STUDENT LEARNING ASSESSMENT REPORT

PROGRAM: Information Technology (BS)
SUBMITTED BY: Diane Murphy
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EXECUTIVE SUMMARY

Program description from the Course Catalog

Marymount's Information technology (IT) program offers a solid foundation of knowledge across the system life cycle — defining requirements, developing software, administering and securing a computer network, and successfully managing IT projects. The curriculum addresses hardware, software, databases, networks, security, quality assurance, and project management. Students will focus in one of the following specialty areas:

Applied IT This specialization is for students who wish to study computers in the context of an application area, such as biology, education, or graphic design
Computer Science This specialization is for students who would like to design and build software products or design and build complex, secure networks
Data Science This specialization is for students who wish to develop knowledge, skills, and abilities to collect, store, find, and interpret "big data"
Forensic Computing This specialization is for students who wish to investigate computer crimes and prepare evidence for use in a court of law
Health IT This specialization is for students who aim to work in the health care industry, using technology to improve patient care
Information Systems This specialization is for students who wish to design support networks, provide technical support to system users, and design and manage websites, usually in a business context
Interactive Media This specialization is for students who would like to design websites using audio and video components
Networking and Cybersecurity — This specialization is for students who wish to specialize in network administration and the protection of today's computer systems

Upon successful completion of the information technology program, students will be able to
- function as IT professionals using a broad knowledge of IT to successfully analyze problems and implement IT solutions to these problems both in an internship and in a job after graduation;
- apply specific skills in a segment of the information technology field (such as software testing or cybersecurity) allowing students to compete successfully for internships and entry-level jobs and to work effectively in these areas;
- demonstrate proficiency in at least one programming language, but be able to learn additional programming languages based on a knowledge of programming principles, and participate in programming competitions;
- demonstrate proficiency in a variety of skills such as computer repair, computer networking, database design, and cybersecurity through a combination of theoretical knowledge and hands-on experiences sufficient to obtain industry certifications; conduct a capstone project that includes research in a an aspect of information technology

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(hardware, software, data, or cybersecurity) and apply that research to a current information technology concern for businesses or society in general; compose and construct written documents and give presentations articulating business IT needs, identifying solutions, and considering decision implications, with arguments backed by data;

- work successfully in a team environment both as a team leader and as a participant of a team, and communicate effectively with team members who do not have a technical background;
- conduct themselves as responsible professionals and global citizens who are aware of ethical issues and societal needs and who can determine the most ethical response to common dilemmas in the field; and
- possess the knowledge and skills required to pursue life-long learning, including advanced degrees in areas relating to information technology and to adapt to an ever-changing, global technological and business environment.

List all of the program's learning outcomes: *(regardless of whether or not they are being assessed this year)*

Learning Outcome	Year of Last Assessment	Assessed This Year	Year of Next Planned Assessment
Build a broad knowledge of information technology, allowing students to function as IT professionals who can successfully analyze problems and implement IT solutions to these problems both in an internship and in a job after graduation.	2016-2017		**2019-2020**
Build specific skills in a segment of the information technology field (such as software testing) allowing students to compete successfully for internships and entry-level jobs and to work effectively in these areas.	2014-2015		2018-2019
Become proficient in at least one programing language, but be able to learn additional programing languages based on a knowledge of programming principles, and participate in programming competitions	2016-2017		**2019-2020**
Become proficient in a variety of skills such as computer repair, computer networking, database design, and cybersecurity through a combination of theoretical knowledge and hands-on experiences sufficient to obtain industry certifications.	2016-2017		**2019-2020**
Conduct a capstone project that includes research in an aspect of information technology (hardware, software, data, or information security) and apply that research to a current information technology concern for businesses or society in general; compose and construct written documents and give presentations articulating business needs, identifying solutions, and considering decision implications, with arguments backed by data.	2014-2015		2018-2019
Compose and construct written documents and give presentations articulating business needs, identifying solutions, and considering decision implications with arguments backed up by data.	2014-2015		2018-2019
Work successfully in a team environment both as a team leader and as a participant of a team, and communicate effectively with team members who do not have a technical background.	**2013-2014**	**XX**	
Conduct themselves as responsible professionals and global citizens who are aware of ethical issues and societal needs and who can determine the most ethical response to common dilemmas in the field.	**2013-2014**	**XX**	

Possess the knowledge and skills required to pursue life-long learning, including advanced degrees in areas relating to information technology and to adapt to an ever-changing, global technological and business environment.	**2013-2014**	**XX**	

Describe <u>briefly</u> how the program's outcomes support Marymount's mission, strategic plan, and relevant school plan *(generally not more than two paragraphs, may use bullet points)*:

The BS in Information Technology program is fully compliant with the mission of Marymount University and the outcomes are based on both the foundation in arts and sciences (needed for a well-rounded education) and career preparation (broad IT knowledge, specialized knowledge, and specific skill proficiency leading to certifications and life-long learning). The program recognizes the new job skills required in the profession and offers specialized courses (e.g., cybersecurity, mobile app development, Python programming, software testing, health information technology) to increase each student's success in getting a good internship, first job, and ultimately a career in the field. These job skills are matched with current industry certifications. The program also includes "soft" skills that are commonly requested by today's employers (communication skills, problem solving, writing proficiency, and the ability to work in teams). Finally, it recognizes the changing nature of the IT field and hence the need for life-long learning.

Our faculty is focused on academic excellence and student success. Our work integrates Marymount's three pillars of intellectual curiosity, service to others, and building a global perspective as follow:

Intellectual Curiosity

Inquiry learning is a key in the IT program and all professors (full-time and part-time) are encouraged to use classroom time, in part, for hands-on application of the subject matter through individual and group assignments. Students are also encouraged to develop their intellectual curiosity outside the classroom through membership of clubs such as the Cybersecurity Society, the UPE Honors Society, The Cyber Competition Group, the ISACA Student Group, and the Mobile App Development Special Interest Group.

> Hands-on self-learning outside the classroom is also facilitated by the ability for students to acquire software for use on their own machines through the department's Microsoft Imagine and VMWare licenses (access to specific software for free) or through open source software recommended by faculty. These self-learning activities promote the life-long learning necessary to be successful in the ever-changing technology sector.

We constantly evaluate the subject matter covered in the program to ensure that we match the knowledge and skills required in the current work place, including new models such as the Department of Labor Competency Models (Information Technology and Cybersecurity), the National Initiative for Cybersecurity Education (NICE) framework, and the ABET Information Technology accreditation standard.

Service to Others

A Marymount pillar is for all students to serve the community. IT students do so through their own individual activities, jointly through club activities, and as assigned on projects in various classes such as in IT125, Web Development, or in their capstone project IT489, IT Capstone Project. We implemented a series of IT seminars (sophomore, junior, and senior) each semester, which provide an environment for volunteer opportunities, discussions, guest speakers, and the introduction of new technology. Students are encouraged to do projects that support the campus. IT faculty and students also participate in a continuing

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education program for seniors at the Falls Church Community Center. Twice a year, we provide a series of 3 2-hour sessions in a series that facilitates safe use of technology by seniors. This has been highly successful and faculty and students will provide an additional series of 3 sessions in November 2018 and in February 2019.

Global Perspective

One of the main concerns in the IT education field is the lack of underrepresented minorities (including women, African-Americans, and Hispanics). Most computer science and IT programs at other universities have fewer than 10% female participation. Marymount has close to 30% female students and has a good representation of African-Americans and Hispanic students. Many of these students are transfer students from the Northern Virginia Community College system with which we have good relations at the faculty level. The program also includes a number of international students and several athletes. The program also supports many veterans, many of whom come in as transfer students. The IT faculty, itself very diverse, is active in recruiting underrepresented minorities to Marymount, working closely with Arlington Public schools, Bishop O'Connell High School, and the Marshall Academy in Fairfax County, for example. The summer NSA-sponsored GenCyber camps run in 2015, 2016, 2017, and 2018 are another mechanism for this with some 75 highly-engaged and diverse students coming to campus each summer

We ran our third global IT event in March 2017 and several undergraduate students came on the trip to Dublin, Ireland. They are still talking about it!! An increasing number of students also participated in the university's study abroad program.

Provide a <u>brief</u> description of the assessment process used including strengths, challenges and planned improvements to the process, and provide evidence of the existence of a culture of continuous improvement based on assessment *(generally not more than two paragraphs, may use bullet points)***:**

There was no outcomes assessment process in the 2015-16 academic year as it was the year after the program review.

In 2016-17, the assessment process was very efficient and undergraduate faculty responses (full-time and part-time) were completed in a timely manner. As in previous years, outcome assessment techniques were discussed early at a meeting of the Department of Information Technology and Management Science. The plans from the previous 2014-15 assessment were discussed, and plans put in place to focus on both career preparation: teamwork, programming languages, and the development of skill sand ethical decision making in the designated courses. Rubrics and data collection requirements were identified.

A number of other initiatives were also identified as part of our continuous improvement process including revising scheduling to meet the additional number of working students, the development of a new specialty in application security, and the need for a specific Python programming course for Fall 2017. Writing intensive strategies have been implemented throughout the curriculum and all undergraduate faculty have been through the writing intensive training program offered by the CTL. Oral and written communication is emphasized in every course, particularly in the seminars.

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Describe how the program implemented its planned improvements from last year:

Outcome	Planned Improvement	Update (Indicate when, where, and how planned improvement was completed. If planned improvement was not completed, please provide explanation.)
Build a broad knowledge of information technology, allowing students to function as IT professionals who can successfully analyze problems and implement IT solutions to these problems both in an internship and in a job after graduation.	We will continue to develop a new specialty in Applied Security to meet the increasing workforce demand in the cybersecurity area. This was proposed in the 2012-13 assessment and some courses have been developed and tested (e.g. Python scripting). Additional content will be added to the seminars (IT223, IT323, and IT423) and to increase the confidence in obtaining a job on graduation. We will increase our focus on finding and promoting opportunities through our alums, adjuncts, and business contacts and promoting them through the Cyber Center Canvas site introduced in Summer 2017.

Faculty will meet and explore how to measure the knowledge piece of the outcome, outside the workplace competencies. | The Applied Cybersecurity specialty was submitted to UCIC and approved by Faculty Council in the 2017-18 school year. It began in Fall 2019 and to date has been selected by about 20 students.
We continue to add content to the seminars to increase student's confidence in getting that all important first job.
The Cyber Center Canvas site has been a great success. With support from a Graduate Assistant about 10 – 12 internships and jobs are posted each week, demonstrating the type of jobs that are available. Many students have obtained jobs and internships based on these postings. |
| Become proficient in at least one programing language, but be able to learn additional programing languages based on a knowledge of programming principles, and participate in programming competitions | Programming, including scripting languages, are an important component in many IT jobs in the workplace. Looking at the various job descriptions, there are a variety of languages, and associated tools and libraries, too many to teach in the program. We will, however, keep abreast of the changes in the IT workplace and ensure students are aware of the "new" environments as part of the seminars (IT223, IT323, and IT423). A new assignment will be added to IT323, IT Junior Seminar, to allow students to research a new language and show how it relates to a language they have taken.

We will continue to work with the students in the seminars and programming classes to do a comparative analysis of what they have learned and what the industry is looking for to help boost their confidence. Some of their concern is the change in programming skills needed in the industry so we will show learning the principles translates into learning a new language. | The assignment was added to IT323 for the 2017-18 school year. In addition, we are working with ISSA, a professional organization, and they provide a mentor to offer free programming skills classes on Friday evenings and Saturday mornings.
We continue to work in the seminars and advisors in developing the confidence of our students as they enter the workforce. This year we also created the TechExpo which allows students to demonstrate any products and be evaluated by judges from faculty and industry. For the first one, five students signed up and 4 demonstrated their web sites and mobile apps. Another event will be held in January 2018.Students are also encouraged to present their work at the Student Research Conference but acceptance has been low. |
| Become proficient in a variety of skills such as computer repair, computer | We will continue to address certifications, and their importance, in the seminars and run at least one boot camp, out of class. Certifications will | Our advising process was changed for 2018-19 and Dr. Conrad advising all sophomores who were Marymount |

Outcome	Planned Improvement	Update *(Indicate when, where, and how planned improvement was completed. If planned improvement was not completed, please provide explanation.)*
networking, database design, and cybersecurity through a combination of theoretical knowledge and hands-on experiences sufficient to obtain industry certifications.	not be required because of the cost, they will be encouraged however and alums will be surveyed to see which and when they take certifications. We are planning to modify our advising program, in Fall 2017 such that a single faculty member advises the students who entered Marymount as freshman the semester before. This faculty member will also teach the IT223, Sophomore Seminar, and so develop a cohesive community among these students.	freshman last year. She also teaches It323, the Sophomore seminar. Because of excessive workloads last year, we were not able to organize and bootcamps in 2017-18, However, one is running now: an AWS Certification bootcamp with about 34 students attending the free Friday evening sessions.

Provide a response to last year's University Assessment Committee review of the program's learning assessment report:

Comment:
The report was generally acceptable with the exception of how the outcomes were phrased. The comments were about the multi-dimensional nature of the outcomes for example focus on jobs and internships, ability to learn additional programming languages, skills such as …. The overall recommendations were that we uncouple outcomes and make sure that measures relate to outcomes measured.

Response:

These outcomes have been in assessments for the past few years and this was the first time that the quality of the outcomes was addressed. We had some preliminary discussions with Joe Provenzano in CTL to reframe the objectives with little success. This is a career-focused degree and we believe that the focus on jobs and internships is important and has resulted in significant increases in enrollment in the program (263 students in Fall 2018). The realignment of outcomes is still an ongoing process in the department. It is scheduled for the department meeting at the end of the semester, when all curriculum changes have been processed and moved on to the School Curriculum Committee.

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Outcomes Assessment 2017-2018

Learning Outcome 1: Work successfully in a team environment both as a team leader and as a participant of a team, and communicate effectively with team members who do not have a technical background.

Assessment Activity

Outcome Measures *Explain how student learning will be measured and indicate whether it is direct or indirect.*	Performance Standard *Define and explain acceptable level of student performance.*	Data Collection *Discuss how the data was collected and describe the student population*	Analysis *1) Describe the analysis process.* *2) Present the findings of the analysis including the numbers participating and deemed acceptable.*
Direct: Measure the effectiveness of team interaction in the IT seminars.	**80% of the students obtain a "good" average grade (4.0 or greater out of a 5.0 scale) is each of the seminars**	**In Fall 2017 and Spring 2018, each IT seminar had a major team project resulting in a formal team presentation** **IT223: Sophomore IT Seminar: 32 students in FA and 20 students in SP (total 52)** **IT323: Junior IT Seminar: 28 students in FA and 37 students in SP (total 65)** **IT423: Senior IT Seminar: 32 students in FA and 27 students in SP (total 59)** **Each student was rated from 1 to 5 (poor to very good) for their performance in each of these seminars by the instructor and 2 GAs. The results were averaged.**	**IT223: 75% earned good or very good (34)** **IT323: 83 % earned good or very good (54)** **IT423: 85% earned good or very good (50)** **Average: 80.01%** **The criterion was met, albeit barely, and performance did improve as the students got closer to graduation. This may be influenced by the fact that students are familiar with each other by that point, their maturity and life experiences, and their education. It was noted that the successful teams made good use of technology to assist in communication even though each student may have a different schedule.** **Note: performance improved by nearly 10% over a similar assessment in 2013-14 when the average was 70.18%**
Indirect: Clients will assess the team activities of their interns in the internship program	80% of internship supervisors will give favorable ratings for the teamwork of Marymount students	Surveys conducted by the SBA Internship Coordinator include the question: The intern was capable of employing leadership and collaboration/team skills	There were 16 IT internships in Fall 2017, 20 in Spring 2018, and 23 in Summer 2018 (Total 59). Of these 93% of all internship supervisors in the IT gave the students a 4 or 5 scale indicating that the students were able to function in the workplace in collaborative teams. The standard was met.

| Outcome Measures
Explain how student learning will be measured and indicate whether it is direct or indirect. | Performance Standard
Define and explain acceptable level of student performance. | Data Collection
Discuss how the data was collected and describe the student population | Analysis
1) Describe the analysis process.
2) Present the findings of the analysis including the numbers participating and deemed acceptable. |
|---|---|---|---|
| | | The scale was 1 (strongly disagree) to 5 (strongly agree) | |
| Indirect: From Graduating Student Survey, ensure that students feel confident about their ability to work in teams in the workplace. | 80% of students believe that they can work effectively as part of a team and 70% of students think that they can effectively lead a team in the workplace. | One of the questions on the 2013-14 Graduating Student Survey – Evaluation of Preparation is "Work as Part of a Team".

Another question is:
"Lead a team" | 34 people responded.
88.2% of the students replied that they were comfortable in working in a team and 82.4% said they were comfortable leading a team.
The standard was met. |

Interpretation of Results

Describe the extent to which this learning outcome has been achieved by students *(Use both direct and indirect measure results)***:**
The standards for the three measures were met and teamwork proficiency increased over time in the program.

Briefly describe program strengths and opportunities for improvement <u>relative to assessment of outcome</u>:
Teamwork is an increasingly important part of the B.S. IT program and students are made aware throughout the program of the increased emphasis of teamwork in the workplace. Much work in IT is, however, performed in remote teams we need to add a component on remote teamwork to the senior seminar, e.g., using WebEx or Zoom.

Discuss planned curricular or program improvements <u>for this year based on assessment of outcome</u>:
Team work is implemented by various professors but we do not have a clear picture of how it is scaffolded throughout the program. A survey of group-based activities in each of the main courses in the program will be collected.

Learning Outcome 2: Conduct themselves as responsible professionals and global citizens who are aware of ethical issues and societal needs and who can determine the most ethical response to common dilemmas in the field.

Assessment Activity

Outcome Measures *Explain how student learning will be measured and indicate whether it is direct or indirect.*	Performance Standard *Define and explain acceptable level of student performance.*	Data Collection *Discuss how the data was collected and describe the student population*	Analysis *1) Describe the analysis process.* *2) Present the findings of the analysis including the numbers participating and deemed acceptable.*
Direct: Make ethical decisions as part of an assignment in the MSC345, Project Management, class	80% of the students in ALL Fall 2017 and Spring 2018 MSC345 classes obtain 24 or more on their ethical assignment, which required carefully thought out responses to ethical dilemmas.	Towards the end of the semester, students were given 3 ethical dilemmas and asked to discuss how they would respond in the workplace. One of the questions were directed as their role as a project team leader, one as a senior member of the team, and one as a junior member of the team. The assignment was an in-class assignment and submitted through Canvas.	The Department Chair was given access to the Canvas site and reviewed the students' submissions. The responses were evaluated by the Department Chair using the rubric in Rubric 1 in the attachment (maximum score 36) Of the 81 students in the five classes, there were 76 responses. Of these 65 were IT students, the remainder being business management students. Using the rubric, the Department Chair assigned scores to each question to ensure consistency across all classes (taught by two different professors). Of the 65 IT students in the two classes, 56 students received a score of 24 or more (86.15%). Most made the right ethical decision and provided a good justification for their actions to demonstrate an understanding of ethical principles. The standard was met.
Indirect: On their internship, students showed an understanding of the importance of ethical behavior.	As ethics is a main component of a Marymount education, we should expect 100% of all supervisors to answer that they agree or strongly agree to the question the student behaved ethically in the internship	Data is taken from the Internship Program Semester Reports from Fall 2017, Spring 2084, and Summer 2018 prepared by the SBA Internship Coordinator. The supervisor survey included the following question: "The intern showed an understanding of the importance	There were 16 IT internships in Fall 2017, 20 in Spring 2018, and 23 in Summer 2018 (Total 59). 100% of the IT supervisors listed agree (4) or listed strongly agree (5) for the IT students. The standard was met.

Outcome Measures *Explain how student learning will be measured and indicate whether it is direct or indirect.*	Performance Standard *Define and explain acceptable level of student performance.*	Data Collection *Discuss how the data was collected and describe the student population*	Analysis *1) Describe the analysis process.* *2) Present the findings of the analysis including the numbers participating and deemed acceptable.*
		of professional ethics and ethical behavior"	
Indirect: From Graduating Student Survey, ensure that students feel confident about their ability to make ethical decision and understand the major ethical decisions in their field.	As ethics is a main component of a Marymount education, we should expect 100% of students to believe that they will make good decisions when placed with a dilemma in the workplace.	Graduating Student Survey prepared by the Office of Institutional Effectiveness. There are two questions on ethics: 1. Determine the most ethically appropriate response to a situation 2. Understand the major ethical dilemma in your field	88.2% of students rated their ability to determine the most ethically appropriate response to a situation and 88.2% felt that they understood the major ethical dilemmas in their field (good or excellent result). The standard was NOT met.

Interpretation of Results

Describe the extent to which this learning outcomes has been achieved by students *(Use both direct and indirect measure results)***:**
Very high standards for ethical behavior were set. Two of the three measures were met by all students.

Briefly describe program strengths and opportunities for improvement relative to assessment of outcome:
From Marymount's web site on ethics: "In today's complex society, ethical issues confront us at every turn. Every area of life – from business and technology to health care and education – requires ethical decision-making. A Marymount education prepares students to meet these challenges both in college and in life. Marymount emphasizes ethics and values across the curriculum and in all aspects of campus life." All B.S. IT Students take PH305, Business Ethics, as part of their liberal arts course. These ethical considerations are related to IT as part of the junior and senior seminars and in several courses, such as software engineering.

Discuss planned curricular or program improvements for this year based on assessment of outcome:
Much of the ethical discussions in these courses are in a group setting. An individual assessment will be developed in the senior seminar to reinforce ethical decisions in the IT field. As this year's Ethics Week is focusing on "Ethics in Technology" we will ensure our students are engaged in related activities. Dr. Schaeffer will develop a program for this based on a book she authored while on sabbatical last semester.

Learning Outcome 3: Possess the knowledge and skills required to pursue life-long learning, including advanced degrees in areas relating to information technology and to adapt to an ever-changing, global technological and business environment.

Assessment Activity

| Outcome Measures
Explain how student learning will be measured and indicate whether it is direct or indirect. | Performance Standard
Define and explain acceptable level of student performance. | Data Collection
Discuss how the data was collected and describe the student population | Analysis
1) Describe the analysis process.
2) Present the findings of the analysis including the numbers participating and deemed acceptable. |
|---|---|---|---|
| Direct: Number of students who elect the 5-year BS/MS options | 10% of students who decide to do the 5-year program and do the combined BS/MS degree. | The data was collected from the forms that are used to apply for the 5-year program and approved by the Associate Dean. | The outcomes assessment standard was met with 11 students from the 62 senior students requesting approval for the 5-year program (17.7%). The 5-year program is increasingly popular with incoming freshman and transfer students and is expected to increase with the influx of students. In addition, BS alums are increasingly entering the master's program after 1 or 2 years of working in the field. |
| Direct: Students took associated industry certifications and successfully passed them. | 25% of students took one or more industry certification tests and passed them. | In the IT senior seminars, students are surveyed on their certification interest and status and the results posted to Canvas. | 28.8% of graduating students have at least one certification prior to graduation. The most common were A+ and Network+.

The outcomes assessment standard was met.

The survey also showed that the students were interested in certifications but many thought they were too expensive (usually around $500 - $600 each). Some said they expected to have their employers pay for them when they get a job. Others requested for the university to give discount vouchers. |
| Indirect: Students attended professional events at the university or other local events in their senior year | 15% of students regularly attended professional events outside the university and 25% attended events hosted at the University. | Faculty attended ISSA, ISACA and NVTC, and other university events in the area on a regular basis and were asked to identify students at these events.
Sign-in sheets were maintained for the Marymount IT events and undergraduate IT students were identified. | 17 students (27%) were regular attendees at external events. At the two main events organized by the Cybersecurity Club in the academic year 2017-18, 22 students (35%) attended.

The standard was met. |

<div align="center">**Interpretation of Results**</div>

Describe the extent to which this learning outcomes has been achieved by students *(Use both direct and indirect measure results)***:**
All three measures were met. More students are realizing the value of a master's degree and are taking advantage of the 5-year program. Students are highly interested in certifications as an entry into the job market, but cost is usually given for the reason for their not actually taking them. Many do, however, state that they will take them when they get a job if the employer requires it, especially if they pay.

Briefly describe program strengths and opportunities for improvement relative to assessment of outcome:
The IT seminars are helping to prepare students for the workplace and are used to actively consider life-long learning opportunities. Certifications still need to be emphasized as an important component of evidence of "job skills" in the IT industry. Attendance at the university's IT events is higher than the standard but some work still need to be done to encourage students to go to external events in the IT field.

Discuss planned curricular or program improvements for this year based on assessment of outcome:
More emphasis will be placed on the need for certifications and some "study groups" will be formed around the certification process. More Marymount University events are being planned with a series of workshops beginning in Fall 2018.