University of Cincinnati and Saint Ursula Academy Partnership: Introducing Female High School Students to the Field of Information Technology, Year 2

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ABSTRACT
In this paper, we describe the second year of a partnership between the School of IT (SoIT), College of Education, Criminal Justice, and Human Services at the University of Cincinnati (UC) and St. Ursula Academy (SUA) to introduce Information Technology class sessions to their female student body. Following the same paradigm of the previous year, students from UC taught courses to these high schoolers under the supervision of SoIT faculty in order to promote a positive attitude in young women towards the IT field [5]. In a similar fashion to last year’s results, the analysis of the surveys after the tech sessions displayed significant improvements in the young women’s attitudes towards IT. In addition, enrollment also increased in the second session, just as seen in last year’s results. As there is a shortage of women in the IT field [1], these after-school tech classes may help reduce the IT professional gender gap. Overall, our classes seem to have an astonishing impact on the young women at St. Ursula Academy, as 29 students have already signed up for IT course at UC for next fall, with an additional 13 students who have signed up for the AP computer science course. These courses will be expanded to other schools in the area to help reduce other disparities in the diversity of the IT field.

Categories and Subject Descriptors
K3.2 [Computers and Education]: Computer and Information Science Education- computer science education.

Keywords
Information Technology, JavaScript Programming, Python Programming, Linux Operating System, PC Hardware, Raspberry Pi Projects, Personal Web Site Development.

INTRODUCTION
The underrepresentation of women and minorities in Science, Technology, Engineering, and Math (STEM) remains an unresolved problem in the United States [2]. In fact, many published papers have remarked upon this gender gap in IT: “Information, communication and technology (ICT) occupations represents a classic example of occupational gendered segregation and includes both vertical and horizontal segregation” [6]. A previous paper [5] described how the University of Cincinnati’s College of Education, Criminal Justice, and Human Services, School of Information Technology (SoIT) formed a partnership with a local all-girl high school in an effort to engage young women in the field of Information Technology. The justification for this partnership agreement, as conceived by SoIT and SUA staff, was that women who have participated in high school tech classes would “have a more confident attitude towards technology and are likely to enroll, and be successful, in the computer sciences at the post-secondary level” [2]; this program intended to introduce women to the discipline of information technology through project-based classes. The success of the program resulted in extending the after-school tech classes into the 2015-2016 school year. Modifications were made to the structure of the sessions—instead of four one-week sessions, the after-school tech classes were held for two two-week sessions. This permitted students who found the topics interesting to continue into the second week with more in-depth involvement.

The sessions were again delivered by undergraduate students who are members of SoIT’s Information Technology Student Association (ITSA)¹ or the Women in Technology (WIT)² undergraduate student organizations, but also included undergraduate students from the CyberCrime Cats³ student organization. The UC student-teachers again served as excellent role models for the high school students. All sessions were monitored and supported by the SoIT faculty and SUA staff.

The two tech sessions were provided, scheduled Monday through Friday in 75-minutes classes, with one session in November 2015 and the second in February 2016. Since most SUA students could not commit to both sessions, the technical classes were independent of each other. Neither of the sessions relied on material presented in the previous session; however, the second week on each session built on information covered in the first week.

Session topics were also selected based on their interest and appeal to high school students and the ability to be taught in a hands-on, active learning delivery by SoIT undergraduate students. The goal was to deliver an engaging and immersive experience that provided the high school students an authentic view of the discipline.
The two session topics were (1) JavaScript and Creating a Web Site, and (2) Raspberry Pi Projects and Cybersecurity. Participants met from 3:15 PM until 4:30 PM Monday through Friday for each hands-on session with all sessions conducted at SUA.

The following describes the sessions, followed by the results of the student surveys.

SURVEY DESIGN

At the end of each session, SUA students were asked to complete a survey. This survey was designed to determine prior IT experience and to judge the expectation and effects of the session on the student.

SESSION ONE- JAVASCRIPT & CREATING A WEB SITE

This session was held 9 – 20 November 2015 at St. Ursula Academy with seven SUA students participating. Six of the seven students who responded to the survey had attended the UC tech classes the previous school year.

Curriculum Content

All course material for this session is located at https://sites.google.com/site/codewizarddyschool/home/javascript-programming. Each session’s activities were pre-recorded as screen capture video and the students could access them prior to each session. The videos were uploaded to YouTube after the completion of each session and can be accessed at: https://www.youtube.com/playlist?list=PLFga3S1icDr87WCnhTMcBx-vLc97PTv.

For the first week, Tom Wulf, a UC professor, created the web design course that lasted from November 9th -November 13th. In the same manner as last year, students used NetBeans to introduce themselves to HTML5 and CSS3 to create web pages. In contrast to last year’s e-Greeting card module, this session was more open to variations based on the students’ interests. To engage the students, the young women were assigned to create their own individualized projects that matched their topics of interest.

The lecture was accompanied by the students creating their own web site, incorporating each day’s lesson as the week progressed. As there was only one week devoted to web design, emphasis was given to the most useful topics for the students’ web pages—links, images, videos, etc. The first day consisted of an overview of the course, HTML5 page structure, NetBeans summary, and a brief discussion of copyright, security, and privacy involved in IT. Day two went further into depth of HTML5, CSS, and NetBeans, while day three continued with the same topics and reviewed the week’s materials. Day four focused on HTML5 and day five was a day to complete the web projects by personalizing the students’ web pages; this included creating new pages and adding pictures and videos to the students’ web sites.

The second week, also developed by Tom Wulf, spanned from November 16th -November 20th. This week concentrated on JavaScript. Similar to the first week of the course, day one started with an introduction to the course and then went into how to create a NetBeans template, how DOM programming works, and gave an overview of JavaScript. Day two went over JavaScript variables. Day three connected weeks one and two by going over HTML5 GUI elements, and then went into JavaScript click event code for buttons. Day four delved into JavaScript control structures and JQuery. Finally, on the last day, the students finished up their work by utilizing the week’s instruction to create their own project. This functions to solidify the course topics by applying the instruction in a hands-on project.

In addition, several supplemental videos were created and available for the students. These videos covered: 1) how to link the e-Greeting Card App from the previous module into the Web site; 2) how to create a random image sequencer with JavaScript; and 3) how to randomize a static image with JavaScript.

One of the students later used knowledge gained from this session to build a website for one of her course projects. She used HTML5 and CSS3 to create a multi-page site, which included features beyond the topics of the JavaScript and Design a Web Page session. This application of the course materials was a confirmation that teaching basic IT subjects promotes confidence in the IT field, and allows students to use technology in other areas of their education.

SESSION TWO- RASPBERRY PI AND CYBERSECURITY

Session two started on February 2nd and lasted until February 11th, 2016. The first week covered Raspberry Pis and the second week covered Cybersecurity. Once again, this session was held at St. Ursula Academy with eleven SUA students participating in the first week and five students in the second week. Sixteen seats were filled in these two weeks, with seven of the ten students who responded to the survey attending at least one of the UC tech classes the previous school year (see Table 1 for more details).

Curriculum Content

The first week of this session was designed by Jen Fritz, a UC professor, and covered Raspberry Pis. Day one included familiarization of the Raspberry Pi components, comparing them to the PC, as well as downloading software and games. Day two consisted of explaining the purpose and the use of resistors, jumper leads, and breadboards. Also, general purpose input/output (GPIO) pins, Integrated Development and Learning Environment (IDLE) environment, and the Python programming language were described. Python was used to code all lab functions for this session. The project for day two was creating a light show with a Raspberry Pi. Day three’s content was explaining pushbutton switches and jumper wires, creating folder and downloading sound files, and incorporating the day’s lessons into a soundboard project. On day four, Python was used to utilize the camera and video functions on the Raspberry Pi. For the final day, students created
their own projects based on their interests and made up any missed projects from the week. Overall, students were able to utilize the Raspberry Pis to create audio and visual projects. One of the students, building on the information obtained in this session, used a Raspberry Pi to power and control lighting in a mock-up house as a project for a physics project! This is a great indication of growing interest and awareness of the field of IT streaming from this after-school session.

Week two of session two was created by Tony Iacobelli, a current student at UC’s School of IT, and the topic was Cybersecurity. This week used hands-on projects with the websites Virus Total and Malwr to analyze suspicious files; students used Raspberry Pis to conduct all the labs during this session. In this way, week two built off of knowledge gained from week one. Wireshark, a packet-capture software, demonstrated how the Transport Layer Security (TLS) protects data in transit. Students had three main focuses for this week: 1) all Internet users are targeted online; 2) all malware has a person creating and directing it; and 3) there are methods to protect themselves and their online data. Students asked excellent questions and realized that anyone with a packet capture software program, i.e. Wireshark, can see their unencrypted traffic online. Most of the questions posed by the students were not about the topics taught in this course, but about common scenarios that the students deal with daily and their implications.

STUDENT FEEDBACK -- CRITICAL ANALYSIS
Fifteen SUA students participated in both tech sessions.

Student Participation
The following table shows the participation across the sessions.

Table 1: Student Participation

<table>
<thead>
<tr>
<th>Student</th>
<th>JavaScript &amp; Creating a Web Site</th>
<th>Raspberry Pi</th>
<th>Cybersecurity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>3</td>
<td>X</td>
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<td>4</td>
<td>X</td>
<td>X</td>
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<td>5</td>
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<tr>
<td>6</td>
<td>X</td>
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<td>7</td>
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<td>X</td>
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<td>8</td>
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<td>12</td>
<td>X</td>
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<tr>
<td>13</td>
<td>X</td>
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<tr>
<td>14</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Student Survey Response Rates
Table 2 shows the percentage breakdown of survey responses in both sessions.

Table 2: Survey Response Analysis

<table>
<thead>
<tr>
<th></th>
<th>JavaScript &amp; Creating a Web Site</th>
<th>Raspberry Pi</th>
<th>Cybersecurity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended</td>
<td>7</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Responded</td>
<td>7</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Mean Response</td>
<td>100%</td>
<td>54.5%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Selected Survey Results
An individual break-down of students who participated in the sessions is provided in Table 1 and Table 3 shows the survey results across all sessions.

Table 3: Selected Survey Responses

<table>
<thead>
<tr>
<th>Question</th>
<th>Number of Respondents</th>
<th>JavaScript &amp; Creating a Web Site</th>
<th>Raspberry Pi</th>
<th>Cybersecurity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other than the SUA freshman tech class, was this the first tech class you have ever taken?</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
If you have taken a tech class previously, please describe it. When & where did you take it?

All previous IT classes were tech sessions provided by UC last school year

All previous IT classes were tech sessions provided by UC last school year

All previous IT classes were tech sessions provided by UC last school year

The pace of the class was:

Just right

Too slow

Too fast

The week was:

Just right

Too short

Too long

Would you recommend this class to a friend?

Yes

No

Maybe

Unanswered

I would be interested in a tech class about (check all that apply)

Programming

Creating a web site

Networks

Robotics

Databases

Digital design

Video

Other

I [More in depth with raspberry pi]

Having taking this class are you:

More interested in technology

Less interested in technology

Interest is about the same as before

How would you rate the class?

Excellent

Very Good

Just OK

Poorly done

Would never recommend it

SESSION ONE: JAVASCRIPT AND CREATING A WEB PAGE
Question and responses that are not covered in Table 3:

Question 3: What were you expecting to do in this class? Did the class meet your expectations?

Responses:

(1) I was expecting to just do HTML and CSS but we did both as well as JavaScript. It exceeded my expectations.

(2) I was expecting to be able to make and publish a website and learn a little about html and JavaScript. Yes, it met my expectation.

(3) I did not really know what to expect, but it was a great learning experience.

(4) I was expecting to design a website. It did meet my expectations.

(5) I was hoping we would learn to make websites. And the class did meet my expectations, as I thought it would be similar to last year. This was better because we got to incorporate JavaScript into our websites which was fun because we did not do this last year.

(6) I was expecting to successfully crate my own website and learn how to code for future use. Yes, the class did meet my expectations.

(7) I didn’t know what to expect, and yes.

Question 4: List two things you learned in class?

Responses:

(1) I learned more things about JS and why classes and IDs are important in HTML.

(2) How to code in HTML5 and make a website look cool. How to use JavaScript and make buttons.

(3) HTML and CSS, to make lists; to make a copyright.
I learned how to do some simple functions in JavaScript and I learned how to use HTML5 and CSS to create and style a website.

I learned a lot about JavaScript. I think that it is so cool how the CSS, HTML, and JS all work together to create a single webpage. I thought learning about the comments were cool. I liked and learned so much from every day of the class.

I learned how to code and build a website.

Question 5: Describe something that could be changed to improve this class:

Responses:
1. Nothing I can think of.
2. idk it was good.
3. The first few days of class when we did not review what we were learning about with the PowerPoint beforehand were a little more confusing than when we did not follow the PowerPoint.
4. I really enjoyed the things that we did with JavaScript, but it would be cool if we could learn some JavaScript functions that could be more useful in our websites, or if we could do an entire other class about JavaScript by itself.
5. Maybe have this class more often during the year so that we can keep working on our websites and learn more about coding. It could be once a quarter.

Question 12: Anything else you’d like to share?

Responses (other than negative responses):
1. Sometimes the class was not well organized and we started late, but otherwise that it was great!
2. I really enjoyed these classes! Please continue to offer them; I think they are very interesting and fun. They have helped me to learn a lot about technology!

SESSION TWO: RASPBERRY PI AND CYBERSECURITY

Question 3: What were you expecting to do in this class? Did the class meet your expectations?

Responses:
1. I expected to get to know the raspberry pi and it met my expectations.
2. I was expecting to code with Raspberry Pi but I was not expecting the level of hands-on activity that we did, which certainly exceeded my expectations.
3. Learn about raspberry pis and the cool things you can do with them
4. I did not know what we were going to really be doing! It was an okay class.
5. I was expecting to program raspberry pi, but I didn't know exactly what we would be programming, so the class did meet my expectations.
6. I was expecting to learn about what a raspberry pie was, what it did, and how to use it. My expectations were met in this class.
7. I was expecting to learn about data security and this far exceeded said expectations.
8. I wanted to learn about cyber safety and how I could protect my computer from malware.
9. I honestly did not know there would be a cybersecurity part to the class. It was very neat though to learn about.
10. I was expecting to learn about hackers and how they can get into private information and how to protect ourselves from it.

Yes, this class did meet my expectations.

Question 4: List two things you learned in class?

Responses:
1. How the raspberry pi works and how to code using the breadboard
2. I learned how to use a Pi, and a bit about how circuitry works.
3. How to make a light show with the Raspberry Pis and how to take pictures with Raspberry Pi
4. Learned how to code. I also learned how to take a picture with the Raspberry Pi.
5. What a breadboard is and what its purpose is and how to put together a Raspberry Pi
6. I learned how to program lights, sounds, pictures, and videos on my raspberry pie. I learned how to read the codes and how to set up a raspberry pie from scratch.
7. How to protect my files from malware & a backup to google drive is useless in some cases
8. I learned that when you have a .docm then the m means it's a bad site. Also, that if people use the word kindly a lot in a strange email it's probably also bad.
9. I learned what a defender was in the cyber world and how you can help protect yourself from people who are trying to steal your information. I learned what NIPS (NIDS) is and how they are the best for defense.
10. I learned about hacking and the kill chain as well as protecting my own data.

Question 12: Anything else you’d like to share?

Responses: Nothing else to share or a negative response.
Evaluation of the Survey Responses

Fostering interest in the study of IT is the major goal of the partnership agreement between UC and SUA. The survey responses show an overall increase in the interest and positive attitudes towards IT.

In the 2014 session, 87.5% of the survey respondents had never taken an IT class before [Question 1] and the only tech classes taken by survey respondents in the remainder of the sessions were courses given through this partnership [Question 2]. Through the 2015 session, eight of the 17 respondents, or 47% of the students, had not taken an IT course and the remaining 53% had only taken IT tech classes offered by SoIT. Of the fifteen students involved in the 2015 session, six had taken tech classes from us during the 2014 session. As in the previous year, we were again able to reach female students who had no previous exposure to IT training.

Looking at student expectations in Question 3 finds that course descriptions accurately described the courses and met the expectations of the students. In Question 4, the students listed two things they learned in the session which corresponded to the learning objectives.

The intent of Question 6 was to see if the time allotted to present the amount of material was suitable. 82.4% (14 of 17) considered the pace as just right while 5.8 % (2 of 17) thought the pace too slow and 5.8% (1 of 17) felt the pace was too fast. This indicates that the majority of students felt that an adequate amount of time was allotted to each topic.

It was important to ensure students were engaged and found the course interesting enough to recommend the course to a friend. Question 7 shows that 81.25% would recommend these classes to their friends, letting their peers know that IT classes are worthwhile. This was the most encouraging of all the responses—women enjoyed studying topics in IT and wanted their friends to experience this opportunity! Peer referrals may be the best way to encourage women to get involved in STEM. The remaining 18.75% answered Question 7 with “maybe.”

Creating a web site generated the most interest in 2014 for the topic of interest for future studies, but this year’s surveys showed that programming was the IT topic that created the most interest, followed by digital design, as seen in responses to Questions 8. It appears that the use of the JavaScript, HTML, and Python languages kindled an interest in studying programming.

Plus, involvement has sparked more interest in IT (58.8%) while the remaining (41.2%) maintained interest level (see Question 9 in Table 3). These students maintained or increased their interest in IT throughout these sessions.

The input to “How would you rate the class?” [Question 11] was varied. 58.8% rated the session as excellent, 29.4% as very good, and 11.7% as just OK.

There were only negative responses to Question 12.

TOPICS TO FOLLOW

The students were asked to list which IT topic they would like to have a tech session include. Students could select as many topics as they would like, plus they could write in additional topics not listed.

<table>
<thead>
<tr>
<th>IT Topic</th>
<th>JavaScript &amp; Creating a Web Site</th>
<th>Raspberry Pi</th>
<th>Cybersecurity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming</td>
<td>7 of attendees 7 students responded</td>
<td>10 of attendees 6 students responded</td>
<td>5 of attendees 4 students responded</td>
</tr>
<tr>
<td>Creating a web site</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Networks</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Robotics</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Databases</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Digital design</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Video</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>1 [More in depth with raspberry pi]</td>
<td></td>
</tr>
</tbody>
</table>

FUTURE PROJECTS

The gender gap in the IT field is not the only problem in diversity. There is a lack of African Americans, especially African American women, who are in the computer sciences and IT majors [6]. The next steps in expanding this IT after-school program will be to offer these courses at Chatfield College, a Catholic three-year liberal arts college, and DePaul Cristo Rey (DPCR), a Catholic college preparatory high school. Chatfield College is comprised of approximately 48% over the age of 24, the ratio of women to men is 3-to-1, and at the Cincinnati campus, most are of African-American heritage. Additional information on Chatfield College is located at www.chatfield.edu/.
For DPCR, financial need is generally significant enough that 60% of the families can only afford to pay $500 of the $5,000 tuition [8]. Additionally, DPCR is a diverse student body, with 64% African American, 20% Caucasian, 11% Hispanic (a growing population of 1% in the senior class and 19% of the freshmen class), 4% multi-racial, and 1% Asian [8]. DPCR invests in their students by providing each student a laptop. This helps to alleviate problems of technological access barriers and assure students are at least able to access the Internet and the school’s Blackboard (web-based learning environment). Assisting in these efforts to ensure that students are not limited by technological barriers, UC intends to provide IT classes, as was done for St. Ursula Academy. Since DPCR does not have IT classes available for students, UC can offer these classes to reach their student body—one that is generally under-represented in the IT field.

To adequately incorporate groups that are missing from the IT professions, specifically African Americans and women, the major risk factors that prevent them from joining the field must be addressed. For many African American students, a risk factor for not joining the IT field is finances [6]. In fact, while “most in our society, including our present government, would state that the digital divide is growing smaller. Statistics do not indicate this fact among African American households” [6]. Integrating diversity into the IT work force is essential to making inclusive environments with multiple perspectives: “Although effective integration of diversity can result in a competitive edge, lack of the utilization of diversity potential is likely to breed tension, conflict, and misunderstanding” [9]. While DPCR is starting to address some of these issues by providing laptops, assistance from UC can help bridge more of these gaps; this is a start that can promote diversity within the future IT work force.

CONCLUSION
The chief goal of this project was to increase awareness of STEM disciplines among female students. In the past two years of this partnership, these technology sessions resulted in 44 (29 in 2014 and 15 in 2015) high school women participating in tech classes, filling a total of 74 (51 in 2014 and 23 in 2015) class spaces. The sessions were intended to improve the young women’s attitudes towards IT and the survey responses of these young women were once again highly favorable in all areas. Reflecting last year’s trends, these high school students generally improved their attitudes towards IT, which shows a favorable trend towards increasing the number of women in IT [5].

Additionally, as seen in the previous year’s sessions and subsequent analysis, the women’s responses to the course surveys continue to parallel the main objective—changing young women’s attitudes towards IT. We are still confident that these attitudes will be shared with the young women’s peers. These positive changes in attitude are not ending with the participating young women who attended these sessions; again, this year and the enrollment in future classes demonstrate that these ideas and attitudes are spreading among their peers.

Ultimately, this project continues to provide optimistic perspectives for the future. This can be seen in the broader opportunities for women in IT that are sparking greater interest in the field; this work may be helping to solve the IT labor shortage of women [3]. Furthermore, our future projects aim to promote diversity among other under-represented groups for the IT field. Overall, a “gender-specific approach” with expanded IT opportunities for women, as well as our future programs to reach other under-represented groups in IT, may be essential to garner these groups’ interest and commitment to the IT field [3, 6].

Although it should be noted that expanded opportunities are not the only essential incentive to draw women into the IT work force, proper environments must be established in order to create social bonds. By continuing to use UC students as the teachers, this program establishes a mentoring relationship. Furthermore, these minor age gaps between the high school students and student teachers foster an empathetic learning environment. UC students are given the opportunity to lead the tech sessions, which allows for co-learning. This process facilitates the high school students studying IT topics while the UC undergraduate students re-enforce their IT skills by teaching. This year’s sessions, just like last year’s, maintained the invaluable co-learning, teaching experience for the UC student teachers, while simultaneously offering peer role models to the high school students.

Sessions were designed to engage the young women, as well as to stimulate their interest, newfound confidence in the IT field, and positive attitudes towards IT. Many of these positive outcomes were from providing these students IT skills that may translate into their future careers, no matter if they join the IT work force or not. The surveys and the encouraging enrollment in the CCP online classes offered through UC suggest that our methods of teaching and the topics being taught should be continued for the incoming classes at SUA, as well as at the future institutions that we will be implementing our courses. These courses provide not only IT skills, but also community engagement and encouragement for continuing upper-level education.

Currently, discussions are in progress to continue the IT sessions at St. Ursula in the upcoming school year. In addition, there are new online class offerings at St. Ursula in addition to the Fundamentals of Technology. These classes are basic IT courses offered to the SoIT freshmen offered for credit to high school students through a program called College Credit Plus (CCP). About 29 SUA students have signed up to take these classes. Of these, 12 participated in at least one of the after-school tech classes offered by UC from 2014-2016; again, this demonstrates that these women have a continued interest in studying IT. As only 12 SUA students have taken the UC courses, the other 17 SUA students were influenced by their peers’ experiences. Thus, this illustrates the effect of spreading positive attitudes among these young women exposed to IT classes in high school. These numbers justify our optimism in introducing new, similar courses at Chatfield College and DPCR.

At SUA, we saw that the environment within the school was impacted by the after-school tech classes and the resultant awareness that was building; the students were not only drawn to take the CCP courses, but they also were drawn to “tell a friend” and influence other students. We expect to see the same impacts on DPCR and Chatfield College students as we saw with the young women at SUA.

In the future, the program could benefit by providing workshops for more advanced topics in programming, web design, and networking. Further, prospective programs could include topics such as robotics, databases, and digital design. One option to train the “student-teacher”
to lead these after-school programs is to offer a 1-3 credit hour Special Topics in IT course to CECH students. This would provide formal training to IT students and prospective teachers who wish to teach IT. Additionally, voluntary co-op sessions could be implemented for students interested in teaching IT to provide training to high school students, in lieu of working in industry.

Additionally, this program may be implemented at other institutions by creating even more teams of student-teachers who specialize in an IT topic and providing training to multiple nearby schools. As of yet, we are limiting ourselves to two additional institutions (besides St. Ursula Academy): DPCR and Chatfield College. However, this program could be replicated in other districts. Our current limitation is available faculty resources to expand the program. As previously suggested, other beneficial opportunities for women and other under-represented groups could be providing workshops that include high-school teachers to prepare both teachers and students to incorporate IT in their assignments—such as using web pages, databases, digital design, or programming.

In brief, engaging female high-school students, as well as other under-represented groups in IT, can be beneficial not only by creating a more equal percentage of women and other groups missing from the IT field, but this tactic may also reduce the overall shortage of professional informational technologists in the workforce.

REFERENCES


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1 The purpose of the Information Technology Student Association (ITSA) is to build networking among students interested in information technology; promote currency in technology trends; increase awareness of technology; encourage involvement and leadership in the department and profession; and to provide service to the school and community.

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3 CyberCrime Cats is a casual club for people who enjoy new challenges, hands-on learning, and small group activities for cultivating the next generation of information security professionals at the University of Cincinnati.

4 Not all questions were answered in the surveys submitted.