirement for starting a career in pollution-control technology.

Employers are sometimes flexible in their requirements, recognizing the value of different combinations of technical training and experience. Job applicants may need only an associate degree with emphasis in a physical science, a scientific technology, or related field. For many positions, applicants must also have practical experience in such areas as sampling techniques, or with measuring and testing equipment. Additional course work in one of the sciences, engineering, or mathematics can be substituted in some circumstances.

Advancement: In general, as pollution-control technicians gain experience they receive more responsibility and higher pay. But in many positions in this field, the greatest advancement is possible only for those who continue to pursue formal education. Many technicians with two-year degrees decide after some work experience that a bachelor of science degree provides the best tools to ensure continued challenges and promotions.

Employment Outlook: In general, the future looks bright for the field of pollution-control technology. The expansion and improvement of water and waste water management activities in particular should mean continued demand for technicians during the 1990s.

Earnings: In the early 1990s, most engineering technicians earned between \$18,000 and \$30,000 a year, with the average being around \$25,000 a year.

Conditions of Work: Conditions range from clean and pleasant indoor offices and laboratories to outdoor hot or cold, wet, bad-smelling, noisy, even hazardous situations. Anyone planning a career in pollution-control technology should realize the possibility of exposure to unpleasant conditions at least occasionally in his or her career. Employers often can minimize these negatives through special equipment and procedures.

The Classification of Instructional Programs (CIP) lists the program title Environmental and Pollution Control Technology/Technician, CIP code number 15.0507: The CIP manual describes the program as:

"An instructional program that prepares individuals to apply basic engineering principles and technical skills in support of engineers and other professionals engaged in developing and using indoor and outdoor environmental pollution control systems, and in disposing of hazardous materials. Includes instruction in environmental safety principles, biohazard identification, testing and sampling procedures, laboratory techniques, instrumentation calibration, hazardous waste disposal procedures and systems, safety and protection procedures, equipment maintenance, and report preparation".

One particularly good article, *Environmental Careers*, in the January/February 1992 issue of "Garbage: The Practical Journal for the Environment", V4, N1, p. 24-30, overviews the trends that are occurring nation-wide. There are currently 16 federal environmental-protection acts passed since 1970 that are helping to fuel the surge in jobs. Annually, there is \$15.6 billion spent to maintain present levels of waste disposal, and air and water quality. Cutting pollution was a \$115 billion operation in 1990. The EPA estimates that figure will rise to \$185 billion by 2000. Over 33,000 hazardous-waste sites are on the Superfund list. It's predicted that 22,500 environmental engineers are needed in the next few years to deal just with toxic chemical, and the federal Department of Energy estimates it will need 10,000 to 20,000 environmental professionals in the next decade.

State Data

MOIS (Michigan Occupational Information System) contained descriptions and information regarding Hazardous Waste industry workers. MOIS states that Hazardous Waste Technicians will see an increase in employment opportunities at a rate faster than the average for all jobs at both the state and national level. The increase in employment has been spurred by the \$9 billion federal superfund and Michigan's additional state funds.

MOIS indicates that "most enter this occupation by completing an Associate Degree, an Apprenticeship, or a Bachelor's degree". The average salary for an environmental technician in Michigan is from \$19,230 to \$37,897.

MOIS also states that federal law requires that every worker at a hazardous waste site receive a minimum of 40 hours in safety training, and that as many as 200,000 people will receive this training.

MOIS lists the community colleges currently offering applicable programs through the state of Michigan. They are:

Community College	Program Name
Jackson Community College	Chemistry (Pre Major)
Lansing Community College	Chemistry, General
Grand Rapids Community College	Chemistry
Lake Michigan College	Chemistry
Muskegon Community College	Chemistry (Transfer)
Southwestern Michigan College	Chemistry
Delta College	Chemistry

The 1991-1992 Financial Aid & Admissions Handbook lists the following community colleges as having programs in Hazardous Materials Technology (CIP Code number 15.0599/15.0701):

University	Program
Jackson Community College	Hazardous Materials Technology
Lake Michigan College	Hazardous Materials Technology
Kellogg Community College	Hazardous Materials Technology

The Handbook also lists the following four-year colleges and universities as having programs in Environmental Engineering:

University	Program
Michigan Tech University	Environmental Engineering (4 yr, Ph.D.)
Western Michigan University	Environmental Processes - Paper Eng. (4 yr)
University of Michigan	Environmental Science Engineering (4 yr)
Wayne Sate University	Hazardous Waste Management (5 yr, 6 yr)

Local Data

According to an Oakland University publication, there is a general shift in the focus of environmental protection away from the federal levels, with fewer government and agency jobs available now as compared with five years ago. Instead, a growing number of environmental consultants are working with state, county, and local governments as well as the private sector to provide specialized environmental services. Fewer companies today use their own permanent employees, although the largest operations are likely to have their

own in-house environmental staff. Opportunities for environmental improvement are slowly expanding in most areas, with a few areas (such as hazardous waste management) increasing rapidly. If the environmental interest that seems to have started the 90's continues, even more opportunities will be available, especially in the more technical fields.

An article which indicates the need for environmental technicians at the local level is from the Detroit News (1/4/93) and sites a recent study of employers conducted by Michigan State University. Environmental and Health Safety Analyst is sited as one of the top ten "best emerging jobs".

METHODOLOGY OF THE SURVEY

Methods of Data Collection

The research staff at Oakland Community College coordinated the development of the survey and conducted the telephone interviews. The process of building the survey included input from members of the consortium, faculty, administrators, and industry experts. In addition, the information from the literature search was used to identify the description of the position, the types of companies to contact, and the skill requirements for employment.

The employer lists came from three main sources. One was provided from consortium members. The second was from general mailing lists and included the Million Dollar Directory published by Dun & Bradstreet and Ward's Business Directory. The third source was from the Department of Natural Resources' Michigan Underground Storage Tank Financial Assurance Act Approved Contractor List. The MUSFTAA contractors are approved as outlined in the Public Act 518 of 1988. In total, the list was comprised of approximately 300 companies. From this list, sixty-one employers were contacted.

The telephone interviews were conducted from February 24 to March 2 from a phone bank at Oakland Community College. The interviewers were trained in coding the surveys and each employer completed the same survey instrument. Employers were asked a series of questions regarding hiring practices and potential employment opportunities. Also, detailed information was solicited from these employers regarding desired qualifications and specific skill levels for entry level employees.

Environmental Technician was described as a person completing a program of study that "trained people to apply basic scientific and engineering principles and technical skills in

support of engineers and other professionals engaged in developing and using indoor and outdoor environmental pollution control systems, and in handling, storing and disposing of hazardous materials." Included would be "instruction in environmental safety principles, biohazardous identification, testing and sampling procedures, laboratory techniques, instrumentation calibration, hazardous waste disposal procedures, safety procedures, equipment maintenance, environmental rules and regulations, and report preparation."

METHODS OF DATA ANALYSIS

The survey findings were analyzed by the research staff at Schoolcraft College. The surveys were entered on a FileMaker Pro database and analyzed using SPSS-Mac Version. The key statistics generated were frequencies, percentages, measures of central tendency, and cross tabulations. Comments were entered into the database and reviewed for perceptions of employers. The comments are attached verbatim at the end of this report. The report was generated using Microsoft Word.

ANALYSIS

Employers

There were 61 employers who participated in the study. They represented a broad category of organizations. There were eight different areas that employers could use to describe the nature of their organization (they could choose more than one). The following chart indicates the types of businesses that were surveyed:

Type of Organization	# of Businesses Who Selected This Type	Percentage	# of Technicians (duplicated number)
Agriculture	2	3.3%	12
General Manufacturing, Production and Processing	2	3.3%	122
Federal, State or Local Government	3	4.9%	27
Transportation, Treatment, Storage, and Disposal Organization	16	26.2%	154
Health Care Facility or Testing Laboratory	9	14.8%	224
Environmental Engineering Service	42	68.9%	365
Consultant	45	73.8%	395
Chemicals and Allied Products	2	3.3%	75
Other:	6	9.8%	20

OTHER included:

Soil and water investigation, witness testimony, and give permits.
Site investigation and clean up full service.

Install and remove underground fuel system, site remediation and ground water recovery
 Nation-wide corporation. Corporate offices in St. Paul, Minn. Michigan District Office serves northern Ohio & northern Indiana with offices in Charlotte, Atlanta and Tampa
 Environmental Scientists
 Site remediation
 Food, nutritional labeling workshops on regulations state and local
 Manufacture and distribute chemicals (water treatment) industrial inorganic

As seen in the above table, the greatest number of those surveyed were involved in some type of consulting service. A cross tab of Environmental Engineering Service and Consultant indicated that 39 of the respondents represent both types of organizations. This means that 64% of the businesses provide consultant services as well as environmental engineering services.

Employers were asked to respond to seven tasks as to whether they provided these services. As indicated in the chart below, a full 93% of the companies stated that they "sample, analyze, and interpret collected waste materials." This has strong implications for knowing how to conduct field tests for graduates. And, later in the survey, the employers rated field testing as one of the most important skill areas.

Tasks	# of Companies that Task Applies To	%
Interpret government regulations, and implement strategies for compliance	46	75.4%
Coordinate emergency response efforts	30	49.2%
Store, transport and dispose of waste and hazardous materials	24	39.3%
Develop, implement, and evaluate training in compliance with government regulations	47	77%
Sample, analyze, and interpret collected waste materials	57	93.4%
Purchase supplies and contract services needed to manage waste and hazardous materials	50	82%
Provide engineering or environmental consulting services	52	85.2%

When asked if they employed environmental technicians working in any of these seven areas, 27% did not employ technicians in these areas while 73% did employ environmental technicians.

EMPLOYMENT OPPORTUNITIES

It is interesting that there were no respondents who hire part-time environmental technicians. All the companies only employ full-time technicians. These 61 companies currently employ 547 full-time technicians (work more than 30 hours per week). The range was from 1 technician to 100 technicians with the average being 9 and the median being 4. The standard deviation was 18, which indicates that there is a wide variance in the number of technicians that are employed by the companies in the sample.

New Job Growth

When asked if they had an immediate or a foreseeable future need for additional persons trained as environmental technicians, 38% said they had an immediate need and 90% felt that would have a need in the future. Of the 38% who have an immediate need, these employers currently employ 283 technicians and are mainly providing services in Consulting and Environmental Engineering Services.

There were 19 employers who gave a specific number as to the number of employees they plan to hire this year. These 19 employers plan to hire 99 full-time technicians, with an average of 5 per employer. Only one employer indicated that they would need one part-time technician. Over the next five years, 24 employers indicated that they would need 312 full-time technicians. No employer indicated a need for part-time technicians.

Number of Jobs Needed This Year	Number of Jobs Needed Over the Next Five Years
99 Full-time 1 Part-time	312 Full-time 0 Part-time

As indicated in the literature search, there is growth in the environmental technology fields. With the pressures of new legislation and increasing tax support, companies are expanding to meet the new demands. The majority of employers (82%) indicated that they plan to hire new employees because of expansion of operations. Over half also indicated that they would need more technicians because of the additional work needed to meet regulations or legislation. There were only 7% who would need additional employees due to employee turnover.

Less than half of the employers experience difficulty in finding well-qualified, entry-level technicians. The comments on recruiting problems that they tend to encounter included such statements as:

- "Not a large pool of trained technicians. No one has OSHA 24/40 hours training. People lack communication skills."
- "It is a new field; more demand than trained people available."
- "Finding experienced people who are familiar with environmental procedures."
- "No program for technicians aside from 4-year degree program."
- "It is not a glamorous job, few people are trained in the field."

Most employers (60%) indicated that they tend to use the newspaper as a major source of recruitment. Others work with colleges and universities through co-ops and interns to recruit new technicians.

Wages and Benefits

Employers were asked the entry-level job titles and the corresponding entry-level salary ranges. Job titles were identified by employers, and these entry-level positions fall under seven general areas:

- 1) Environmental Technician
- 2) Industrial Hygiene Technician
- 3) CAD Operator
- 4) Environmental Sampling Technician
- 5) Waste Coordinator
- 6) Lab Technician
- 7) Hazardous Waste Material-Certified Technician

Environmental Technician was the most widely used job title with 42 or 69% of the companies employing those persons. In identifying program names, it would be consistent with industry to use the program title, "Environmental Technology" or "Environmental Technician Program".

Salaries range from \$17,780 to \$22,500 for entry-level positions. The following chart indicates that salaries were fairly consistent among job titles:

Title	# of Companies (percentage)	Entry Level Salary (median)
Environmental Technician	42 (69%)	\$20,064
Industrial Hygiene Technician	4 (7%)	\$18,760
CAD Operator	1 (2%)	\$20,500
Environmental Sampling Technician	2 (3%)	\$20,000
Waste Coordinator	2 (3%)	\$20,920
Lab Technician	1 (2%)	\$22,500
Hazardous Waste Material Certified Technician	2 (3%)	\$17,780

Main Duties Of Environmental Technicians

In general, environmental technicians (or related positions) are responsible for field work, such as sampling, drilling and testing, report writing, equipment maintenance, and serving in a support capacity for engineers and scientists. The employers who responded to the survey listed the main duties and responsibilities of their environmental technicians in the following ways:

Sampling, sample preparation, sample shipping, chain of custody responsibility, quality control. Site sketching, mapping. Know equipment (operation of) for sampling soil, water, air. Maintain low-tech retention systems, trouble shoot equipment, compressors, solenoids.

Collect and analyze soil and ground water samples. Routine operation and maintenance of remedial equipment. Assist scientists and engineers in investigation and remedial tasks.

Asbestos air training. Have pumps for OSHA compliance studies; make surveys; do surveys; (do not design surveys); review plans.

Act as support to geologist of higher trained technicians; monitor, survey, collect samples; report writing.

Must know government regulations, sampling techniques.

Need 40 hours of OSHA training. Operate machinery & equipment. Medical monitoring training. Sampling waste.

Field & environmental sampling; operation of remedial systems; carpentry; knowledge of electrical systems; construction, oversight, installations, startup of remediation systems; environmental sampling of existing wells; air quality testing, testing of underground storage tanks.

Function as a support to field engineers in job specified and job completion areas. Collect samples and physical data, assist in report writing, maintain equipment. Inventory equipment and materials.

Field samples, observations, preparing reports, recording construction activities.

EPA Regulations, compliance audits, writing programs (EPA & OSHA). Dissemination of regulatory issues/training other employees.

Educational Requirements

Employers were asked what the minimum educational qualifications were for entry-level environmental technicians. Almost half wanted, at minimum, an associate degree and 30%

wanted at least a bachelor degree. Another 25% wanted a high school diploma or its equivalent.

Minimum Education	Yes	No
No specific requirement	12%	85%
High School diploma or equivalent	25%	72%
Certificate	2%	93%
Associate Degree	46%	51%
Bachelor Degree	30%	67%
(Percentages do not add to 100% because of missing responses)		

Other requirements that were listed by employers included:

40 Hours of OSHA Training
 Chemical Engineering (4 year)
 Masters Degree

Advancement Opportunities

Potential career paths were discussed with employers. They were asked about advancement opportunities that are available and examples of typical job titles. Over 90% of the respondents discussed potential career paths and advancement opportunities for environmental technicians. The comments were positive about the future job advancement. Overall, it appears that those who are employed as technicians, get practical job experience, and continue their education to complete a four-year degree, are the most likely to advance to upper levels. Several examples of advancement opportunities are:

Once in a company, employees are supported by tuition reimbursement so they can move up the ranks: field team leaders; engineers; project leaders; equipment managers; department heads.

With B.S. degree advancement unlimited to President of company.

Junior project manager, senior project manager, job site foreman, marketing department. Company promotes from within-advancement unlimited.

Technician; professional technician project manager. With additional education to department head, vice president.

If they get a 4-year degree, they can move to an environmental scientist.

Depending on initiative, success in completing projects, ability to manage, ability to do additional quality work, an individual's future is unlimited because the field is growing/expanding quickly.

Technician I through III; field supervisor (with additional 4-year degree) engineer; geologist; designer (path splits to); technical project manager; field engineer; oversee a department; business, office manager, regional marketing.

Highest with associate degree (after 5 years without 4-year degree): Associate engineer. After 8-10 years (without 4-year degree): senior associate engineer.

With additional education, can advance to supervisory or management position.

Skill Requirements

"Environmental Education is as interdisciplinary as the ecological web of life is interconnected. Many job-placement experts agree that in any career situation, especially one in the environmental field, a balance must be played between well-rounded generalism and marketable specialization." (Garbage: The Practical Journal for the Environment)

Skills in communications (written and verbal), interpersonal relations, work ethics, and logical and critical thinking are important to job success in any field. The draft survey had a question asking the importance of each of the above areas. However, it seemed obvious that employers want employees who possess these skills. And in fact, employers included comments regarding the need for these skills. However, in order to prioritize the information needed, the survey focused only on the technical components of core courses. There were 24 skill areas that were listed on the survey and employers were asked to rate them as Very Important = 3, Somewhat Important = 2, Not Important = 1, and Unaware of (no rating).

Skill Area	Very Important	Somewhat Important	Not Important	Unaware of	Mean
OSHA 40/24 Hour Hazardous Material Training	89%	10%		2%	2.90
Federal and State Environmental Laws and Regulations	80%	18%	2%		2.79
Environmental Field Testing	79%	21%			2.78
Health & Safety Training	77%	23%			2.77
Technical Writing	72%	25%	2%	2%	2.71
Laboratory Procedures/Sampling/Testing	64%	33%	2%	2%	2.63
Site Characterization & Remediation	66%	26%	8%		2.57
Soil Testing	67%	28%	5%		2.62
Physical Geology and Geography	62%	33%	5%		2.57
College Math (Algebra/Trig)	62%	28%	8%	2%	2.55
Chemical Right-to-Know	56%	41%	3%		2.52
Fundamentals of Surveying	57%	36%	7%		2.50
Organic Chemistry	49%	39%	12%		2.38
Equipment Maintenance & Repair	44%	49%	7%		2.37
Conservation/Environmental Science	46%	44%	10%		2.36
Construction Quality Control	43%	43%	15%		2.27
Biology	43%	39%	18%		2.24
Emergency Response Planning	36%	49%	15%		2.21
Physics	39%	36%	25%		2.14
Waste Minimization	34%	44%	21%		2.13
NICET Certified Technician	31%	48%	21%	25%	2.10
Environmental Microbiology	26%	30%	20%		2.08
Computer-Aided Design	31%	36%	33%		1.98
Transportation, Storage & Disposal of Hazardous Materials	33%	30%	38%		1.95

As indicated on the preceding table, the OSHA 40/24 Hour Hazardous Material Training is one of the key components of an environmental technology program. This training would certify students as required through state and federal legislation. Employers also felt that a strong knowledge of state and federal environmental laws and regulations was very important to meet their needs. Experience with field testing, sampling, and procedures should be included in the curriculum in order to give students the hands-on experience that will be required on the job. As part of this hands-on training, employers felt a need for technical report writing, a skill which was also cited as part of the main duties of environmental technicians.

In general curriculum areas, employers want technicians to have a background in math (Algebra/Trig), geology and geography, and organic chemistry.

Program areas listed as being not important were "Computer-Aided Design" and "Transportation, Storage & Disposal of Hazardous Materials".

Employers were asked through an open-ended question to name other specific courses, seminars or workshops which they felt should be tailored to meet their needs.

Department of Public Health has requirements NIOSH 582- course on Air. This would be great to offer.

Mechanical Repair is important.

Communication skills and quality control courses could help a great deal.

Writing skills are very important, since everything needs to be documented in this business.

Training in air regulations and air contamination prevention. The area of air regulation is growing faster than needs can be met.

Introduction to treatment technology (used in field) of waste material.

People need knowledge of word processing, ability to generate reports and computer literacy.

Training Programs

The Michigan Community Colleges are active in business and industry training. As part of this mission, the colleges were interested in finding out what kinds of training are being provided for current employees and if the companies would use the community colleges to conduct this type of training. A full 82% of the companies stated that they provide in-

house training and that over 300 of these were provided each year (one company stated that they did 200). In addition, 63% of the respondents indicated that they use external training. Approximately three-quarters of the respondents would send current employees to Schoolcraft or Oakland Community College for training in environmental technology continuing education. Only 10% said that they would not and another 15% were uncertain.

Of those that were uncertain, many indicated that it would depend on the type of training and when it was being offered (evenings). Several companies had tuition reimbursement programs, and students sought out the training and received approval for reimbursement. One employer commented that it is important for the companies to know about the kinds of training that will be offered. Another stated that "there is a great need for this (Continuing Education)".

There was support from employers to support an internship program in Environmental Technology. Almost 70% said they would support a paid internship program. There were also 23 employers who would support an unpaid program. In total, there would be 45 slots available, with most being paid positions. Approximately 15% were uncertain. They stated their uncertainty as "safety requirements in the lab", they "would have to see the individual and the program", and "Absolutely. If they have 20/40/80 OSHA training".

The support of the program from industry is positive. Fifty-one of the respondents, or over 80%, would be willing to help in the design and development of an Environmental Technology program.

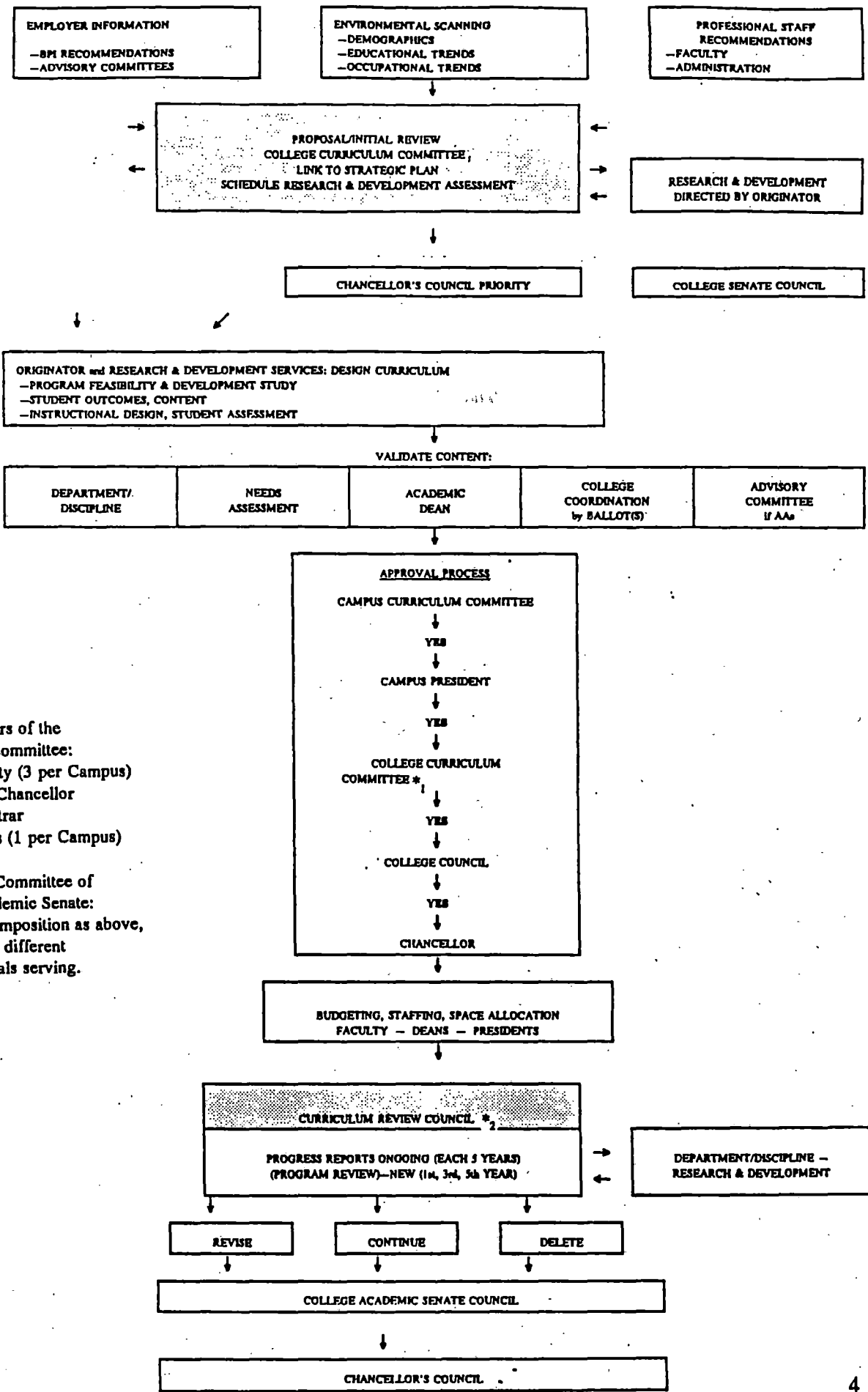
RECOMMENDATIONS

Based upon the research findings, it appears that a program in Environmental Technology would be warranted. The sample of employers that was surveyed indicated that there will be 99 jobs available in the next year and 312 over the next five years. The key to preparing students for these jobs would be to design a program that meets employer needs, provides certification training, incorporates federal and state regulations and laws, builds a solid science and math background, and includes hands-on experiences in soil testing, lab work, and documentation.

The program holds promise for graduates in that the literature indicates that more dollars will be available from the federal and state levels to assist in environmental clean-up and monitoring.

The pay range for technicians is comparable to other occupations that require associate degree training. The preferred educational requirement is for a person trained at the associate degree level. The technical skills required for the job appears to fit the two-year programs provided by community colleges. It seems, however, that it would be in the best interest of the students to design programs to articulate with four-year colleges, since many employers feel that four-year degrees provide the best opportunities for advancement.

PROGRAM/MAJOR COURSE DEVELOPMENT PROCESS



*₁ Voting Members of the Curriculum Committee:
 12 Faculty (3 per Campus)
 1 Vice Chancellor
 1 Registrar
 4 Deans (1 per Campus)

*₂ Standing Sub-Committee of College Academic Senate:
 Same composition as above,
 but with different individuals serving.

Phase 1: Information Gathering

Curriculum proposals usually originate with faculty and academic departments. Valuable sources of information useful in planning curriculum proposals include the College Environmental Scanning Report (process), the Student and Financial Data Book, occupational program advisory committees, Business and Professional Institute as well as professional organizations. A "Tech-Scan," part of the DACUM process, can also be a valuable source of information. The campus Academic Dean and Campus Curriculum Committee provide overall guidance to the originator.

Phase 2: Initial Assessment

The College Curriculum Committee conducts an initial review of new programs, new program options, new courses and major revisions to programs to determine:

- a. Consistency with the College Strategic Directions and Operational Plan.
- b. Necessity for a formal needs assessment.
- c. Necessity for Chancellor's Council to assign a priority based on anticipated cost, and demand on college resources.
- d. Identification of college groups and individuals to be balloted.

Obtaining initial support from the Chancellor's Council at this early stage will assist the originator in the further development of the full proposal. In the event that the Chancellor's Council does not support the curriculum proposal, appeal may be made by the originator to the College Academic Senate Council, which may recommend, at its discretion, reconsideration to either the College Curriculum Committee or the Chancellor's Council.

Phase 3: Proposal Origination

Following the College Curriculum Committee's review of the initial assessment, the originator begins full development of the proposal. Consultation and support is available through research and development services provided by the College. This network of services includes assistance with instructional design, library resources, instructional media development, further content research, core competencies, student outcomes assessment methodologies, and subject matter expertise. Provision for these services will be made through the Academic Dean.

Phase 4: Validation

Where appropriate, originators validate the content of proposals by such activities as:

- a. Obtaining department and discipline support.
- b. Incorporating findings of needs assessments.
- c. Conducting College-wide balloting.
- d. Soliciting Advisory Committee input.
- e. Obtaining support of the Academic Dean.

Phase 5: Approval

The formal approval process begins with the Campus Curriculum Committee and is completed with the Chancellor's approval, as indicated by the flow chart (page 4). The approval process is terminated when a campus or college committee denies the proposal and the appeal made at the next step is also denied. Proposals can proceed to the next step with one rejection.

Phase 6: Implementation

Once approved, the program or course is implemented through the normal campus planning and budgeting process. (Note: Obtaining Chancellor's Council support in Phase 2, helps assure college implementation.)

MEETING AGENDA

Oakland Community College

Meeting Description ad hoc "New Programs" Committee - 1st Meeting

Results Desired Review Proposed Programs Indicated in the Millage Campaign

Date December 8, 1995

Time 12 Noon

Location Board Room, D.O.

Scheduled Time			Actual Time		
Start	Stop	Total Hours	Start	Stop	Total Hours
12:00 Noon	1:30 p.m.	1 1/2			
Persons Attending					
1	Maureen Carney	11	Marty Orłowski		
2	Ann Craigmile	12	Marv Parent		
3	Chris Galli	13	Jim Warner		
4	Dan Jaksen				
5	Helen Kieba-Tolksdorf				
6	Cheryl Kozell				
7	Martha Kuzak				
8	Julie Marshall				
9	Deborah Niemer				
10	Dick Osgood				
Items To Be Discussed					
1	Review of "Charge"				✓
2	Review of Curriculum Committee Process				
3	Review Proposed New Programs List				
4	Prioritize each Program for Submission to the Curriculum Process				
5					
6					
7					
8					
9					
10					
Materials Needed				Person Responsible	
	Packet of Information:		Ann		
1	"Charge" to the Committee				
2	Original 7-year list of proposed new programs				
3	Executive summaries and other pertinent data from programs				
4	Excerpts from The User Handbook for Curriculum Development				
5	Meeting Agenda				

ENVIRONMENTAL STUDIES/

ENERGY MANAGEMENT

PROGRAM ASSESSMENT:

Employment Opportunities and Outlooks

Prepared by

**The Office of Institutional Planning & Analysis
Oakland Community College**

February 1992

Overview of the Assessment

This preliminary report presents results of explorations in three areas, namely:

1. Careers and career outlooks for proposed OCC program options in Environmental Studies/Energy Management,
2. Michigan degree programs in Environmental Studies/Energy Management, and
3. Interviews of potential employers of OCC graduates.

Many careers involve expertise in dealing with the environment. Some environmental careers require completion of a two-year associates degree program, while other environmental careers require completion of a four-year degree program and beyond.

The major category for environmental careers that require a two-year associates degree is that of Environmental Technician. Environmental Technicians typically attend to hands-on activities designed to bring about environmental health, environmental safety, and pollution control. They facilitate cost effective and environmentally effective uses of energy resources. Such technicians generally work in lab settings, field settings, and/or business and institutional settings.

The overall category or title for environmental careers that require a four-year degree (and beyond) is that of an Environmental Professional. Environmental professionals protect our health and physical surroundings. They may be generalists or specialists.

Forecasters predict that career opportunities in environmental industries will increase. For example, Naisbitt (1991) predicts that the 1990's "will open up an extraordinary variety of career opportunities, both technical and nontechnical...Recycling laws will bring a flood of jobs."

Nevertheless, career opportunities among and within program options vary. The opportunities are significantly more evident for the environmental professional than for the environmental technician.

The viability and effectiveness of the existing Michigan degree programs in Environmental Studies/Energy Management are questionable. Only a very small percentage of students enrolling in these programs graduate.

Results of employer interviews reveal yet additional job titles and employment outlooks that vary from excellent to very poor. Nearly two-thirds of the companies, however, are currently looking for new employees.

CAREERS AND CAREER OUTLOOK FOR PROGRAM OPTIONS

Six options for the proposed Environmental Studies/Energy Management program follow:

1. Energy and Resource Management (climate control)
2. Pre-environmental Science
3. Environmental Site Analysis (environmental laboratory, land management)
4. Waste Management (incineration, recycling, composting, household hazardous wastes)
5. Environmental Health (occupational safety and health)
6. Pollution Control (water and air pollution)

Each option for the proposed Environmental Studies/Energy Management Program opens career specialties to students who earn a two-year degree, or a four-year degree in their field of interest.

All of the suggested field options except the Pre-Environmental Science option, relate to career opportunities that are available to students with two year degrees. For the five options that require a two-year degree most jobs are for technicians: "These jobs are heavily oriented toward fieldwork or lab work and hands-on skills" (The CEIP Fund, 1989, p. 40).

For the Pre-Environmental Science option, a wide variety of positions as environmental generalists or specialists are available to students providing they attain a baccalaureate (or higher) degree.

A major challenge for encapsulating career outlooks for the entire environmental technician/energy management work force is that diverse types of institutions hire this work force under a wide variety of job titles. The types of institutions that employ environmentalists include, for example, energy auditing firms, management companies, energy products companies, architectural firms, health agencies, pollution control agencies, water treatment plants, and consulting firms. The complete list is coextensive with the extent that environmental and energy management problems that affect people, and subsequently, business and industry. The employment demands of each institution may vary greatly.

Neither the current Michigan Occupational Information System (MOIS) data files, nor the Michigan Employment Security Commission (MESC) Occupation/Industry Forecasts for 1995 attempts to project a general outlook for environmental technicians. This is because multiple job titles that claim fewer than 50 employees per year divide the field. In general, information from sources other than MOIS/MESC on environmental career outlooks for technicians is often tentative or vague.

The following descriptions sketch out the varied career specialties, diverse employers, and employment outlooks currently available for each of the six program options.

Option #1: Energy and Resource Management

Exploration of career outlooks for the eight career specialties identified with the Energy and Resource Management Program yielded limited opportunities. The most promising of these specialties for employment in the next five years is that of energy technician (MESC/MOIS, 1991), although a two-month examination of Sunday advertisements in The Detroit News and Free Press (1991) revealed no demand for an energy technician nor for any of the other Energy and Resource Management specialty careers.

1. Alternative Fuels Technician

Description. Alternative Fuels Technicians work with engineers to develop and test cleaner gasolines, methanol, and methane for automobiles and special fleet programs.

2. Energy Auditor

Description. Energy Auditors conduct audits of facilities to assess energy use and their potential for energy savings. They determine the energy saving products that are cost-effective for a given facility.

Employers. Energy auditing firms, utility company subcontractors, energy product manufacturers, and retailers and their representatives employ Energy Auditors.

3. Energy Managers

Description. Energy Managers have the same duties as Energy Auditors. Energy Managers also manage maintenance crews on energy saving product installation and maintenance, develop and manage preventive maintenance programs, and report to upper management on energy costs, savings, and new projects.

Employers. Medium-to-large corporations, management companies, cities, and universities are most likely to hire Energy Managers.

4. Energy Technician/Climate Control Mechanic

Description. Installing, maintaining and troubleshooting energy conservation equipment are major duties of Energy Technicians/Climate Control Mechanics.

Employers. Heat and cooling companies with energy divisions, energy products companies (e.g., energy management systems, energy efficient lighting companies), and energy contractors hire Energy Technicians/Climate Control Mechanics.

Outlook. The Michigan outlook appears to be better than the national outlook. *Nationally:* MOIS predicts average growth in employment of Energy Technicians. *Michigan:* MOIS predicts a shortage of Energy Technicians in Michigan and faster than average growth in job opportunities through 1995. Qualified Energy Technicians may select from an average of 260 job opportunities in Michigan annually (100 due to growth). Detroit area employers will offer 150 of those opportunities. (MOIScript #156, 1991)

5. Installer

Description. Installers are a subgroup of Energy Technician/Climate Control Mechanics.

6. Manufacturer's Representative/Salesperson

Description. Salespersons and Manufacturers' Representatives sell energy conservation and pollution control equipment.

Employers. All pollution control and energy conservation product manufacturers, distributors or retailers, and energy contractors are the most likely hiring agents for knowledgeable Manufacturers' Representatives and Salespersons.

Outlook. The demand for salespersons is highly dependent upon the state of the economy. *Nationally:* Growth in demand for salespersons will be slower than for most occupations through 2000. Additional growth will occur with increasing demand for technical products but with economic downturns, manufacturers will demand fewer representatives because they will switch to retailers to sell their products. *In Michigan:* Depending on the state of the economy, the number of job opportunities will vary each year. (MOIScript #105, 1991)

7. Sales Technician

Description. Sales Technicians help design energy conserving products for specific energy applications.

Employers. Institutions with a maintenance crew, energy contractors, or heating/cooling contractors are the major employers for Sales Technicians.

Outlook. Future projections for Sales Technician positions are not currently available. However, The Detroit News and Free Press is currently advertising for Sales Technicians.

8. Service Technician

Description. Service Technicians service energy conserving products.

Employers. Potential employers for Service Technicians are the same as for Sales Technicians.

In sum, current and future employment opportunities for students who specialize in Energy and Resource Management appear limited. If other jobs are available, employers may be advertising, if at all, elsewhere than in The Detroit News and Free Press. MOIS/MESC offers information only for two of the career specialties of Energy and Resource Management. The other career specialties are either only mentioned or omitted altogether because of the small number of Michigan employees in the specialized fields. The most promising career forecast is that of Energy Technician/Climate Control Mechanic (see Table 1), although a recent lack of demand evident in classified advertisements for these technicians does not support the assertion of current shortages in the field.

Table 1: Employment Outlook for Careers Related to the Energy and Resource Management Option

OPTION 1: ENERGY AND RESOURCE MANAGEMENT	
Career	Outlook
Alternative Fuels Technician	NA
Energy Auditor	NA
Energy Manager	NA
Energy Technician/Climate Control Manager	Nat: ave. growth MI: "shortage", 260 *
Installer (subgroup of Energy Technician)	
Manufacturer's Representative/Salesperson	Nat: ave. growth MI: varies, growth dependent upon economy
Sales Technician	NA
Service Technician	NA
*jobs annually	

Option #2: Pre-Environmental Science

Students choosing the Pre-Environmental Science option position themselves for academic study beyond a two-year degree. They prepare for careers as environmental professionals. The field for environmental professionals is very diverse, and continues to change and evolve dramatically. As Environmental Protection Agency (EPA) representatives suggest "opportunities for meaningful and rewarding careers will be as diverse as the environment itself" (The CEIP Fund, 1989; 92).

1. Environmental Professional

Description. Environmental Professionals protect human health and the environment. Environmental Professionals are either general practitioners or specialized practitioners. General practitioners are either environmental scientists or environmental specialists, on the other hand, specialized

practitioners are geologists, chemists, engineers, toxicologists, epidemiologist, biostatisticians, industrial hygienists, hydrologists, or environmental lawyers, for example.

Employers. Potential employers of environmental professionals include architectural firms, the Federal government (e.g., U.S. Environmental Protection Agency), state and local governments, corporations, health agencies, management companies, research firms, and universities.

Outlook. Nationally: Environmental groups project growth of the environmental field into the next century. Representatives of the Center for Environmental Intern Programs, for instance, state that "there will be a continuing need for skilled professionals in all aspects of environmental protection and preservation"...., and "the environmental profession is in great demand"...., and further, that "by the year 2000 the environmental profession will be comprised of a larger percentage than ever before of individuals whose entire academic work experience and academic training has been 'environmental'." (The CEIP Fund, 1986; 1990, pp. 92,98,99; The CEIP Fund, 1986)

The number of classified advertisements for two-year degree candidates versus four-year degree candidates indicate that employment opportunities are more plentiful for someone with a four-year degree than for someone with a two-year degree. The listed opportunities for environmental professionals are eight times as great as opportunities for Environmental Technicians. That is, over a period of two months the Sunday "Classified Marketplace" of The Detroit News and Free Press advertised more than forty positions for persons at an Environmental/Energy professional level as compared to five employment opportunities for persons at a technician level.

In sum, employment opportunities for Environmental Professionals are great currently and the demand will increase into the next century (See Table 2). Qualified environmental generalists and specialists will find abundant career opportunities.

Table 2: Employment Outlook for Careers Related to the Pre-Environmental Science Option

OPTION 2: PRE-ENVIRONMENTAL SCIENCE	
<u>Career</u>	<u>Outlook</u>
Environmental Professionals	great demand, increasing demand through 2000

Option #3: Environmental Site Analysis

Employment opportunities are possible in two technical specialty careers of site analysis, namely, those of Chemical Laboratory Technician, and Engineering Technician.

1. Chemical Laboratory Technician

Description. Chemical Laboratory Technicians maintain equipment, weigh and mix chemicals, perform routine chemical and physical tests, and calculate amount of pollutants present in air. They may also analyze samples from soil, water, seawater, and industrial waste or sewage.

Employers. Private industry, environmental engineering firms, research companies, health agencies, treatment plants, and government agencies hire Chemical Laboratory Technicians.

Outlook. Nationally: Opportunities for Chemical Technicians (of which Chemical Laboratory Technicians are a specialty) will grow faster than average for all occupations through 2000. Private industry offers some job opportunities for Chemical Laboratory Technicians, while government agencies have even fewer job opportunities (Shapiro, 161). **Michigan:** Opportunities for Chemical Technicians will be only as fast as the average for all occupations through 1995. Most opportunities will be due to replacement needs. (MOISCRIP T #140, 1991)

2. Engineering Technician

Description. Engineering Technicians assist professional engineers. In particular, Engineering Technicians prepare and review plans and specifications for construction of water distribution systems, swimming pools, purification plants and waste water treatment facilities. They work on projects dealing with noise, air, or water pollution control.

In addition, Engineering Technicians may review construction details, inspect sites; estimate quantities of materials needed for a project, cost of repairs, and maintenance; conduct stream surveys and collect water samples; or inspect public water supplies and investigate environmental crises.

Employers. Many different employers hire Engineering Technicians. Employers include government pollution control agencies, consulting firms, architectural firms, municipal treatment plants, and private industry.

Outlook. Nationally: Jobs should be available for Engineering Technicians. Some of these jobs are temporary; they are created for meeting production deadlines. (Shapiro, pp. 161-162)

In sum, employment projections for jobs of Chemical Laboratory Technician and Engineering Technician are qualified and tentative (See Table 3). A survey of potential employers may be a more exact and effective way to determine current career opportunities in the field of Environmental Site Analysis.

Table 3: Employment Outlook for Careers Related to the Environmental Site Analysis Option.

OPTION 3: ENVIRONMENTAL SITE ANALYSIS	
<u>Career</u>	<u>Outlook</u>
Chemical Laboratory Technician	Nat: above ave. growth through 2000 possible MI: ave. growth through 1995
Engineering Technician	Nat: jobs should be available, some temporary

Option #4: Waste Management

Although the news media currently gives much publicity to waste management issues (e.g., use of incinerators, scarce landfill sites, need for recycling) and environmentalists predict growing need for environmental professionals in the waste management field (CEIP Fund, 1990, p. 86), neither MOIS nor other sources (e.g., Classified Marketplace) show evidence of a demand for graduates of two-year programs.

1. Recycling Coordinator

Description. Recycling Coordinators are in charge of recycling programs for a private company or a governmental unit (e.g., municipality or county). They coordinate curbside and community recycling programs or commercial recycling projects.

Employers. Recycling companies and governmental units (cities or counties) may hire a recycling coordinator.

2. Waste Management Planning Coordinator

Description. Waste management coordinators may do long range planning, assist with grant proposals, provide organizations with technical assistance, and facilitate the siting of recycling and waste facilities.

3. Waste Management Technician

Description. Waste Management Technicians operate sampling, monitoring and other data-gathering equipment that determine the effects of waste disposal on the environment and environmental health.

Outlook. *Nationally:* A national environmental health committee predicts a surplus of technicians through 1992 (Levine Associates, 1988)

4. Wastewater Treatment Plant Operator/Water Treatment Plant Operator Specialist)

Description. Wastewater Treatment Plant Operators operate and maintain wastewater treatment plants. Operators control the flow and processing of wastewater, and purify water from the plant before it enters rivers, streams or city mains.

Employers. City and state treatment plants, state environmental health agencies, private industry, Federal government, and the state of Michigan are likely employers of Water Treatment Plant Operators.

Outlook. *Michigan:* Private industry offers some career opportunities for Plant Operator Specialists (MOISCRIP #217). The Federal government offers a few opportunities as well. (Michigan Department of Civil Service)

5. Water Quality Technician

Description. Water Quality Technicians perform a variety of water quality monitoring and control activities to protect water resources for environmental and recreational purposes. Specifically, these technicians sample and perform chemical tests of lakes, streams, and wastewater treatment systems and their surrounding environments.

Employers. State government is the major employer of Water Quality Technicians.

Outlook. *Nationally:* Employers will demand an increasing number of opportunities for Water Quality Technicians through 1992. (Michigan Department of Civil Service; Levine Associates, p. 65)

6. Water Treatment Laboratory Technician/Wastewater Treatment Laboratory Technician

Description. Water Treatment Laboratory Technicians monitor water characteristics. They perform routine chemical, biochemical and physical analyses of samples taken from streams, raw and treated water, sludge and other byproducts of sewage treatment processes.

Employers. Community water treatment plants are the sole employers of Water Treatment Laboratory Technicians.

Outlook. *Nationally:* Anticipated growth of new treatment plants and expansion of existing facilities will cause a continuing demand for Water Treatment Laboratory Technicians. (Shapiro, pp. 150-151)

7. Water Treatment Plant Operator

Description. Water Treatment Plant Operators control equipment that removes impurities from raw water and produces clear drinkable water. They also monitor controls that regulate passage of water through filter beds and other processes. In addition, Water Treatment Plant Operators may keep records of tests and water samples, as well as handle complaints.

Employers. Community wastewater treatment plants are the major employers of Water Treatment Plant Operators.

Outlook. *Nationally:* Most occupational growth for Water Treatment Plant Operators will occur by the early 1990s, but then the growth rate will diminish due to an expected slowdown in the construction of new plants. *Michigan:* The growth will be as fast as the average for all occupations through 1995. Employers will offer an average of 60 openings annually (20 because of growth; 40 because of needed replacements). (Shapiro, pp. 148-149; MOIScript #217; Levine Associates, p. 65)

In sum, forecasters predict growth at the national level in waste management opportunities and for the environmental field in general. This growth may or may not apply to job opportunities at the technician level. Michigan offers few opportunities now and will offer only few in the near future. Although Water Quality Technicians are in demand nationally, the most promising career in waste management in Michigan is that of Waste Treatment Plant Operator (See Table 4).

Table 4: Employment Outlook for Careers Related to the Waste Management Option.

OPTION 4: WASTE MANAGEMENT	
<u>Career</u>	<u>Outlook</u>
Recycling Coordinator	NA
Waste Management Planning Coordinator	Nat: Surplus through 1992
Wastewater Treatment Plant Operator	Nat: NA MI: not many jobs available
Water Quality Technician	Nat: increased demand through 1992
Water Treatment Laboratory/ Wastewater Treatment Laboratory Technician	Nat: continued demand
Water Treatment Plant Operator	Nat: growth in early 90s, then a slowdown MI: average growth through 1995

Option #5: Environmental Health

Although concerns for environmental health are increasing locally as well as nationally, legislation and regulation have not yet resulted in increased demands for environmental health specialists in Southeastern Michigan.

1. Asbestos and Lead Removal Technicians

Description. Asbestos and Lead Removal Technicians work with contractors to alleviate lead or asbestos in buildings.

Employers. Contractors specializing in lead and asbestos problems hire Asbestos and Lead Removal Technicians.

Outlook. Michigan: Asbestos and Lead Removal Technician careers will last twenty to thirty years only. Few job opportunities are available. (Oakland County Department of Health)

2. Environmental Health Technician

Description. Environmental Health Technicians operate sampling, monitoring and data gathering equipment for health control and prevention.

Employers. Federal, state, and county government are the most likely employers of Environmental Health Technicians.

Outlook. Nationally: The nation will host a surplus of health technicians through 1992. Southeastern Michigan: Most government programs will hire no new people. The need for Environmental Health Technicians fluctuates greatly, but currently no shortages exist. Oakland County typically hires only one or two Health Technicians per year at most. (Levine Associates, pp. 68-70; Oakland County Department of Health)

3. Radiation (Radon) Laboratory Technician

Description. Radiation Laboratory Technicians analyze samples of air for radon levels

Employers. Radiological health laboratories hire Radiation Laboratory Technicians.

Outlook. Nationally: Job opportunities for Radiation Technicians will be best in the public sector. (Levine Associates)

4. Radon Technician

Description. Radon Technicians work with contractors to alleviate radon problems in buildings.

Employers. Contractors specializing in radon problems hire Radon Technicians

Outlook. Nationally: The supply of Radon Technicians is inadequate to meet present needs. Michigan: Job opportunities are few. Radon Technicians will not have long term careers. (Oakland County Department of Health; Levine Associates, pp. 69-70)

In sum, the environmental health field experiences passing demands for technicians due to the rise and fall of emerging environmental health problems and their solutions. For example, today's jobs due to hazardous presences of asbestos and radon may change to attention to other health threats in days ahead. Job opportunities due to rising and falling environmental health concerns are short-lived and point to a need for technicians with job flexibility and a broad background of knowledge and skills. Employment opportunities in Michigan in the field of environmental health are limited. Some jobs are temporary or transitional. (See Table 5)

Table 5: Employment Outlook for Careers Related to the Environmental Health Option.

OPTION 5: ENVIRONMENTAL HEALTH	
<u>Career</u>	<u>Outlook</u>
Asbestos and Lead Removal Technician	MI: few jobs (20-30 year career only)
Environmental Health Technician	Nat: surplus of technicians through 1992 SE MI: no shortage of technicians
Radiation Lab Technician	Nat: best opportunities in public sector
Radon Technician	Nat: shortage of technicians MI: few jobs (short term career)

Option #6: Pollution Control

A recent front page of The Detroit News and Free Press (Saturday, August 10, 1991) featured three "Burning Issues", namely;

1. If Michigan rejects future incinerators, alternative plans will include more waste reduction and recycling.
2. Landfills are filling up, and people don't want new ones built in their communities. Recycling is only a partial answer.
3. Society must generate less trash. This means "unpackaging" or selling more products in bulk.

Frequent articles such as this one increase awareness of the need for pollution control, however, this awareness has translated into more opportunities for Environmental Professionals rather than Environmental Technicians.

1. Air Pollution Control Technician/Air Technician

Description. Air Pollution Control Technicians keep watch on pollution sources. In particular, they inspect smoke control equipment in factories, or tests engine exhausts from motor vehicles. They may operate a van with built-in electronic instruments to gather information on air pollution in traffic. Air Technicians also collect samples of outdoor air or pollutants, such as fumes or dust in the air, do routine tests on samples, record the amount of pollutants, and check and calibrate instruments. In addition, Air Technicians investigate air pollution complaints.

Employers. Many different types of institutions employ Air Technicians. Employers include city, county, state and Federal governments; departments of health, environment, transportation or traffic; and private engineering consultant firms.

Outlook. Nationally: A slight increase in demand for Air Technicians is due to new areas of concern; air toxins are creating significant work force needs. (Shapiro, pp. 156-157; Levine Associates, pp. 45,64)

2. Field Technician/Environmental Sampling Technician

Description. Field Technicians collect air, water, industrial waste and/or sewage samples.

Employers. The employers for Field Technicians are the same as for Chemical Laboratory Technicians.

Outlook: Michigan: Employers are currently advertising for Field Technicians. (Classified Marketplace, The Detroit News and Free Press)

3. Pollution Control Technician

Description. Same as Chemical Laboratory Technician

4. Water Pollution Control Technician

Description. Water Pollution Control Technicians assist professionals in data collection and verification for water pollution control projects, collect water samples, and sometimes conduct physical and chemical field tests to identify the composition of samples.

Employer. Private industry and consulting firms are the primary employers of Water Pollution Control Technicians.

Outlook. **Nationally:** Employers will increase their demand for Water Pollution Control Technicians through 1992. (Shapiro, pp. 151-152; Levine Associates, p. 47)

In sum, sources in the field of pollution control predict at least some demand for Pollution Control Technicians nationally and in Michigan. (See Table 6)

Table 6: Employment Outlook for Careers Related to the Pollution Control Option.

<u>OPTION 6: POLLUTION CONTROL</u>	
<u>Career</u>	<u>Outlook</u>
Air Pollution Control/Air Technician	Nat: some demand; continuing need
Field/Environmental Sampling Technician	MI: some demand
Water Pollution Control Technician	Nat: increased demand through 1992

In sum, the most promising option is Option 2, Pre-environmental Science. The limited and inconclusive nature of information for some careers may indicate either that for some options the jobs just aren't there, or for others that hidden pockets of opportunities haven't yet been discovered. (See the final summary for an abstract of the more promising careers for each option).

ENVIRONMENTAL STUDIES/ENERGY MANAGEMENT PROGRAMS IN MICHIGAN

Twenty-one colleges, institutes and universities in Michigan offer Environmental Studies/Energy Management programs. Although data from these institutions is incomplete, available data shows that very few students graduate from these programs in relation to the number of students enrolled in them.

Colleges and Universities that Offer Two-Year and Four-Year Programs

Twelve institutions offer two-year programs, and nine institutions offer four-year programs in Environmental Studies/Environmental Management:

Two year programs

- Bay De Noc
- Careerworks, Inc.
- Grand Rapids Community College
- Lake Superior State University
- Lansing Community College
- Macomb Community College
- Mid Michigan Community College
- Mott Community College
- Northern Michigan University
- Oakland Community College
- RETS Institute of Technology
- Schoolcraft College

Four year programs

- Eastern Michigan University
- Ferris State University
- Jordan College
- Jordan Energy Institute
- Michigan Technological University
- Oakland University
- University of Michigan, Ann Arbor
- Wayne State University
- Western Michigan University

HOME HEALTH AIDE

Needs Assessment

Prepared by:

Office of Institutional Planning & Analysis

Caitlin L. Hawkins
Kay E. Palmer
Terrie L.C. Paulson

September, 1995

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EXECUTIVE SUMMARY

- ◆ The purpose of this report is to review current needs in the home health field and to examine the viability of a home health aide training program at OCC. Home health aides provide personal and homemaking services to the ill and elderly, typically in private home settings.
- ◆ The demand for home health aides is growing substantially. Over the course of the next five to ten years, it is expected to be one of the fastest growing occupations in the United States.
- ◆ Locally, over two-thirds of home health employers predict significant increases in demand for home health aides within their organizations. Currently, almost half of employers report frequent difficulty in finding qualified employees.
- ◆ Nationally as well as locally, the home health field suffers from low wages, poor working conditions, no advancement opportunities, and, as a result, high turnover. Typically, hourly wages range from \$6.00 to \$8.00.
- ◆ In general, there are few if any prerequisites for employment as a home health aide. More than half of local employers require no training beyond a high school diploma. To many employers, previous experience in the field is regarded more favorably than formal education.
- ◆ Most employers base their training on the federal guidelines for home health aides. Employees are sometimes required to take a competency test based on these guidelines, particularly when employed at agencies receiving state or federal assistance in the form of Medicare or Medicaid. In Michigan, there is a state competency test employers may require, but there is not state certification.
- ◆ Two-thirds of employees felt that the proposed home health aide program would be worthwhile.
- ◆ Over half of students from OCC's nursing program wait list indicated a personal interest in the proposed training.
- ◆ While there is significant evidence of demand for home health aides, the college will need to carefully consider whether it is appropriate to offer students a program which is not likely to provide them with higher wages, increased job security, or career advancement potential. Offering the program to students on the nursing wait list, while resolving some of these issues, would raise others including the question of credit and relationship to the nursing program.

OAKLAND COMMUNITY COLLEGE

Home Health Aide

Needs Assessment

INTRODUCTION

The purpose of this report is to review current industry needs and educational responses related to the field of home health care. Currently, most employment opportunities in this field are for home health care aide positions, although there are also opportunities for RNs, LPNs, and Physical Therapists. This report was initiated at the request of Chancellor's Council. The report, which focuses on the prospects for home health care aides, includes a comprehensive literature review, data supplied by the U.S. Department of Labor and Michigan Occupational Information System (MOIS), information compiled from telephone interviews with industry experts, and an examination of related programs in other higher education institutions. Phone surveys of employers in the home health care industry were conducted.

Description of Occupation

In 1992, according to Occupational Outlook there were approximately 475,000 home health aides employed nationwide. The majority of these are employed by home health agencies, visiting nurse associations, hospitals, public health and welfare departments, volunteer agencies, and temporary employment agencies. Typically, home health aides are responsible for several patients at a time and travel from home to home over the course of the day. Given the nature of the employment, the work of the home health aide may be performed in the evening or weekend hours. While a licensed practical nurse (LPN) supervises the case and provides detailed instructions about the care of the patient, the home health aide performs most daily duties on her own.

The Home Health Aide provides personal and homemaking services to ill, convalescing, elderly, and disabled persons, and if needed, to their families (see Appendix A for CIP definition). Duties of the Home Health Aide are usually performed in the patient's home. According to the Michigan Occupational Information System, general duties of the Home Health Aide may include:

- ◆ measuring patients' pulse, body temperature, and respiration rates
- ◆ changing surgical dressings for patients under the supervision of a registered nurse

- ◆ giving medication to patients under the supervision of a registered nurse
- ◆ helping patients to exercise
- ◆ assisting patients to bathe or giving bed baths
- ◆ helping patients into and out of beds, automobiles, and wheelchairs
- ◆ transporting patients to doctor's offices
- ◆ entertaining patients by reading aloud or playing cards or other games
- ◆ massaging patients and applying preparations, such as alcohol rubs
- ◆ changing patients' bed linen
- ◆ washing and ironing patients' laundry
- ◆ purchasing food for patients and family members
- ◆ preparing and serving "balanced" meals or meals for special diets
- ◆ cleaning patients' living quarters
- ◆ maintaining records on services performed and the patients' condition
- ◆ providing information on preparing healthful meals on limited income, household management
- ◆ assisting patients to adapt to limitations caused by disability
- ◆ discussing cases with supervisors
- ◆ acting as a companion or friend to patients
- ◆ teaching patients and family members approved medical techniques, such as mobility training in the use of walkers, crutches, and other devices.

METHODOLOGY

Methods of Data Collection

In order to obtain background information about the home health care field, a literature search was conducted and professional, industry, public and regulatory bodies were contacted. A complete list is provided in the *Bibliography* and *Supplemental References*.

A survey of home health care providers in southeast Michigan was also conducted to determine local employment opportunities, skill requirements, and trends in the field. Employer names were obtained through Dun's (1995) *Regional Business Directory* as well as the *1993-1994 Michigan Business Directory*. All employers contacted were listed under one or more of the following SIC codes:

Residential Care	8361
Home Health Care Services	8082
Nursing and Personal Services	8059
Skilled Nursing Care Facility	8051
Medical and Surgical Hospitals	8062
Social Services	8399

A total of 87 employers were contacted for the survey (see Appendix C). The largest group of employers (44) proved to be Home Health Agencies, followed by Nursing Homes (25), and Residential Care Facilities (17). Other employer groups represented included Hospitals, Nurses Associations, Hospices, and other Social Service Agencies (see Appendix B). It should be noted that some organizations classified themselves in more than one of these groups. Of the total 87 employers, fifty-five indicated that they employed home health care aides and majority of survey questions were directed to this latter group.

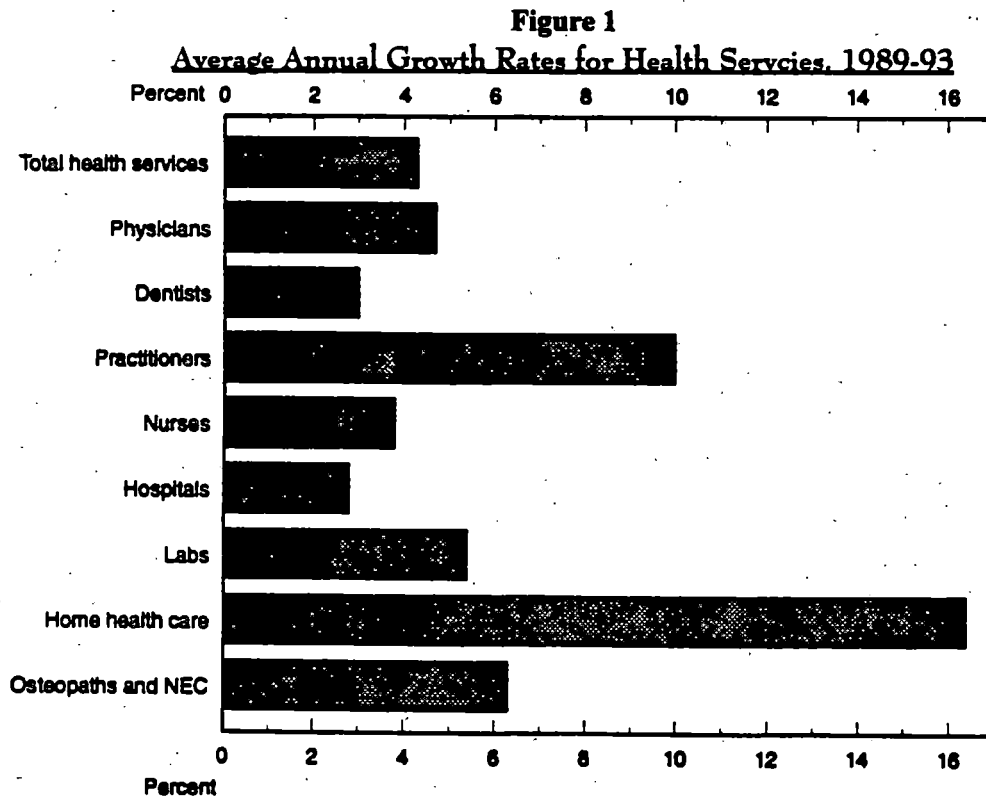
In addition, a survey was conducted of 111 prospective students on the waiting list to enter the OCC Nursing program in Fall, 1996 to determine the level of interest among this group in participation in home health care training (see Appendix D).

ANALYSIS

Home Health Care Industry Outlook

Employment Outlook

According to the Bureau of Labor Statistics' *Occupational Outlook Handbook* and the *Career Information Center*, employment in home health care is expected to grow at an above-average rate for the next five to ten years. In 1990, the U.S. Department of Labor's *Outlook 2000* predicted growth rates in the number of home health workers ranging from 54% to 68%. Within the field, employment prospects are brightest for home health aides, as evidenced in Figure 1, shown below:



N.E.C.: Not elsewhere classified

While much of this growth is anticipated due to the aging Baby Boom population, economists in the Office of Employment and Unemployment Statistics have identified several other factors which will undoubtedly contribute to this growth in employment opportunities. First, changes in health care and insurance systems have resulted in increasingly expensive hospital care. From the perspective of both the hospital and the insurers, a shorter hospital stay combined with longer at-home care is often an attractive option. Second, technology has made possible a variety of at-home treatments which were once available only on an inpatient basis. Within the medical profession, there is a growing belief that treatment in surroundings familiar to the patient can hasten recovery. Thirdly, the growth in demand for home health aides has been influenced by the reduction in informal, unpaid caregiving, reflecting the greater participation in the labor market of women who were the traditional unpaid caregivers. Finally, the nature of home health aide employment--long hours, emotionally and physically tiring work, low pay, and few opportunities for advancement--have resulted in high turnover rates in a field where demand is constant or expanding.

Expert observers have pointed out that the market for home health care providers does not follow the rules of a typical supply and demand model because of the role of state, local and federal government in the field. Direct influence is exerted by government through Medicare, Medicaid and their policies, while other government policies such as minimum wage, welfare and immigration have more influence over this field than is typical of the whole low-wage labor market. Thus, changes in the home health care market tend to reflect both market and political pressures.

The Michigan Occupational Information System (MOIS) indicates that the employment outlook will grow much faster than the average for all occupations through the year 2005. In Michigan, approximately 1,540 home health aide positions are expected to open annually, with 1,300 due to growth and 150 due to replacement of current workers.

MOIS indicates that increased awareness on the part of the public and the medical profession of the availability of home care services is one of the main reasons for the expected increase in demand for this occupation. Care in the home can cost less than care in an institution, and the aging population will account for a large majority of those needing home health aides. In addition, MOIS foresees a high turnover rate among current Home Health Aides, thus creating many openings for those wishing to enter this field. MOIS is also concerned with the change in projected growth patterns if federal and state funding is changed. MOIS predicts that the growing demand for Health Care Aides may also be due to the availability of Medicare and Medicaid program payments and the growing inclusion of home health care in health insurance policies.

In order to further investigate the opportunities for Home Health Aide employment, an examination of health care insurance providers' requirements was conducted. Health Alliance Plan (HAP) provides one hundred percent coverage for Home Health Care as determined by the attending physician. Each case is individually assessed for care requirements, and those providing the care must meet skill standards determined by HAP. For the most part, Registered

Nurses (RN) are sent to the homes, but occasionally Home Health Aides, provided by a Home Health Care Provider, are used in the same capacity, under the direct supervision of a RN. However, care is only covered if it is medically indicated; custodial care is not covered by this insurance provider. Custodial care would include any type of housekeeping duties. HAP is also under the impression that the Home Health Aides provided by the Home Health Care agencies are certified by the agency.

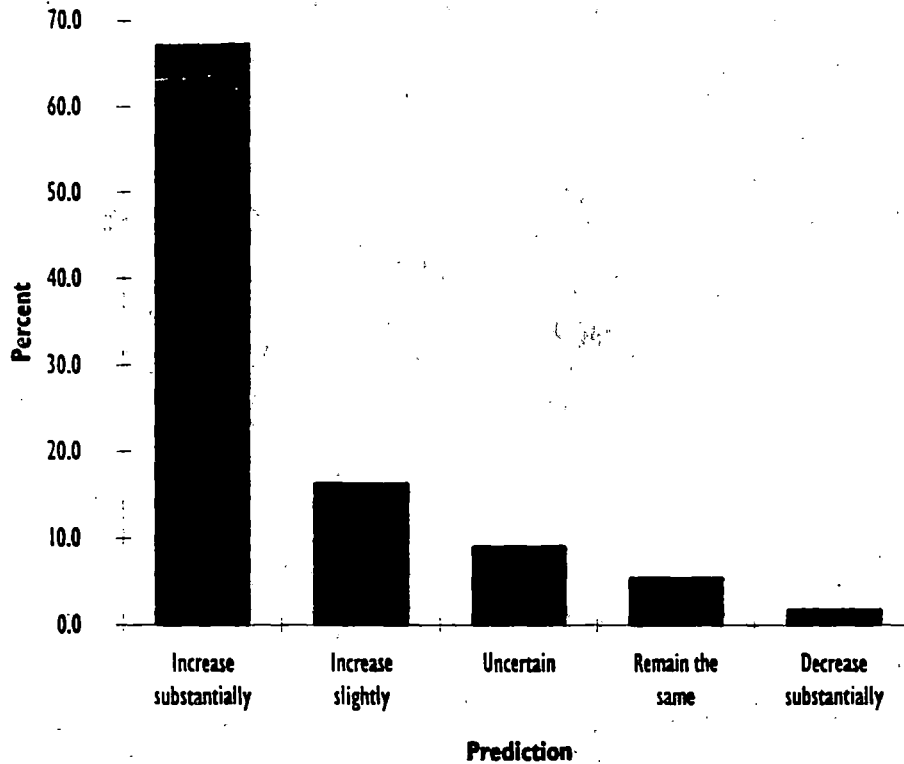
Further investigation of additional insurance providers reveals similar claim procedures when determining health care coverage. Among those insurance providers interviewed, home health care is typically determined by the attending physician, often with the consent of family members or the individual under the care. Any type of custodial care is not generally covered by health insurance providers, although automobile insurance providers may cover custodial care in the case of a temporarily disabled client.

National and state data on the employment outlook is confirmed on the local level by data provided by the OCC Home Health Aide Employer Survey. Of the fifty-five employers contacted who employ home health aides, 67% predict their need for employees will increase substantially over the next five to ten years. An additional 16% predicted a slight increase in need, while only one employer (2%) foresaw a decrease (see Table 2 and Figure 2).

Table 2
Prediction of Need for Home Health Aides
Employer Survey

	<i><u>Number</u></i>	<i><u>Percent</u></i>
Increase substantially	37	67.3
Increase slightly	9	16.4
Uncertain	5	9.1
Remain the same	3	5.5
Decrease substantially	1	1.8
<i><u>Total</u></i>	<i><u>55</u></i>	<i><u>100.0</u></i>

Figure 2
Prediction of Need for Home Health Aides

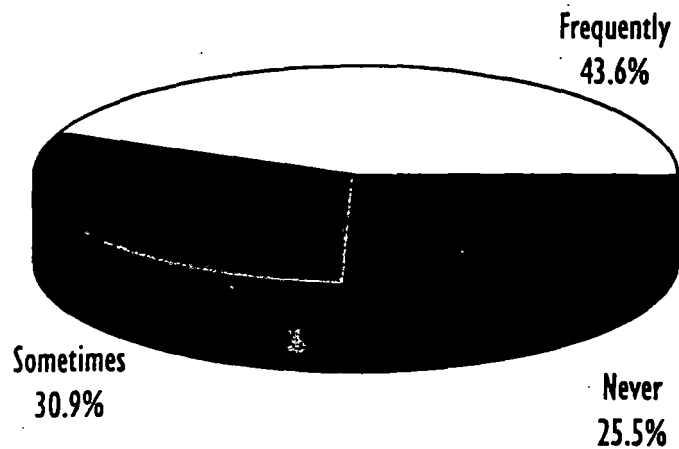


In addition, 44% of the employers of home health aides reported that they "frequently" experienced difficulty finding qualified home health aides. Thirty-one percent "sometimes" had difficulty, while 26% reported that they "never" had difficulty (see Table 3 and Figure 3).

Table 3
Employers Having Difficulty Finding Qualified
Home Health Aides

	<i>Number</i>	<i>Percent</i>
Never	14	25.5
Sometimes	17	30.9
Frequently	24	43.6
<i>Total</i>	<i>55</i>	<i>100.0</i>

Figure 3
*Employers Having Difficulty Finding Qualified
Home Health Aides*



The large majority of home health aides employed by our respondents (82%) are assigned to work outside the employer's organization in private homes, hospitals, nursing homes and other care facilities. Only about 15% of aides are employed on site by their employers, while 4% work both on and off site. Much of the employment in the home health care field is of a part-time or contingent nature as evidenced by the 3:7 ratio of full to part-time home health aides reported by our respondents.

Employers were asked to consider the current trends in the health care field and comment on the need for LPNs and RNs to have more experience in home care. The majority of the respondents believe that this need is currently being met by home health aides, except in cases where a higher level of medical treatment is necessary, thus a higher level of skill is needed. Comments are as follows:

The need is being met by home health aides - LPNs are not in a lot of demand as they still need to be supervised by RNs and they demand more pay.

Daily aides are sufficient - most could not afford an LPN or RN to come into a person's home.

There is a need for nurses to perform more of the tasks of a home health aide, but the problem is cost.

A little bit of both because many clients are coming home earlier, but need for an RN is cut with more time for home health aide needed.

The way the health care industry is moving a lot of managed care that was once done in hospitals is being done at home and people will need to be trained in that area.

Need for LPNs and RNs to get more home care experience - as the trend is to release patients earlier from hospitals, it's cheaper to keep them at home - more high-tech care needs in the home.

The need is not being met by home health aides - with more critical care patients being cared for at home - LPNs and RNs will need more home care experience.

These comments reflect the literature reviewed, as well as the employers' opinions, and can be a factor in the decision of a prospective nursing student to take a home health aide course.

Employee Benefits

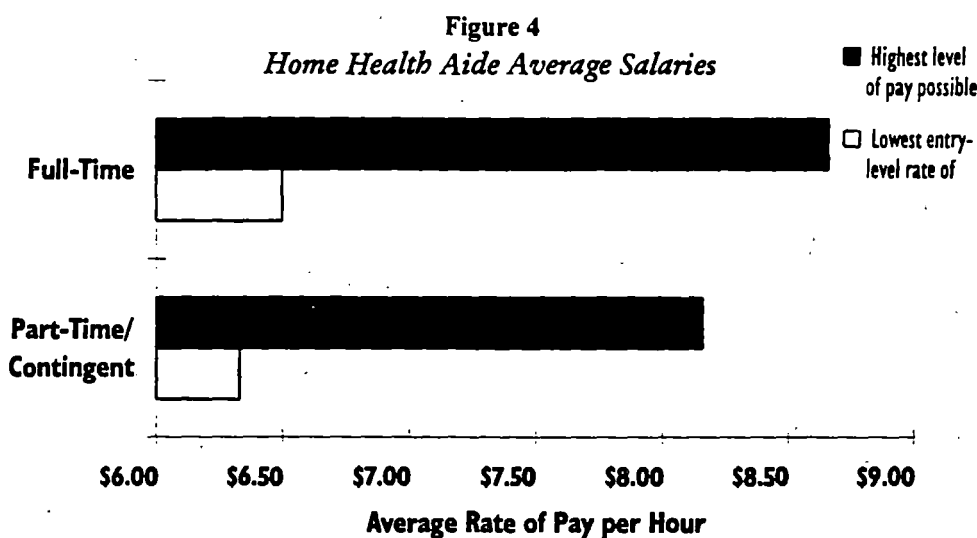
Wage and Salary

As mentioned earlier, turnover among home health aides is unusually high, due in large part to low salaries and poor benefits. *Occupational Outlook* reports that the national average starting salary for a home health aide is \$6.31, while the maximum hourly rate is \$8.28. Analysis of national and regional data indicate that average salaries may be somewhat lower in the Midwest. Many home health aides are part-time employees and receive no benefits. These employees are typically paid only for the hours they are with patients and do not receive compensation for the time spent travelling between homes. Some employers of full-time home health aides offer full benefits packages including sick leave, vacation time, health and life insurance, and retirement.

Data from the OCC Home Health Aide Employer survey confirmed these salary levels. The average pay rate per hour reported by respondents ranged from \$6.50 to \$8.66 for full-time aides. The reported pay rate for part-time and contingent aides was slightly lower ranging from \$6.33 to \$8.16 per hour (see Table 4 and Figure 4).

Table 4
Home Health Aide Average Salaries
Employer Survey

	<i>Part-Time/ Contingent</i>	<i>Full-Time</i>
Lowest entry-level rate of pay	\$6.33	\$6.50
Highest level of pay possible	\$8.16	\$8.66



Seventy-four percent of the employers with whom we spoke said that they provided benefits for home health aides. Typical benefits cited by these employers included vacation time, health insurance, sick leave, pensions and in some cases tuition reimbursement. When asked for specifics, 44% of the employers said that benefits were available only for full-time employees, while 56% of employers reported that benefits applied to both full and part-time employees. However, in some cases provision of benefits was conditional, often on the number of hours worked per week or per year.

Inadequate wage and benefits packages may contribute to the high turnover rate of home health aides. The most common reasons why home health aides leave their position have been identified by the employer survey as low pay with no benefits, temporary employment or not enough hours, no advancement, poor and stressful working conditions, and lack of convenient transportation. On average, respondents claim that employees remain at their establishment from six months to five years. Some employees stay even longer, up to 25 years, according to employers surveyed. In addition, experts have noted that the longevity of the type of

establishments surveyed is typically reflective of the employees, thus they may also suffer from high turnover rates.

Advancement Opportunities

According to *Occupational Outlook*, MOIS, and the Foundation for Homecare and Hospice, there are very few advancement opportunities for home health care aides. Because many of them do not have formal training beyond the federally mandated 75 hours, they are unqualified to perform more advanced medical procedures.

The OCC Home Health Care Aide Employer survey indicated that the line between the functions of home health aides and other trained medical staff is clearly defined, with more than three quarters of employers (78%) reporting that they do not use LPNs or RNs to perform the same duties as home health aides. Of those employers who use other staff, nearly three-quarters (74%) use LPNs, and 42% use RNs instead of home health aides (respondents gave more than one answer). Certified nurse's aides and assistants are also used in lieu of home health aides. The most common reasons for using other medical staff include: client request, emergency situations only, or a home health aide was not available.

Occupational Desirability

National studies (Cantor & Chichin, 1989; Feldman, Sapienza, & Kane, 1990) have shown while many workers enjoy the helping aspects of home care and find the work rewarding, they are frustrated by both the low wages and poor working conditions. In addition, studies of the current shortage of home health care givers have identified a variety of other issues affecting the desirability of the work: the isolating and monotonous aspects of the job, exposure to disease and dirty working conditions, fluctuating work hours, long commutes to reach clients, little training and few opportunities for promotion.

Cantor & Chichin, 1989 found that the profile of home health care workers reflected a considerable number of single, low-income women in their forties. Home health care was the first job for one third of the workers they interviewed. However, the AFDC Homemaker-Home Health Aide Demonstrations found that programs to train and employ welfare recipients as home care workers were often not cost effective. Welfare recipients often did not make sufficient income to get off welfare permanently and the availability of food stamps and Medicaid benefits often make welfare a more attractive option.

Level of Training Needed

Most employers of home health aides have no specific education or training requirements. While some state a preference for employees with high school diplomas or previous experience in the field, the reality is that many home health aides are hired with neither.

The exception, according to *Occupational Outlook Handbook*, is the group of employers who are being reimbursed by Medicare. The specifics of this training program are detailed below. In these instances, employees are required by federal law to complete a 75 hour training program and pass a basic competency test. While some employers may require new employees to complete an in-house training or orientation program, it is rarely a prerequisite for employment.

The federally mandated 75 hour training program must be supervised by an RN with at least two years of experience, one of which must be in home care. The program includes the following components:

- ◆ Communication skills
- ◆ Observing reporting, and documenting patient status and care or service given
- ◆ Reading and recording temperature, pulse, and respiration
- ◆ Basic infection control procedures
- ◆ Basic elements of body functioning and changes in body function that must be reported to a supervisor
- ◆ Maintenance of a clean, safe, healthy environment
- ◆ Recognizing emergencies and knowledge of emergency procedures
- ◆ Physical, emotional, and developmental needs of and ways to work with populations served, including the need for respect for the patient, and respect for his or her privacy and property
- ◆ Appropriate and safe techniques in personal hygiene and grooming that include bed bath, sponge, tub or shower bath, shampoo in sink, tub, or bath, nail and skin care, oral hygiene, toileting and elimination
- ◆ Safe transfer techniques and ambulation
- ◆ Normal range of motion and positioning
- ◆ Adequate nutrition and fluid intake
- ◆ Any other task that the home health agency may choose to have the employee perform

(Source: Foundation for Hospice and Homecare Summary of Federal OBRA regulations)

While these guidelines are set at the federal level, testing is administered at the state level or through national home health care associations.

If an aide has not worked in the home for 24 consecutive months, retesting of competency in these areas may be required.

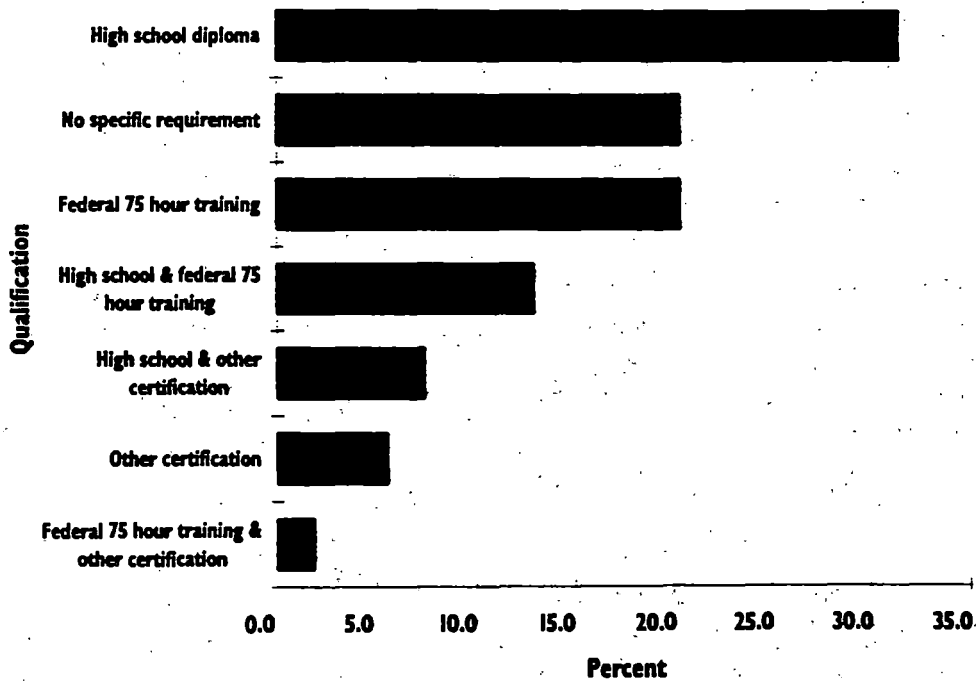
The Foundation for Hospice and Homecare offers a training program which meets the federal standards and also provides home health aides with a national credential, which they believe benefits both the consumer and the industry by setting and maintaining a higher standard than the law requires. However, the Foundation's certification does not result in greater potential for advancement or a higher salary. The skills taught are essentially the same as those offered through the federal program.

Data from the OCC Home Health Care Aide Employer Survey supports the national data on the level of employee training. Twenty percent of employers have no specific educational requirements for employment, 32% of employers require a high school diploma, while another 20% require the seventy-five hours of federal training. Thirteen percent of employers require both a high school diploma and the federal training. Of the employers who said they required other certification, the most frequently mentioned types were CPR and nurse's aide training (see Table 5 and Figure 5).

Table 5
Minimum Qualifications for Home Health Aides

<i>Qualification</i>	<i>Number</i>	<i>Percent</i>
High school diploma	17	31.5
No specific requirement	11	20.4
Federal 75 hour training	11	20.4
High school & federal 75 hour training	7	13.0
High school & other certification	4	7.4
Other certification	3	5.6
Federal 75 training & other certification	1	1.9
<i>Total</i>	<i>54</i>	<i>100.0</i>

Figure 5
Minimum Qualifications for Home Health Aides



Most employers surveyed desire a minimum amount of experience above or in lieu of educational qualifications. The employer survey reveals that over half (54%) of respondents require at least one year of experience in a nursing home, hospital or other care facility (including private homes). Other employers require a minimum of six months up to three years of home health care experience. Less experience is required if the applicant has some form of certification.

Home Health Aide Programs in Michigan

Findings indicate that there are currently no Home Health Aide programs in community colleges or in universities in the State of Michigan. However, St. Clair County Community College offered a "Homemaker/Home Health Aide" program in the winter 1994 semester, but has not been able to obtain enough prospective students to run the program again. According to Halina Jedrzetzak, Coordinator of Contracts and Grants at St. Clair, the program was primarily established as a customized contract training program requested by private industry. The majority of the tuition was paid by the employer, thus Jedrzetzak believes that they are having such a difficult time attracting new students to the program because they cannot afford to pay the tuition up-front, or see little relevance when compared to possible earnings in the field.

St. Clair's program consisted of 126 hours (10 weeks of classes), which included 18 hours of practicum. Classes included above and beyond the federal guidelines were CPR, employability skills, study skills and interpersonal skills. Classes were taught by nursing staff, and labs were held in the nursing department. Jedrzetzak notes that St. Clair has followed up on the graduates from the program, and reports that they are working and enjoying the work. Of the ten students from this particular program, one student pursued further education in nursing.

There are a limited number of community colleges offering a home health aide program nationwide. In fact, the National HomeCaring Council (a.k.a. Foundation for Hospice and Homecare) could only suggest two national community college programs offering such a program, Laurel Institute and Northern Virginia Community College.

Training programs in the field are currently provided by organizations like the American Red Cross. Regina Pierce, Supervisor of Health Care Training at the American Red Cross, indicated that its program lasts four weeks, includes 26 hours of experience as an intern, and 90 hours of instruction at a cost of \$665. In her experience many of the participants are "literacy learners", who want to spend as little time as possible in school. She believes that the length of time required to complete the program is an important consideration for them.

A number of trade schools in southeast Michigan offer training programs in home health care. Ross offers a Patient Care Technician/Home Health Aide program which prepares students to take the state competency test. The cost of the 4 month, 450 hour program is \$2,900. Many of the students who enroll in this program are new to the health care field; relatively few people with previous health care experience choose to enroll.

The Academy of Health Care Careers also offers a Home Health Aide training program. Like the Ross program, the Academy also prepares students to take the state competency test. Students must complete 308 hours (12 weeks) of training in order to complete the program which costs \$1,350.

In-house training is provided to new employees by 76% of employers we interviewed in the OCC Home Health Care Aide Employer survey. Sixty-eight percent provide certification for this training. It is generally applicable at that particular agency only, but seven (28%) employers who claim their training results in certification offer national certification or training which complies with the federal guidelines.

There appears to be a considerable degree of consistency about the components of in-house training provided by these employers and the elements mirror those specified in the federal provisions. Only 15% of employers named components other than those listed in the federal guidelines. These additional aspects include first-aid, CPR, psycho/social aspects of home care (for patient as well as the home health aide), and legal aspects (i.e. patient confidentiality). The four components most commonly taught are observing, reporting and documenting patient status (93% of employers), basic infection control procedures (91%), maintenance of clean, safe, healthy environment (91%), safe transfer techniques and ambulation (91%)(see Table 6 and Figure 6).

Table 6
Components Included in On-Site Home Health Aide Training
Employer Survey

	<i>Number</i>	<i>Percent</i>
Observing, reporting and documenting patient status	39	92.9
Basic infection control procedures	38	90.5
Maintenance of clean, safe, healthy environment	38	90.5
Safe transfer techniques and ambulation	38	90.5
Communications skills	37	88.1
Physical, emotional and developmental needs of patients	37	88.1
Recognizing emergencies/knowledge of emergency procedures	36	85.7
Normal range of motion and positioning	36	85.7
Basic elements of body functioning/changes in body function	35	83.3
Appropriate/safe techniques for personal hygiene/grooming assistance	34	81.0
Adequate nutrition and fluid intake	33	78.6
Reading/recording temperatures, pulse and respiration	28	66.7
<i>Total responding</i>	<i>42</i>	<i>100.0</i>

ROBOTICS NEEDS ASSESSMENT

Prepared by:

**Office of Institutional Planning & Analysis
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EXECUTIVE SUMMARY

- Locally as well as nationally, the robotics industry outlook is promising. The Bureau of Labor Statistics, the Robotic Industries Association, and southeast Michigan employers agree that employment prospects for the future are bright. While the automotive industry continues to dominate the field of robot use, there are indications that the market is becoming more diverse.
- Machine vision is expected to experience exceptional growth in coming years. Among the southeast Michigan employers contacted, however, very few are significantly involved with machine vision, suggesting that this trend may not yet be fully realized in the local area.
- Women and minorities continue to be underrepresented in robotics careers. While OCC's Robotics program enrolls minority students in numbers proportionate to college-wide enrollments, there are very few women in the program. This is not a problem unique to OCC, as evidenced by the growing number of programs at both two and four year institutions designed to attract and retain women and minorities in science and math-based programs.
- The education required for a career in robotics varies substantially depending on the particular needs of the employer. In many cases, employers reported that previous work experience in the field was at least as important as formal training. Analysis by employer type indicates that systems integrator employers tend to emphasize previous experience, while robot user employers are more likely to require an associate degree for employment.
- Employers' ratings of the robotics skills important for employment indicate that safety skills, interfacing, and troubleshooting are very important. GMAW, joint design, and weld positions are considered the least important skills for employment in the robotics field.
- Student ratings of the robotics skills important for employment are consistent with employer ratings, indicating a student awareness of employer requirements and the skills necessary for employment.
- Employers find that most new hires in the robotics field are well trained in interpretation of schematics and robotic safety procedures. Many report that training is not adequate in end effector nomenclature and installation.
- Approximately half of employers contacted are currently hiring new employees, primarily due to company expansion. However, many employers also cited a need for employees with up-to-date technology training and employee turnover within the organization as reasons for hiring.
- Tuition assistance and on-the-job training are both common practices among the employers contacted. Employers in southeast Michigan appear confident that the robotics market will continue to grow over the next ten years.

Robotics/Automated Systems Technology

Needs Assessment

Oakland Community College

INTRODUCTION

The following report summarizes the findings of a needs assessment implemented by OCC's Office of Planning & Analysis. Designed to evaluate declining enrollments in the Robotics program in light of current employer needs and industry trends, the report incorporates information from the Occupational Outlook Handbook, the Michigan Employment Security Commission, and the Michigan Occupational Information System with data collected through student and employer surveys and interviews with industry experts. Where appropriate, faculty members and program coordinators at peer institutions were consulted.

Description of Existing Program

The current Robotics program at OCC is an Extended Associate Program leading to an associate degree in Applied Science. Designed to prepare students for careers in robotics and automation, the program covers robotic programming and welding, mechanical drives and linkages, sensor technology, robotic controllers, and CIM applications. Robotics courses are designed to provide students with the technician-level skills required for employment in field service or systems building. Robotics faculty believe that many students in the Robotics program are currently employed in the field and are enrolled at OCC in order to improve their chances for career advancement. OCC's Robotics program recently received five FANUC robots through the College's Major Gifts Campaign, an addition the faculty feel may make the program more attractive to potential students who are already employed in the field. While the program has additional equipment which has been donated over the years from plant closings, faculty feel much of it is outdated.

Currently, the Robotics program offers the following core courses:

ROB 150	Introduction to Robotics Technology
ROB 152	Robot Manipulator Drives and Linkages
ROB 162	Industrial Robotic Applications
ROB 164	Interpolated/Welding Robotic Applications
ROB 166	Sensor Technology
ROB 204	Programmable Controller Systems
ROB 240	Automated Systems Applications
ROB 250	Automated Controller Maintenance

Students are also required to complete the following non-core courses:

CAD 100	Fundamentals of Engineering Graphics
EEC 102	DC Fundamentals

*Oakland Community College
Robotics Needs Assessment
June 1995*

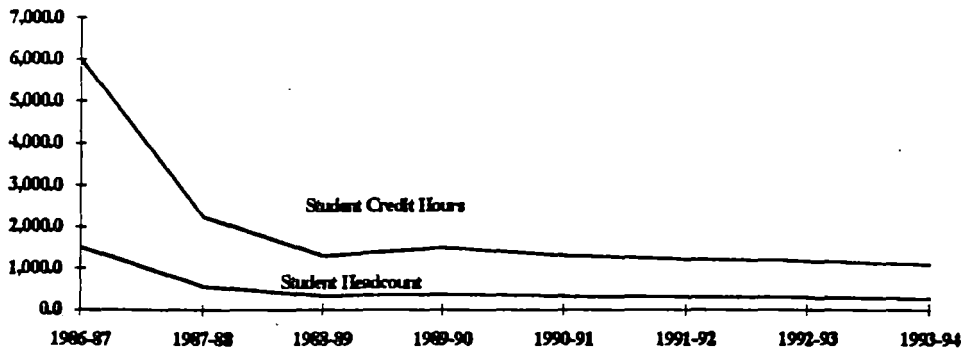
EEC 104	AC Fundamentals
ETT 270	Machines and Process Controls
ECT 208	Introduction to Microprocessors
ATF 140	Introduction to Hydraulics
ATF 147	Fundamentals of Pneumatics
ENG 135	Business Communications
MAT 154	College Algebra
MAT 156	Trigonometry

Student headcount and credit hour enrollments in the Robotics program have been on the decline since 1986, although this decline has been minimal for the past four years. Available data reveals that enrollments for the past three years have been concentrated in the introductory course (ROB 150). In the 1993-94 academic year, for example, 36% of all students who took a Robotics course were enrolled in ROB 150. Data for 1992-93 and 1991-92 reveal similar trends. Enrollment data also reveal that ROB 166 (Introduction to Sensor Technology) and ROB 204 (Programmable Controller Systems) have also had relatively high enrollments. These enrollments may be due in part to the fact that the ROB 150 course is a core requirement for several other programs, including Computer Integrated Manufacturing, Manufacturing Technology, and Technical/Management Development Technology.

The following table represents overall enrollment trends:

Table 1
 Annual Student Credit Hours and Duplicated Headcount
 (1986-87 Through 1993-94)

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	Percent Change	
									5- Year	8- Year
Student Credit Hours	6,002.0	2,234.0	1,292.0	1,482.0	1,304.0	1,216.0	1,164.0	1,084.0	-26.9	-74.3
Student Headcount	1,504	559	327	372	326	304	291	271	-27.2	-74.5



METHODOLOGY

In order to obtain background information on the robotics industry, a literature search was conducted and representatives of various professional organizations were contacted. Relevant information was used in both the writing of this report and in the employer survey design process.

In April 1995, telephone interviewers in OCC's Office of Planning & Analysis contacted 68 employers in southeast Michigan to answer survey questions regarding employment opportunities and skill requirements. Employers were selected through the 1994 Harris Industrial Directory from manufacturing categories which employ large numbers of people in the local area. These employers, many of whom are involved in automotive-related manufacturing, are categorized as follows:

<u>SIC Code:</u>	<u>Name:</u>
3462	Iron & Steel Forgings
3455	Automotive Stampings
3471	Electroplating & Plating
3479	Coating & Engraving
3544	Dies, Tools, Jigs & Fixtures
3711	Motor Vehicles & Car Bodies
3714	Motor Vehicles Parts & Accessories
3715	Truck Trailers

Respondents were asked to comment on the level of training of most job applicants as well as their own current employer needs. A similar survey designed to gauge student opinion of the Robotics program was also carried out in April 1995. Telephone interviewers contacted 78 of the 180 students (43%) who were enrolled in one or more Robotics courses between Spring 1994 and Winter 1995 were contacted. Survey instruments appear in Appendices A and B. Frequency distributions, crosstabulations and correlations were used in the analysis of the survey data.

ANALYSIS

Occupational Outlook

The Occupational Outlook Handbook (1994) indicates that the long-term outlook for the robotics industry in North America is promising. The Bureau of Labor Statistics predicts a need for more than 800,000 employees to design, maintain, and operate robotic equipment by the year 2000. While the majority of the robotic equipment installed in North American businesses were once manufactured overseas, domestic robot manufacturers reported record sales in 1993. According to the Robotic Industries Association in Ann Arbor, Michigan, "the 31% increase in new orders in 1993 followed a 21.5% gain in 1992, resulting in the industry's healthiest year-end backlog since 1984. The US robot population now tops 50,000, ranking the US second only to Japan in robotics use" (Managing Automation, June 1994). While the automotive industry continues to lead the way in robot use, non-automotive manufacturers are increasingly turning to robots in the face of corporate right-sizing, lower capital, affordably-priced robotic equipment, and the need to remain flexible and adaptable.

According to the Robotic Industries Association in Ann Arbor, one area of robotics which may well experience growth in coming years is machine vision. Used for inspection, gauging, measurement, and character recognition, machine vision systems continue to play an important part in quality assurance by allowing industries to increase productivity while improving defect identification. Since their inception in the early 1980's machine vision systems have been

prohibitively difficult to use. Recently, however, manufacturers have directed their efforts at creating systems which will be easier to use. Of the southeast Michigan employers responding to the survey, just two indicated current involvement with machine vision, suggesting that the trend may not yet have fully impacted the local market. Tracking this trend among local employers over the next few years could prove beneficial to the OCC Robotics program, as it is likely that these employers will have additional training needs.

Salary and Employee Benefits

Salaries in the field of robotics vary widely depending on position and level of education. According to Opportunities in Robotics Careers, graduates of a two-year robotics program can earn anywhere between \$12,000 and \$22,000 a year, depending on level of experience and employer. Those with a bachelor's or graduate degree in engineering earn between \$25,000 and \$52,000, depending on level of experience and education. Benefits also vary widely, although college-educated robotics workers typically received paid holidays and vacations, health insurance and pension plans. The responses of employers in southeast Michigan indicate a similarly wide salary range, from hourly wages beginning at \$6.00 to yearly salaries of \$35,000 and up. Many employers declined to answer this question, stating that salary is too dependent on individual experience to estimate a range.

Opportunities for Women and Minorities in Robotics

According to Jan Bone, author of Opportunities in Robotics Careers, women and minorities are often underrepresented in robotics careers. Citing the Women's Educational Equity Program at Purdue University, the author states that "too often, women interested in entering engineering have had no encouragement to develop manual skills, and are unused to handling tools or technical equipment." A report issued by the National Science Foundation in 1986 reveals that while the number of women and minorities employed in engineering fields has grown since the mid-70's, underemployment among degree-holders is higher among women than men. The same study reported that employment of African and Asian-Americans has risen more rapidly than that of whites, although engineering careers are still dominated by whites.

Analysis of data from OCC's Robotics program indicates a consistency with the trend noted above. Of the students who have taken an ROB course between Spring 1994 and Winter 1995, just 15.7% were female. For those students declaring Robotics as their major field of study, this figure was even lower (8.9%). Minorities are better represented in OCC's Robotics program, comprising 17.5% of those who have taken an ROB course over the last year.

Currently Available Training

Several other community colleges in southeast Michigan offer an associate degree in Robotics. Washtenaw Community College in Ann Arbor offers a Robotic Technology associate degree

program, as does Henry Ford Community College in Dearborn and Macomb Community College in Warren.

Macomb Community College

Macomb students interested in pursuing a career in robotics have several educational options. The college offers a one-year certificate program in Robotics, a two-year associate degree program in Industrial Technology (Robotics specialty), and a four-year degree in Mechanical Technology (Robotics specialty) through the college's University Center. Several years ago, the college did a needs assessment for the Industrial Technology program, and found that employers want employees with a high degree of specialization in a variety of areas. This is consistent with the findings of OCC's survey in which employers indicated that the majority of the skills and competencies covered in the program are "very important." In response, Macomb faculty and administrators developed seven specialty areas within Industrial Technology, one of which is Robotics. Al Manore, a faculty member in Industrial Technology who advises students in the Robotics specialty, says that the college recognizes the importance of providing students with quality instruction which will allow them to move forward in the field. This is particularly true of the basic courses which students take early in the program. Currently, he says, the Mechanical Technology program with a Robotics focus is one of the College's few growing programs.

Henry Ford Community College

Henry Ford Community College offers a Automation/Robotics option within their Electrical/Electronics Technology program. Students choosing the robotics option receive focused instruction in four technical areas: electrical/electronic power and controls, hydraulic/pneumatic power and controls, computer circuitry and programming, and industrial instrumentation and electronic calibration. One half of class time is devoted to hands-on laboratory experiments involving simulated automated machines. Courses are designed to prepare students for employment as support technicians in research and development, assembly and testing, field service, and equipment sales.

Washtenaw Community College

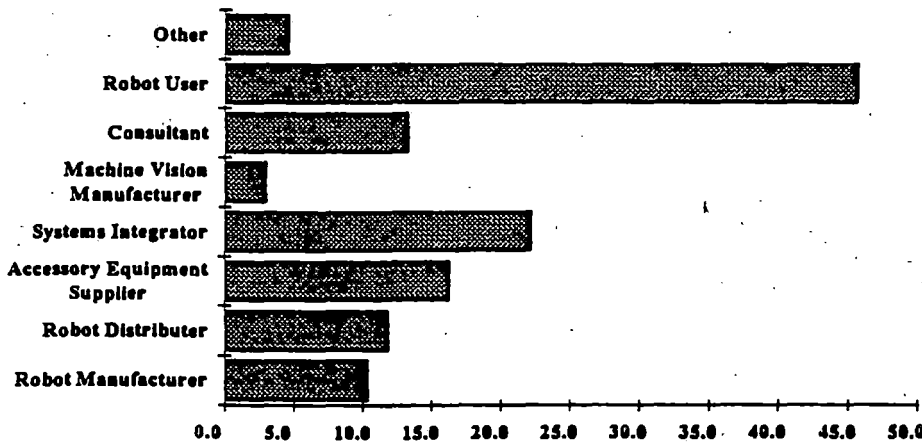
Washtenaw Community College's program in Robotic Technology prepares students for employment as automated equipment technicians in assembly, installation, and maintenance of electrical and electronic, electro-mechanical, pneumatic and hydraulic components. Students receive instruction in the use of hand tools, electronic testing instruments, diagrams, and prints, and are qualified for entry-level employment in the field upon completion of the program.

Employment Opportunities

In April 1995, telephone interviewers in the Office of Planning & Analysis contacted 68 employers in southeastern Michigan. At the start of the interview, employers were asked whether they build, service, or use robotic equipment. Those with no involvement with robotics were not questioned further. The 68 employers completing the survey represent a mix of manufacturers, distributors, suppliers, and users. It should be noted that some employers are represented in more than one category. The breakdown by category is as follows:

Table 2

Type	Employer Type Number Responding	Percent
Robot Manufacturer	7	10.3
Robot Distributer	8	11.8
Accessory Equipment Supplier	11	16.2
Systems Integrator	15	22.1
Machine Vision Manufacturer	2	2.9
Consultant	9	13.2
Robot User	31	45.6
Other	3	4.5



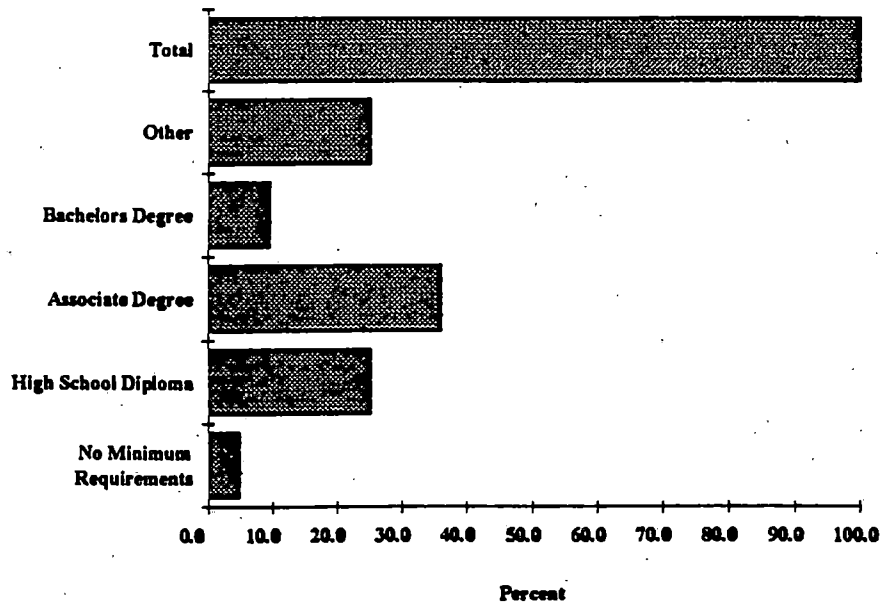
The majority (91%) of employers responding to the survey indicated that their companies employ people—either on staff or on a consulting basis—to maintain their robotic equipment. Most (63%) have employees on staff in this capacity, while the remainder bring consultants or manufacturers' representatives in to service equipment.

The minimum level of education required for employment in robotics varied significantly among the employers contacted. Over one-third (35%) said that employees must have an associate degree, while one-quarter (25%) reported that a high school diploma is their minimum requirement. However, an additional 25% said that their minimum educational requirement varies depending on the amount of work experience. In many cases, an associate degree is preferred, but a skilled background and technical training is an acceptable substitute. Several employers commented that "experience counts more than education."

Table 3

Minimum Education Required

Education Level	Number Responding	Percent
No Minimum Requirements	3	4.7
High School Diploma	16	25.0
Associate Degree	23	35.9
Bachelors Degree	6	9.4
Other	16	25.0
Total	64	100.0



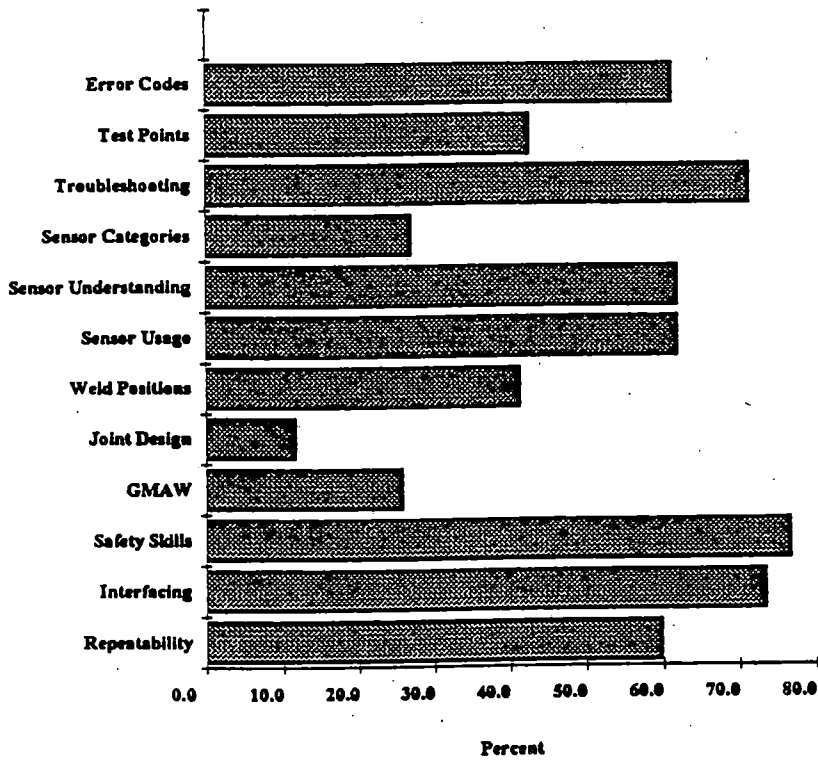
Crosstabulations of minimum education required by type of employer indicate that the two largest employer groups surveyed—robot users and systems integrators—have different educational requirements than the group as a whole. Robot user responses reveal that 36% require a high school diploma and another 36% require an associate degree. Systems integrator responses

indicate that while the associate degree (27%) and the high school diploma (20%) are common educational requirements, others—such as previous employment and on-the-job experience—are also important. Twenty percent of systems integrator employers reported that their educational requirements fall into this category, and analysis of narrative responses indicate that many look for previous work experience.

Employers were also asked to comment on the importance of various skills to the tasks and duties of their robotics employees. These skills were identified by faculty members as the competencies which students should possess at the completion of each course. Employers were asked to state whether each competency is not at all important, somewhat important, or very important when hiring new employees in the robotics area. The following graph displays responses.

Table 4
Employers Rating Skills "Very Important"

Skill	Number Responding	Percent
Repeatability	37	59.7
Interfacing	47	73.4
Safety Skills	49	76.6
GMAW	16	25.8
Joint Design	7	11.5
Weld Positions	26	41.3
Sensor Usage	39	61.9
Sensor Understanding	39	61.9
Sensor Categories	17	27.0
Troubleshooting	45	71.4
Test Points	26	42.6
Error Codes	38	61.3



WATER AND WASTEWATER TREATMENT TECHNOLOGY NEEDS ASSESSMENT

EXECUTIVE SUMMARY

- ★ This needs assessment was initiated by the Emerging Technologies Environmental Science Consortium in response to state wide interest in environmental programs. The Consortium consists of Oakland Community College, Schoolcraft College, Wayne County Community College, Lansing Community College, Kellogg Community College, Grand Rapids Community College, Northwestern Michigan College, and Delta Community College.
- ★ Information for the assessment was obtained from a survey of employers in the field, a literature search, data from state and federal government sources, information from professional organizations, and a study of programs offered by other higher educational institutions.
- ★ Although many employers mentioned that post-secondary education would benefit those in the field, a high school diploma is the minimal educational requirement of 91.3 percent of employers surveyed. Only 7.8 percent of the employers require an associate degree.
- ★ The near term employment outlook for the water and wastewater field is unfavorable based on data obtained. According to MOIS and to several industry experts, supply and demand are currently in balance and no unmet openings are predicted for the near future. Only 11.8 percent (26) of surveyed employers indicated they are now hiring (See Table 2).
- ★ Analysts point toward the industrial wastewater field as being a source of jobs for the future, but disagree as to how and if this could be taught in a classroom setting.
- ★ One company (Williams and Works Operations Services), has an extensive hiring need for people skilled in water and wastewater technology. They are interested in working with a community college in starting a program.
- ★ There are both in-house and external training offered in this field. Some employers and analysts advocate a need for more training in the form of courses specifically tailored for water or wastewater. Those who desire more training programs and continuing education for their employees want the facilities to be near their plants and the classes to be offered in the evenings. Others maintain that there is no need for additional training; that it is difficult to motivate employees to take advantage of the proliferation of training programs now offered.
- ★ Higher education institutions in Michigan are primarily preparing students for the certification exams and to subsequently work for a municipality. One program is concentrating on updating the skills of current water and wastewater treatment employees. All the programs have an internship component, are highly regarded by local employers and are typically quite successful at placing their graduates.

**EMERGING TECHNOLOGIES ENVIRONMENTAL SCIENCE CONSORTIUM
WATER AND WASTEWATER TREATMENT TECHNOLOGY
NEEDS ASSESSMENT**

INTRODUCTION

The purpose of this report is to review current industry needs related to the field of water and wastewater treatment technology. This report is intended to assist the Emerging Technologies Environmental Science Consortium in planning and evaluating future programs related to water and wastewater treatment technology. The Consortium was created by Oakland Community College (OCC) and Schoolcraft College, who jointly submitted a grant proposal to the Michigan Department of Education (MDE) for developing an Environmental Science/Studies curriculum. The MDE approved grant funding from the Emerging Technologies Fund. In addition, the MDE sent a letter to all community colleges in Michigan informing them of the Consortium and inviting them to join the Consortium (Appendix B). On September 29, 1992 the Consortium held its first meeting at which time it was decided to study water and wastewater treatment technology. The Consortium includes:

- Oakland Community College
- Schoolcraft College
- Wayne County Community College
- Lansing Community College
- Kellogg Community College
- Grand Rapids Community College
- Northwestern Community College
- Delta Community College

The information presented in this needs assessment was obtained from the following sources:

1. A comprehensive literature review
2. Data from the Michigan Employment Securities Commission (MESCC)
3. Data from the Michigan Occupational Information System (MOIS)
4. Information compiled from phone interviews with industry analysts and experts
5. An examination of related programs in other higher education institutions
6. Survey of 223 employers in the water and wastewater fields

Description of Occupation

This needs assessment focuses on all occupations which test and/or treat water and/or wastewater. According to MOIS, 86.8 percent of employees who test and treat water or wastewater can be found within municipalities. These employees are classified as either water-treatment plant operators or wastewater treatment plant operators. Typically, those employed in municipally operated systems must also live within the city in which they work.

A water-treatment plant operator controls treatment plant machines and equipment to purify and clarify water for human consumption and for industrial use. The Occupational Outlook Handbook lists the operator's duties as,

"Operating and controlling electric motors and pumps, regulating the flow of raw water into treating plants, dumping specified amounts of chemicals, such as chlorine, ammonia, and lime into the water, and adjusting automatic devices that admit specified amounts of chemicals into tanks to disinfect, deodorize, and clarify the water. Once the water has been treated, the operators adjust controls to regulate flow rates, loss of head pressure and water elevation. They can then distribute the water. During this process, they test water samples to determine acidity, color and impurities, using colorimeter, turbidimeter, and conductivity meters. They also continuously record data, such as residual content of chemicals, water turbidity, and water pressure."

Wastewater treatment-plant operators work with sewage treatment, sludge processing, and disposal equipment. According to the Occupational Outlook Handbook, these operators,

"Control the flow and processing of sewage. In order to do this, they monitor control panels and adjust valves. They observe variations in operating conditions and interpret meter and gauge readings and test results. They start and stop pumps, engines, and generators to control flow of raw sewage through filtering, settling, aeration, and sludge digestion processes. They are also routinely conducting lab tests on the water."

In addition to working for municipalities, occupations within water and wastewater are also available with private manufacturing and environmental companies. Those who work with industrial wastewater are cleansing the wastewater of chemical impurities, as opposed to the biological waste which is found in the municipal plant's wastewater.

All facilities which discharges to ground or surface water are required by state law to employ a certified worker. Both facilities and employees need to be "certified," which means they are licensed by either the Michigan Department of Natural Resources (DNR) or the Michigan Department of Public Health (DPH). The DNR certifies wastewater facilities and operators, and the DPH certifies water facilities and operators (Appendix C). The DNR also runs a

certification program for industries and industrial wastewater workers (Appendix C). However, not all industries are covered under the state law, since most channel their wastewater directly into municipal systems rather than into ground or surface water.

Each water and wastewater facility is certified based on the number of residents within its community. State law also requires at least one employee within each facility to be certified at the level of the facility. This person is usually the superintendent, and he or she is usually licensed at the highest level which indicates that they have fulfilled the education and experience necessary to take the high level examinations. Other workers in the facility may be certified at varying levels, depending on their education, and more importantly, on their experience.

METHODOLOGY

Methods of Data Collection

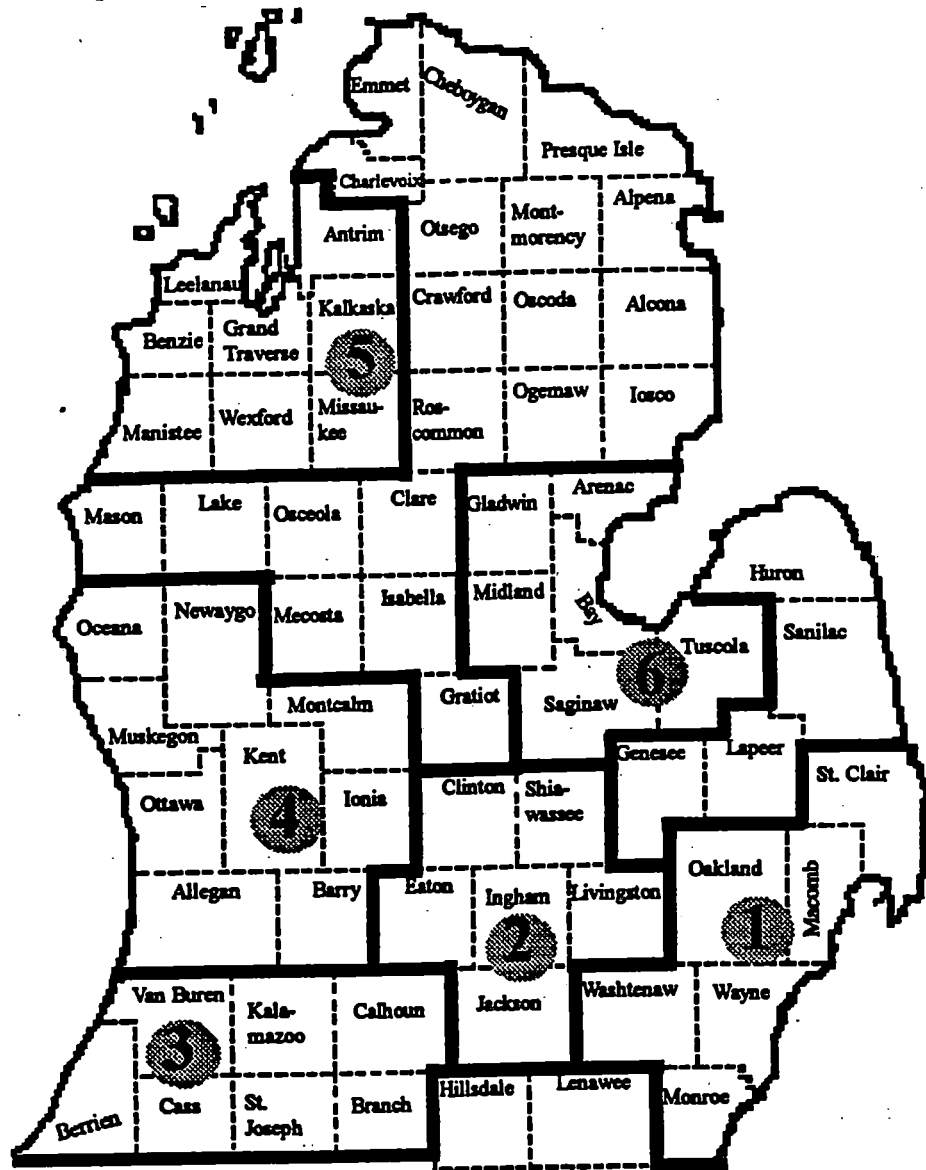
In order to obtain background information on the water and wastewater treatment field, a literature search was performed and a variety of professional, industrial, public and regulatory organizations were contacted. A review of existing water and wastewater treatment programs in higher educational institutions in Michigan was conducted. Comparisons of enrollment and graduation information were made, and the program content was examined.

A telephone survey of two hundred and twenty three (223) employers was conducted between November 11 and November 23, 1992. These employers are located within six regions throughout the state. These regions were established in order to incorporate the communities surrounding each college involved in the Consortium. The six regions consist of:

- Region 1: Southeast Michigan (Oakland Community College, Schoolcraft College, Wayne County Community College)
- Region 2: South Central Michigan (Lansing Community College)
- Region 3: Southwest Michigan (Kellogg Community College)
- Region 4: Mid West Michigan (Grand Rapids Community College)
- Region 5: Northwest Michigan (Northwestern Community College)
- Region 6: Mid Central Michigan (Delta Community College)

An "employer list" was generated for each region. The employers were selected at random from a variety of sources, and included those suggested by members of the Consortium, by the Michigan Department of Natural Resources (DNR), by the Michigan Department of Public Health (DPH), and those found in The Million Dollar Directory published by Dun & Bradstreet and in Ward's Business Directory. The majority of the employer list consisted of municipal/city water and wastewater facilities, but private sector employers including

REGIONS SURVEYED



manufacturing and environmental firms were also included. Within the municipal system, there were a variety of sizes and plant types represented on the employer list in order to provide a comprehensive view of employer needs throughout the six regions. The same survey was used for all regions (Appendix E). Employers were asked a series of questions regarding hiring practices and potential employment opportunities. Additionally, detailed information was solicited from these employers regarding desired qualifications and specific skill levels for entry level employees.

Methods of Data Analysis

Survey findings were analyzed by means of frequency distributions, measures of central tendency and correlations. Verbal responses were analyzed for content (Appendix F). The number of employers surveyed in each region was based on a percentage of the total water and wastewater employers located in the region. Table 1 presents a breakdown of the number of employers surveyed in each region.

Table 1
Employers Surveyed By Region

<u>Region</u>	<u>Employers</u>
Region 1	62
Region 2	35
Region 3	32
Region 4	45
Region 5	20
Region 6	29
TOTAL	223

Source: W/WWT Employers Survey, November, 1992

ANALYSIS

Water and Wastewater Treatment Outlook

Employers were asked to identify what functions they perform related to water and wastewater treatment. Table 2 indicates the number of employers in each region who perform various functions. The majority of the organizations perform more than one function. Sewage treatment and water quality testing are most commonly performed, but there are variations by individual region.

Table 2
Functions Performed by Employers
in Each Region

	<u>Reg 1</u>	<u>Reg 2</u>	<u>Reg 3</u>	<u>Reg 4</u>	<u>Reg 5</u>	<u>Reg 6</u>	<u>Total</u>
Sewage Treatment	75.8	77.1	54.8	79.1	80.0	79.3	74.5
Water Quality Testing	74.2	79.4	87.5	68.2	75.0	58.6	73.8
Municipal Water Treatment	58.1	67.6	78.1	45.5	30.0	34.5	54.3
Water Remediation	35.5	73.5	53.1	31.8	25.0	13.8	39.4
Industrial Wastewater Treatment	35.5	45.7	31.3	43.2	20.0	37.9	36.9
Stormwater Runoff Control	41.9	60.0	28.1	16.3	15.0	10.3	31.2
Soil Testing	24.2	36.4	12.5	16.3	20.0	17.2	21.5
Other*	—	5.7	50.0	2.3	—	3.4	9.0

**Other includes design of municipal water treatment, repair of water treatment and distribution systems, recording of precipitation and the maximum and minimum temperature, metering for the weather service, spreading sludge on fields, working with wells, and testing for agricultural herbicides.*

Source: W/WWT Employers Survey, November 1992

NOTE: The above functions can be further defined to assist in the reading of this report. "Sewage treatment" and "wastewater treatment" will be used interchangeably from this point on. The term "industrial wastewater treatment" will only be used to signify water that is contaminated by chemical wastes generated by industries as opposed to individuals. Finally, "municipal water treatment" will be used to describe city systems that purify water for household and industrial use, and in specific cases when "water treatment" pertains to the work done by a private environmental firm, this will be noted.

Municipal Water and Wastewater

There are approximately 360 municipal wastewater plants and 70 water facilities in the state of Michigan. Employment for water and wastewater employees is usually steady because treatment of water is essential, regardless of economic conditions. According to the MESAC, there is currently a predicted eleven percent (11%) growth per year for wastewater treatment plant operators in Michigan. This growth rate is considered average. There are on average 100 annual openings (30 due to growth, and 70 due to replacement). Supply and demand are presently in balance, and few opportunities are projected for additional workers to enter this field in the near future.

According to MOIS, the state-wide expanding population and growth of the economy are expected to increase demand for water and wastewater treatment services. When new plants are constructed to meet this demand, employment of water and wastewater treatment plant operators should increase. "Many water and sewage departments are planning extensive expenditures to meet the future demand for new storage facilities, treatment plants, pumping stations, transmission mains and rehabilitation of existing plants" (MOIS). Also according to the prediction of MOIS, employment opportunities will be greater for those operators trained in the use of computers for data collection and analysis; highly trained operators will have an advantage in securing new positions or advancing to higher-level jobs.

Although these factors should help to increase the future employment of water and wastewater treatment plant operators, the lack of funding for public works projects has delayed most of the planned plant construction and rehabilitation and, as a result, this has *reduced* demand for these operators. It remains unclear how the new Clinton Administrations campaign promises concerning major new funding for public works projects will impact public water and wastewater facilities.

Industrial Wastewater

Some of the employers surveyed mentioned that there is potential growth in the industrial wastewater field. Municipal wastewater systems cannot accept certain chemicals, and Industrial Pretreatment Programs (IPPs) have been in place for the last five years to make sure these

chemicals are treated before the municipal system receives the wastewater. Not all communities have industries which require an IPP program. Examples of these industries are metal processing, automotive, plastics, and food processing companies. The municipality must identify those industries which dump water into their system, and then issue a permit restricting the industry to discharging only a limited level of chemicals. The industry must then treat the majority of its own waste. This generates a lot of paperwork which is closely monitored by the DNR.

Occasionally such industries will try to hire operators who have wastewater experience to help them initiate the treatment process. This can be done on a short term consulting basis, or the operators may be hired full time. It is up to individual communities to require industrial certification (See Appendix C for certification details). Warren, Michigan is the only community in the Southeast Michigan area which requires its industrial pretreatment employees to be certified, however, many superintendents of wastewater facilities want this to be the norm. Since this is not now the case, anyone can be delegated to work with industrial wastewater, and often current industry employees are trained in this area in order to save the expense of hiring from the outside.

Howard Selover, (Chief of Operator Training for the DNR), indicated that industrial wastewater operators usually come from "within the industries, off the line in the case of the auto industry." Since these employees do not have to be certified, there is no pressure to hire new employees and the industries usually do their own training.

Haviland Engineering (Grand Rapids) installs industrial wastewater systems in small companies and also trains employees for three days on how to use the equipment. One of the builders for Haviland believes that this training is a good base, but is not sure that employees in these small companies fully understand all they should know about industrial wastewater. This could be combatted by hiring employees who are certified by the DNR. Since this is not required by law, the builder is certain that these smaller companies "will not hire a trained operator to run the industrial wastewater system until there are laws which force them to hire people who are certified." No one can predict when and if this will be mandated, but if so, there should be a greater need for certified people in industrial wastewater.

Storm Water Management

Other employers mentioned that storm water management will be a growing field in the near future, but they also indicated that this need can be met by retraining current wastewater operators; not necessarily by hiring new workers. Some are predicting that by 1994 the Federal Environmental Protection Agency (EPA) and the Michigan DNR will require stormwater to be treated as wastewater is now. Municipalities will then be responsible for it, but as of now, there is no required storm water treatment. It is difficult to prepare for this possible legislation, since no one knows exactly what it will entail; perhaps the salt level will be regulated, or maybe specific chemicals will have to be removed from the water.

Employment Opportunities

Of all employers surveyed, 89.2 percent hire *only* full time employees, 3.2 percent hire *only* part time employees, and 7.6 percent hire both full and part time employees. The average number of full time employees per employer is nine. The number of employees per plant varies by region, but the majority of plants hire between one and five full time employees. As would be expected, the more populated regions have more full time employees in their plants. Table 3 gives a breakdown of full time employees within each region.

Table 3
Full Time Employees Per Employer
by Region

<u>Full Time Employees</u>	<u>Region 1</u>	<u>Region 2</u>	<u>Region 3</u>	<u>Region 4</u>	<u>Region 5</u>	<u>Region 6</u>	<u>Total</u>
1 - 5	43.3	65.7	62.5	68.3	84.2	60.7	60.5
6 - 10	30.0	14.3	25.0	14.6	10.5	25.0	21.4
11 or more	26.7	20.0	12.5	17.1	5.3	14.3	18.1
	(N=60)	(N=35)	(N=32)	(N=41)	(N=19)	(N=28)	

Source: W/WWT Employers Survey, November, 1992

Only twenty-six (11.8%) of all employers surveyed are currently hiring. Out of these, sixteen are wastewater plants or lagoon systems, nine are water facilities, and one is an engineering company. Of these 26 employers, 69.2 percent of hiring is due to employee turnover, and 38.5 percent is due to expansion of their operations. This closely corresponds to MESC information which reports that each year 70 percent of hiring is due to annual openings and 30 percent is due to growth. One employer in Region 1 and one employer in Region 4 (7.7% of the total) are hiring in order to meet regulations or legislation. There were no other reasons given for hiring. The following table presents this information by region. Some employers may have indicated that both employee turnover and expansion of the operations were the reason for the new hires, as was the case in Region 6 which has one employer hiring one new employee due to both reasons.

Table 4
Employers Who Are Currently Hiring
By Region

	<u>Number of Employers</u>	<u>Percent Hiring</u>	<u>Due to Employee Turnover</u>	<u>Due to Expansion of Operations</u>
Region 1	9	15.0	66.7	44.4
Region 2	5	14.3	80.0	20.0
Region 3	2	6.3	100.0	0
Region 4	8	18.2	62.5	37.5
Region 5	1	5.0	0	100.0
Region 6	1	3.4	100.0	100.0
TOTAL	26	11.8	69.2	38.5

Source: W/WWT Employers Survey, November, 1992

According to survey findings, the number of employers currently hiring is very low. Howard Selover concurs with these findings in regards to wastewater openings. "There is no need for new people to enter the field of wastewater treatment; there aren't many openings." Neither does he predict a big hiring need for the future. He said he now has "operators calling and looking for jobs." He admitted that the DNR is introducing more regulations, but stressed that the DNR's upgrades "do not require more personnel." Selover concurred with MOIS by insisting that "the only way there will be a demand for operators is if there is more construction, and program grants for construction are down; state funds are currently being recycled."

The City of Detroit has the largest wastewater treatment system in the world; they employ 900 workers, 300 of which are operators or maintenance employees. Dennis Christie, (Superintendent), maintains that they will always need qualified people, and he has seen a trend within the last ten years of more qualified people. But, due to both "economic problems and the fact that we have a relatively young work force," he does not see them hiring any more employees in the short term. On the other hand, Christie foresees the new administration in Washington introducing more regulations which *may* entail more hiring. However, according to surveyed employers, "new regulations" are not causing more hiring in Michigan at this time.

It is important to consider the role of unions in this field when discussing hiring practices. Some municipal plants are unionized which can limit the amount of hiring done from the outside. Dan Stefanski, (Superintendent of Monroe Wastewater Treatment Plant), says that his "outside hiring is locked due to the union; jobs go out for union bids." Since neither DNR nor DPH

certification is yet a minimal requirement at his plant, he bids to "any eligible Teamster with a driver's license and a high school diploma." He has tried to get certification to be a requirement but has had no luck. He would like to see a wastewater program in the Detroit area, but he says that his hiring would still be conducted within the union system.

Several other employers agreed with Stefanski, and indicated that they go to the unions first when they were hiring. Typically, when asked "How do you recruit new entry-level employees?" employers responded:

"First we have to post jobs with the union, and then we go to newspaper ads."

"Promote from within our plant."

"Jobs are posted within the city and then we go to local papers if we don't find someone"

"Through the union."

"Use the union system, then place ads in the local papers."

However, not every plant is unionized, and as is evident from the above quotes, most go to the union first, but can then look outside. Some plants have managed to get certification to be a requirement for employment, and if no one in their local union is certified, going "outside" is necessary for these municipalities.

Although Selover and Christie concur that the current economy and work force are not conducive to additional hiring, and some say that hiring is controlled by contractual agreements, there are others who disagree. Otto Green, (Superintendent of a wastewater plant in Bay City), was instrumental in beginning programs at both Bay de Noc and Delta Community Colleges. In his words, this is a "Good field, good job." Unlike Selover, Green sees a need for a program in the Detroit area to both provide continuing education and to attract new students to the water and wastewater field. He tries to hire as many college graduates as he can; he believes the industry needs "good science students." His plant had a "30 percent turnover in the last three years." (They have thirty employees). His experience has been that "there are usually a lot more job openings than there are students."

Bill Cretens would also like to see another community college program in Michigan. He is the President of Williams & Works Operations Services in Grand Rapids. They are a private management, engineering and design firm which does contract operations with municipalities to manage and run their water or wastewater plants in Michigan and eight other states. They supply all the managers, operators and technicians, and Cretens emphasized that they are "always hiring." In fact, they have growth projections for "100 new employees within the next year, and aggressive growth plans for the next five years." Cretens wishes there were going to be "100 college graduates to fill these positions", since highly trained people are the key to their success. Cretens is a graduate of Bay de Noc, and believes that if Bay de Noc can be successful in the Upper Peninsula, "there is no reason why a community college near a metropolitan area could not succeed." In disagreement with Christie, he also maintains that there is a shortage now of well trained people. Cretens is willing to assist in starting a program in water or wastewater. He has a strong need for qualified people and he wants them to be community college graduates.

Some employers and industry contacts suggested that the field of industrial wastewater treatment has more demand for new employees than either water or wastewater treatment. But, unlike the municipal field, industries do not require certified employees to handle their wastewater and like the municipalities, many of these industries are unionized. Although some of their employees are certified, Ford Motor Company once tried to make certification a condition of employment but were unsuccessful. Ford is one of the industries which handles a lot of wastewater. Big corporations such as the "big three" automotive companies already have their own employees and training in place. Bill Gaines, who oversees all of the industrial wastewater programs for Ford, said "Approximately 80 percent of their operators come from the United Auto Workers (UAW) and 20 percent come from the outside," and he does not foresee this changing. Ford and other large industrial companies of this type have had industrial wastewater treatment processes in place for "fifteen to twenty years," and Gaines does not think that this is "a good place to go looking for new employment; they have reached their capacity by now." General Motors and Chrysler also use their own employees and do their own training.

Smaller and newer companies may have more of a need, but again, they are not required to hire certified workers, so there is no guarantee that they will have the funds or desire to hire someone from outside their company.

Qualifications for Employment

Employers were asked to identify which academic skills and personal qualities they look for in entry level personnel. Table 5 presents regional breakdowns of the desired personal qualities and academic skills for entry level employees.

Employers were asked what is the single most important quality or characteristic they look for when hiring water or wastewater employees. A wide range of responses were obtained by this question:

- "Math skills and the ability to work with others."
- "Work ethics, dependability, responsibility, and maturity."
- "Science backgrounds."
- "Honest, hard working, dedicated."

Some of the answers were related to knowledge and others were related to personal qualities. Employers were then asked how entry level personnel could be better prepared for employment:

- "Education."
- "Courses in hydraulics and chemistry."
- "Math and science skills."
- "Education in water quality."
- "Education - biological and mechanical."