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Assessment of Master's Program in Technology

Niaz Latif, Joy L. Colwell

***Abstract*—**Following implementation of a master's level graduate degree program in technology, a research-based assessment of the program was undertaken to determine how well the program met its goals and objectives, and the impact of the degree program on the objectives and the needs of its graduates. Upon review of the survey data, it was concluded that the program was meeting its goals and objectives, and that the directed project option should be encouraged.

***Keywords*—**Master's Degree, Graduate Program, Assessment.

I. Introduction

PURDUE University Calumet (PUC) is a regional campus serving approximately 9,300 students, located in a highly urban environment in a large metropolitan area. The campus is located in Northwest Indiana just outside Chicago. The campus serves a diverse population of about half traditional students and half non-traditional students. Sixty percent of the student population is full-time. Seventy-four percent of its students are first generation college students (neither parent attended college). Minority students comprise about 30% of the total body and female students comprise 57% of the student body. Most of the students are commuters, with a small but increasing percentage of residential students.

The University is a master's level campus, with a renewed emphasis on and commitment to graduate level education. In 2013, the campus had 1150 graduate level students, up from 904 for Spring 2008.

Purdue University Calumet started its Master of Science in Technology degree program in 2008, and by 2011 the program had the third largest enrollment nationally for graduate degree programs in Technology. In an effort to implement continuous improvement, the institution conducted an assessment and evaluation of the program. Similar assessments have been done for the Technology graduate program to determine graduates' satisfaction with the program, value perceptions, and career advancement after graduation [1].

This paper describes the program and program status. The process of assessment and evaluation of the program objectives are also presented in this paper.

II. MS Degree Program in Technology

The Technology program is designed for students with both technical and non-technical backgrounds, and provides the knowledge and skills required for its graduates to function effectively in a technical environment and to accept increasing responsibility in technical leadership positions. The degree program permits specialization in an area of modern technology applicable to each student's working environment or area of interest. Emphasis is placed on preparing students for technical leadership positions in business and industry, faculty positions in technology and engineering technology at community college and university levels, or to continue for a PhD in technology or a closely-related field at Purdue or another university. Available focus areas are listed below.

The Master of Science in Technology program is a 33-credit hour flexible curriculum. Students can have a concentration in one of the five approved concentrations (Table I). The program also allows a student to receive a graduate certificate as part of degree completion with appropriate plan of study.

TABLE I
MS Degree Concentrations And Graduate Certificates

MS degree concentrations	*Graduate Certificates*
Technology Leadership and Management	*Organizational Leadership and Supervision*
Electrical Engineering Technology	*Database Integration Technology*
Industrial Engineering Technology	*Six Sigma for Business and Industry*
Mechanical Engineering Technology	
Computer Information Technology	

The Master's degree program requires 33 credit hours. There are four required courses in the program (including the Directed Project in a Directed Project-based program (DP)), an additional 4 courses generally in Technology Management areas and 3 to 4 courses within the area of interest to be chosen by the student (see detail below). The degree requirements are flexible enough to allow students to customize their coursework to their particular goals and needs. Students may concentrate their electives in a secondary technology area rather than selecting general technology management courses. The objectives of the program are: "1) Ability to develop research concepts and practical applications of research methodologies in technical environments and analyze, evaluate and synthesize research, 2) ability to communicate effectively and employ constructive professional and interpersonal skills, 3) ability to function effectively in one or more of the technology disciplines, 4) ability to function on multidisciplinary teams, and 5) ability to continue for a PhD program in technology or a related field." [2]

Out of the program's 33 credit hours, four courses (12 credit hours) are in the student's area of interest. Three core courses (9 credit hours) are the followings: 1) Measurement

N. Latif is Professor of Mechanical Engineering Technology, Purdue University Calumet, Hammond, IN 46323 (phone: 219-989-3251; e-mail: nlatif@purduecal.edu).

J. Colwell is Professor of Organizational Leadership and Supervision, Purdue University Calumet, Hammond, IN 46323 (phone: 219-989-2545; email: colwell@purduecal.edu).

and Evaluation in Industry & Technology, 2) Quality and Productivity in Industry & Technology, and 3) Analysis and Research in Industry and Technology; Three courses in technical electives (9 credit hours) are highly recommended. These are, 1) Leadership & Ethics; 2) Project Management and 3) Technology in a Global Environment. However, depending on the focus of the student's plan of study, other courses may be substituted for these, including courses from other graduate programs on campus. The final 3 credit hours have two options; a) a directed project which is a research-based written report focusing on applied research, or b) an elective course with approval of the advisor.

III. Admission Requirement and Enrollment Trend

The admission requirement for unconditional admission is an earned baccalaureate degree from an accredited (recognized standing) college or university with a B or better average in an undergraduate major. Although the program encourages admitting students from Science, Technology, Engineering and Mathematics (STEM)-related fields, admission to the program was given to students with backgrounds other than STEM, as well. These students are industry professionals and have been working in technical environments for several years and aspire to be in a management role after completion of the degree.

Admission into the program is based on the following criteria and documentation:

- *B.S. from an accredited technology program or related field.*
- *Undergraduate GPA of 3.0 or greater based on a 4.0 scale. (Students whose GPA is somewhat less than 3.0 may be considered for conditional admission.)*
- *Appropriate experience as documented in a resume.*
- *A goal statement from the applicant commensurate with the area of interest*
- *Three letters of recommendation*

The enrollment growth has been from 68 students in 2008 to 127 students in Fall 2013 (Fig. 1). The program attracts both full-time and part-time students; a significant number of the students are part-time, since they are working adults who are returning to enhance their education and credentials. For example, for Fall 2013, of the 127 enrolled students, 64 were full-time (50%), 60 were part-time (46%), and 3 were degree candidates only.

IV. Evaluation Model

The assessment of this program done in 2013 was modeled on the assessment survey which had been previously published, outlining an evaluation process for a Technology program [1]. Although the assessment process outlined in this paper was applied to a very specific concentration in a technology degree, overall the programs aligned, such that the published model was a good match for the Technology degree offered by PUC. The questions for the survey appear below. The survey questions were presented with a Likert scale range of responses, primarily from Strongly Disagree to Strongly Agree (SD to SA). Some questions presented a range of possible answers (age, income level, etc.).

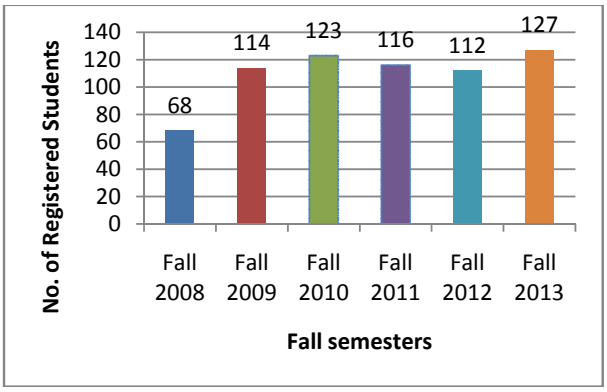

Fig. 1 Enrollment in MS degree program in Technology

Assessment has become an increasingly important part of education, including graduate education, whether done for campus accreditation, program accreditation, or to improve the program quality and student learning. [3] ABET, an accrediting body for engineering, engineering technology, and related programs, extends its accreditation to master's level programs. [4] ABET is an outcomes based accreditation, and can extend to institutions outside the United States as well as domestic institutions. [4] The assessment process for ABET accreditation is similar to assessment processes for academic programs in general. Direct assessment, such as evaluation of student work, is commonplace. However, program assessment generally and outcomes based accrediting bodies, such as ABET, encourage not only direct assessment but indirect assessment methods, such as alumni surveys, employer surveys, and student exit surveys. [5] The method chosen for this evaluation helps address the post-graduation impact of the degree program.

V. Data Collection

At the time of the assessment (Fall 2013) there were 161 graduates with contact information (email addresses) for the degree program. This represented nearly all of the graduates since the 2008 start date of the degree program. The survey was developed for email delivery through Qualtrics. Graduates of the program were sent an email with a link to the survey.

The survey questions fell into the following categories: demographic and contact data; outcomes; expectations; Directed Project (DP)-related questions for those who completed a DP; employment; and open questions for general comment.

The survey was sent to 161 graduates. A few surveys (7) were returned for invalid emails. A total of 50 former students responded to the survey, and 47 surveys were completed. This represents a completed survey rate of 30.5%, response rate of 32.5%. The survey questions are listed below.

Demographic and Contact Information:

- *Gender*

- *Age range*
- *Email (voluntary)*
- *Contact info (voluntary)*

Questions Related to Outcomes:

- *I increased my technical problem solving skills as a result of MST.*
- *I increased my ability to learn new skills and techniques as a result of the MST.*
- *I increased my ability to access, synthesize and analyze information as a result of the MST.*
- *I increased my ability to interpret information and make decisions as a result of the MST.*

Expectations

- *I feel that the degree program met my learning expectations.*

Directed Project (DP)

- *My DP was fully implemented in the workplace (or in a practical setting)*
- *My DP resulted in a savings of time and/or money.*
- *My DP was valuable to my company.*
- *My DP was valuable to me.*
- *The DP is an important part of the MST program.*

Employment-Related Questions

- *I have obtained a higher level position because of my degree.*
- *I obtained a position with a better employer because of my degree.*
- *I have increased professional opportunities because of my degree.*
- *My job responsibilities have increased because I completed the degree.*
- *My salary increased because I completed the degree.*
- *What has been the employer reaction to the degree?*
- *My employer provided financial support for my participation in the MST.*
- *My employer provided release time for my coursework.*
- *Overall, my employer was supportive of my participation in the MST.*

Open Questions

- *What were the most beneficial aspect of the degree?*
- *What were the least beneficial aspects of the degree?*

VI. Findings and Discussions

The total response received was 50 (response rate of 32.5%), of which 60% of the responders were male and 40% female, and 60% of those responding were within 26-35 years of age. Forty-eight percent of respondent attended the program as part-time students, taking less than 8 credit hours per semester. Forty-four percent of students completed the degree in two years and an additional 42% completed within 3 years. Most graduates (64%) work for industry or business.

Responses related to program outcomes are presented in Fig. 2. The data shows student learning outcomes were met by the program for almost 90% of the graduates (at the levels "somewhat" to "greatly"). Sixty percent or more has responded that their abilities had been enhanced "greatly" in research, critical thinking, problem solving, and time management. More than 80% percent of respondents agreed that the ability to solve technical problems, ability to learn new skills and techniques, and ability to interpret information and make decisions have increased through their graduate education. Forty percent of graduates obtained positions with a better employer and or moved to a higher-level position.

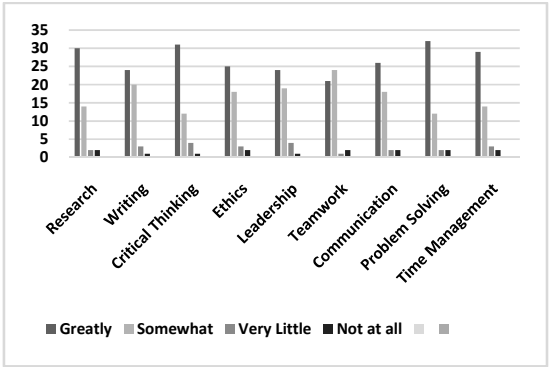

Fig. 2 Responses related to program learning outcomes

One of the strengths of the MS in Technology program is the opportunity to do a directed project (in most cases with industry) for completion of the degree. Typically, a directed project results in improved productivity, improved processes, and/or cost savings. Sixty-eight percent of the respondents completed directed projects during their graduate study. Of these, 48% of the graduates indicated that their directed projects were implemented at their workplace. Also, 52% reported that the projects resulted in savings of cost and/or time. Further, 91% of graduates who did the directed projects had indicated that it was an important part of the MS in Technology program.

VII. Summary and Conclusion

Based on the survey results, the outcomes and goals of the program are being met, particularly (or most notably) for those students who undertook a directed project as part of their studies. A consistent theme in the comments made in response to the open question of what were the most beneficial aspects of the degree was the directed project or research projects. As a result of this survey information, the authors have concluded that strongly encouraging students to choose the Directed Project option should be undertaken in the degree program.

Future additional assessment of the program's impact on graduates should also be undertaken to explore in depth the impact on subgroups in the pool of graduates, which might also be helpful in recruiting students to the program. For example, qualitative interviews could be performed with graduates to explore such concepts as interest, motivation, and values which motivate students to select this graduate degree program, as Peters and Daly did in exploring returning engineering graduates through the use of the expectancy value theory (EVT) model. [6]

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Dr. Niaz Latif is the Dean of the College of Technology at Purdue University Calumet. Dr. Latif has authored/co-authored numerous refereed journal articles and peer reviewed conference proceedings articles and has made national and international conference presentations. His publication record includes articles related to academic program development and assessment of academic programs

Joy L. Colwell is a Professor of Organizational Leadership and Supervision, and the Director of Graduate Studies for Purdue University Calumet. She writes regularly on the incorporation of interpersonal and career skills in technology education, and on issues relating to administration of graduate programs.