E-Learning Early Admit College Program in Cybersecurity Broadens Participation in Cybersecurity: The Case of Recruiting and Retaining High School Underrepresented Students in the Cybersecurity Pipeline

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Abstract

Early Admit College Program in Cybersecurity can increase awareness and readiness of underrepresented high students for successful matriculation into careers in cybersecurity by implementing an e-learning (e.g., online) college cybersecurity career pathway for Grades 11 and 12 students. This case study provides insights into the importance of time management skills for the success of underrepresented students taking early admit cybersecurity classes while in high school. This study also provides insights into an under researched but important group of underrepresented college students, Filipino Americans. Similarly, it provides insights into the recruitment and retention of first generation college students into cybersecurity.

Keywords: cybersecurity education, e-learning/online teaching/learning, early admit, underrepresented students, broadening participation, cybersecurity pipeline

1. INTRODUCTION

XYZ Pacific University investigated how to increase the number of women and minority high school students

in cybersecurity. In an early-admit after school e-learning cybersecurity pathway for Grades 11 and 12, students prepared for jobs from basic Computer Support Specialist and Information Assurance level positions.

Grounded in an economic model and the human capital theories, the study uses cybersecurity as a viable college/career choice for students. The study reveals how to motivate women and minority students in information security professions and their achievement factors. Grades 11 and 12 high school students are engaged in cybersecurity education by: (1) enrolling in a sequence of online college level introductory cybersecurity courses; (2) using a cyber environment that combines problem-based learning; (3) participating in hands-on competitions (i.e., Cyber Patriot); and (4) connecting with college/community mentors via academic support and social integration strategies.

The intellectual merit is to accelerate cybersecurity e-learning (online) methodologies to understand underrepresented students

motivation and achievement factors, and identify areas for improvement to increase their rates of successful matriculation from high school to college. The overall goal is to broaden participation in diversifying the culture of the workforce to collectively develop innovative solution that are critical for small business of special interest to Hawaii and other U.S. rural communities.

This article highlights the findings from the project year three external evaluator reports. The 3rd year external evaluation focused on the Post High School Early Admit Cybersecurity Program Survey and the students' parents. Copies of the online surveys are included in the appendices.

The Post High School Program Survey (Appendix 1) consists of 14 questions to highlight accomplishments of program completers, to improve the program and for research purposes. The Cybersecurity Early Admit Parent Survey (Appendix 2) was administered to highlight accomplishments to improve the program, for research purposes, and to seek additional grant funding. The survey consisted of 14 questions.

2. UHMC POST HIGH SCHOOL EARLY ADMIT CYBERSECURITY PROGRAM SURVEY

There was an 86% response rate from the Post High School Early Admit Cybersecurity Program Survey. Of those responding 67% were male and 33% were female. This compares favorably with the composition of both cybersecurity nationwide and worldwide. Women globally comprise 11% of the cybersecurity workforce

and 14% of the cybersecurity workforce in North America (Frost and Sullivan, 2017).

In regard to ethnicity based upon self-reported data, 25% were Filipino, 17% were Japanese, 8% Hispanic, 17% were White, 8% were Other Pacific Islanders, and 25% Multiple Ethnicities, (Figure 1). This is a very diverse composition of ethnicities. Also, little research has been conducted on those with Filipino, Other Pacific Islanders, and Multiple Ethnicities and STEM success. This is truly an underrepresented and under researched population as it related to STEM education.

Filipinos are the second largest ethnic population on the Hawaiian Islands (Librarios, 2013) and the second largest Asian ethnic group in the United States (Panganiban, 2016). Filipinos are disproportionately underrepresented at the University of Hawaii at Manoa (Libarios, 2013).
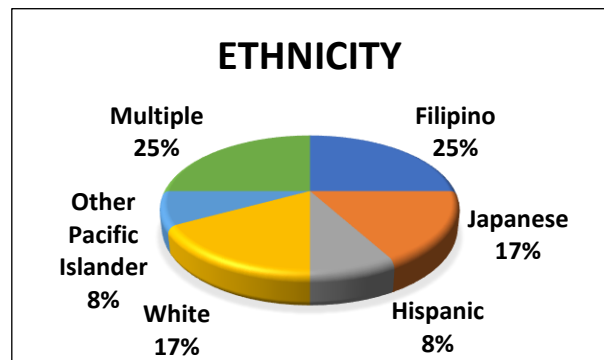

Figure 1. Demography - Ethnicity

A new item that was explored on the Post High School Early Admit Cybersecurity Program Survey was whether the students were First Generation College Students. Of the respondents, 58% of the students had parents who completed a college or graduate degree while 42% of the students are considered First-Generation College Students. The question was asked so that first generation college students can be further refined. Of the first-generation college students, 20% of their parents did not attend college, 20% had parents with a vocational diploma, and 60% had parents with an Associate's Degree. It is interesting that all of the participants that selected White as their ethnicity were First-Generation College Students. Thus, all of the High School Early Admit completers in this program, met some category of underrepresented student (Figure 2).
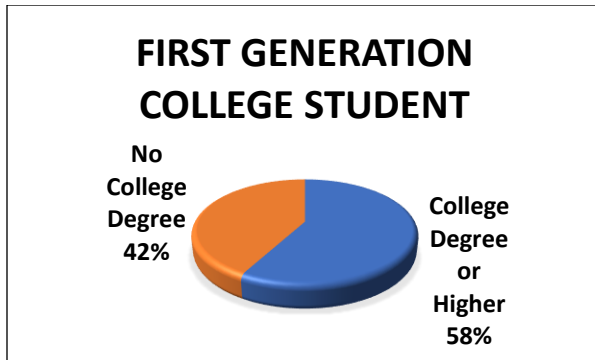
Figure 2. Demography – College Student

All of the students completed ICS 101, 42% completed ICS 110, 50% completed ICS 169, and 75% completed ICS 184 as indicated below in Figure 3.
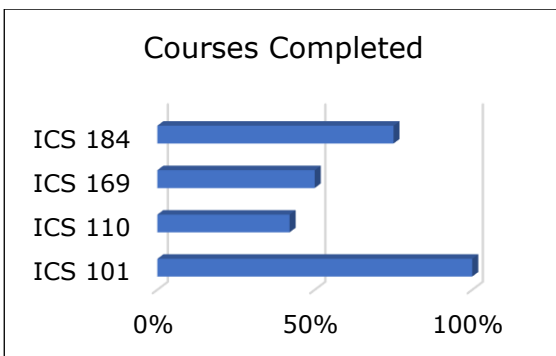

Figure 3. Demography – ICS Courses

The students overwhelming reported that these courses had a positive impact on their lives. All of the students reported that by taking these courses they were more aware of the career opportunities in cybersecurity and were more aware of what is involved in a career in cybersecurity. Similarly, all were more prepared to take future classes in cybersecurity and more confident to take college classes in general. From participating in this project, 92% were more interested in a career in cybersecurity. Of the respondents, 87% reported that they were interested in taking additional classes in cybersecurity and correspondingly, 87% reported that they planned on doing further studies in cybersecurity. (See Appendix 3: Course Description of College Cybersecurity Courses)

All students reported that this opportunity would help them be more successful in the future and that they would recommend this opportunity to others. These results demonstrate that the project is successfully accomplishing the goal to increase awareness and preparation of

underrepresented college students (women, minorities, and first-generation college students) for matriculation toward a career in cybersecurity as indicated in Figure 4.

Figure 4. Career in Cybersecurity

An important part of the Post High School Early Admit Cybersecurity Program Survey was to find out what the students are doing once they complete the program. Of those completing the program, 25% of the students are still in high school, 8% of the students are at the UH Maui College, 25% are at another college in Hawaii, and 42% are in college on the US Mainland or Abroad. All those who had graduated from high school were enrolled in college (Figure 5).
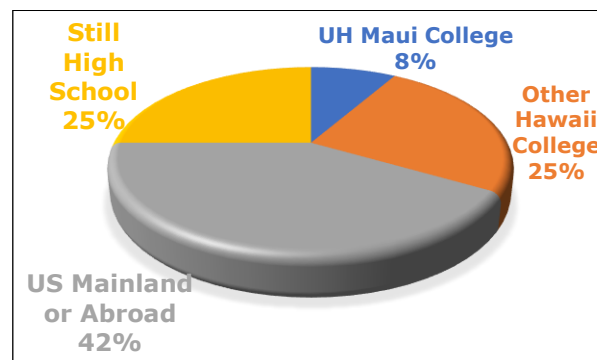

Figure 5. Demography – Course Completion

Of those enrolled in college, 43% reported that they are majoring in Computer Science or Related Fields, 43% reported that they are majoring in another STEM Field, and 14% reported that they are majoring in a non-STEM Field. Thus, 86% had been retained in a STEM field (Figure 6). This is a very impressive retention of STEM talent especially with underrepresented students. Of those that have

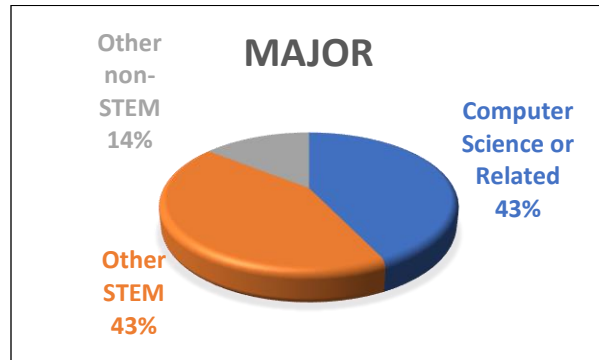graduated 44% have already taken additional college classes in cybersecurity.

Figure 6. Demography – Student Major

When asked the open-ended question about what was the most important thing that they learned from participating in this project: 42% reported computer science knowledge; 25% reported that they learned about cybersecurity jobs; 25% reported preparing for college; 25% reported time management skills; 17% reported cybersecurity knowledge; 17% reported how to take an online class; and 8% reported intuitive thinking (Figure 7).
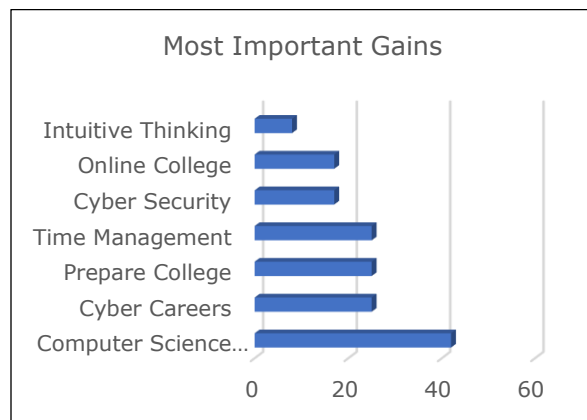

Figure 7. Student Gains

When students were asked how the project benefited them personally, there was a broad range of responses. Selected responses are included in the table below.

When the Post High School Early Admit Cybersecurity Program Survey students were asked an open-ended question about what factors influenced their decision to participate in this program, they had a wide range of responses. The most frequently reported response was that they were going into a career in cybersecurity or related field with 42% of the

students reporting this response. This was followed by the fact that the course was free which was reported by 25% of the students.

Personal Benefits from the Project
This project has shown me that college can be difficult, and the importance of time management.
I now will have an easier process getting my first job.
I was able to learn more things about cybersecurity and programming in general
I understand basic concepts now, instead of being completely clueless when I go to college.
Personally, I feel that taking these courses have allowed me to grow as an excellent communicator between my classmates and instructor. I have also been able to manage my time more effectively to complete assignments on time.
It helped me in real life with my home network
This project personally benefitted me by teaching me the basic of computer programming in Java. Learning Java gave me the opportunity to learn the skill I need for engineering.
It has taken some financial burden off of me while I can learn more about the field I am interested in.
From doing these courses, I have become more prepared and ahead for college.
This projected allowed me to develop better working habits that will follow me into college. While also providing me help in school due to my financial situation, without this program I would have never considered taking these types of classes due to the cost.
It's a great opportunity for high school students to get ahead of their peers and receive credits for no cost to them.

Table 1. Personal Benefits

The importance of the good relationship that the project team had with teachers and counselors is reflected in that 17% of the Post High School Early Admit Cybersecurity Program Survey mentioned that they participated at the recommendation of a teacher and/or counselor. Keep in mind that this was an open-ended question which makes this a relatively high response (Figure 8).
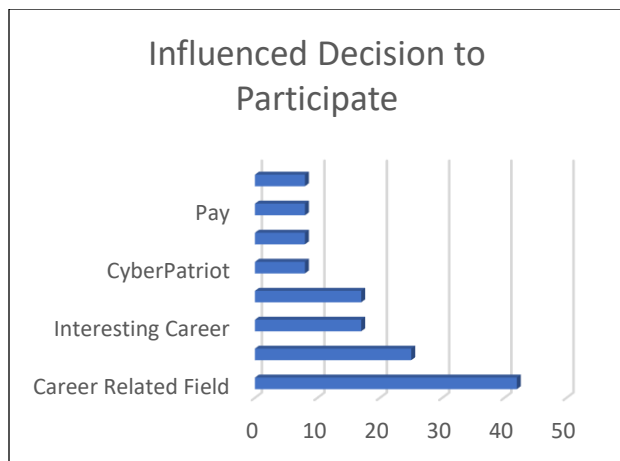
Figure 8. Decision to Participate

When student completers were asked what could be done to improve the program, overwhelming the response was that the students wanted more communication between the teachers and the students. Every student that provided a suggestion except one student who wanted this to be a dual credit course, provided a suggestion to have more communication between the students and the teachers. The suggestions included the following, "more communication between teachers and the students, maybe have the students meet up and talk about how the class is going;" "thank you so much for the opportunity to take these courses. I suggest that there should be more class discussions to help students understand the material better;" and "the classes should have a Skype or a personal connection to the student to allow the student to be more successful".

3. PARENT SURVEYS

Parents of the project completers were also requested to complete an online survey. This survey had a similar response rate to the Post High School Early Admit Cybersecurity Program Survey. Of the parents responding, 64% were female and 34% were male. Consistently, the parents felt that this was a positive experience for their children.

All parents agreed that from their son or daughter or both participating in this opportunity that their daughter and/or son was more prepared for college classes in the future and that their son and/or daughter would be more successful in the future. Similarly, all felt more confident about their son and/or daughter taking college classes.

Likewise, all parents felt that they themselves were more knowledgeable about what might be involved in a cyber career and 91% of parents responding were more aware of cyber career opportunities. All parents would recommend this project to others (Figure 9).
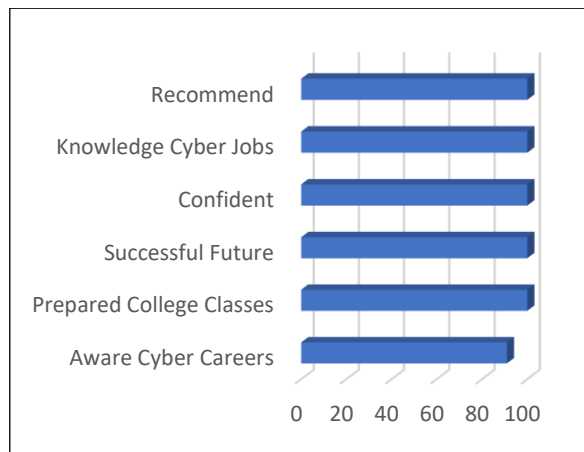

Figure 9. Parental Recommendations

When asked an open-ended question about the most important thing that their son and/or daughter gained from participating in the Early Admit Program, the most frequent responses reported by 50% of the parents who responded was that it prepared them for college and similarly 50% reported that their son/daughter learned better time management skills. Other important gains included computer skills which were reported by 30% of the parents.

In addition, cybersecurity skills were reported as the most important gain by 20% of the parents and college credit was reported as the most important gain by 10% of the parents. Note that these percentages add to more than 100% because some parents reported more than one gain.

All parents reported that they encouraged their daughter and/or son to participate in the program. When asked why the parents encouraged their daughter/son to participate in the program with an open-ended question the most frequent response was that it would help them with their future success which was reported by 60% of the parents.

The second most frequent response was that it was a college level class which was reported by 50% of the parents. The courses being free were reported by 20% of the responding parents. The opportunity to take a class online, to learn about cybersecurity and to boost their

confidence was reported by 10% of the parents. Again, since some parents reported more than one reason, these responses also total more than 100% (Figure 10).
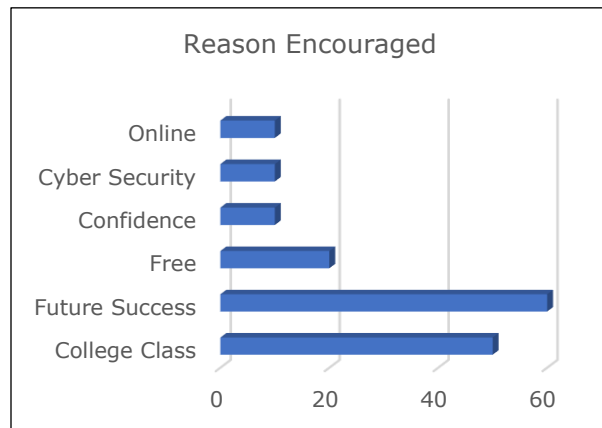

Figure 10. Encouragement Reported

When asked to select important reasons for their son/daughter to participate, 91% of the parents selected to earn college credit in high school and 91% selected that their son/daughter was interested in computer science before the program began. While 91% of the parents felt that their daughter/son was interested in computer science before the program began, only 55% reported that their daughter/son was interested in cybersecurity before the program began.

The free tuition was an important factor for 82% of the parents. The number of jobs in cybersecurity was important for 64% of the parents, but the number of jobs nearby in cybersecurity was important for 36% of the parents. There was no difference in the ethnicity of the parents and the importance of cybersecurity jobs nearby. The extra assistance that was provided to help them be successful was important for 45% of the parents. The lowest priority was that their friends were also participating which was only selected by 20% of the parents (Figure 11).
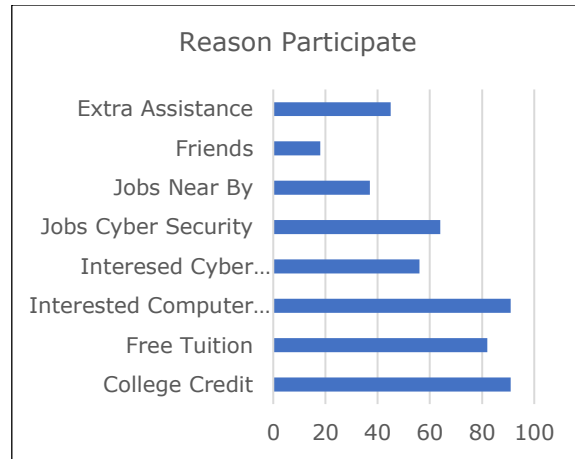

Figure 11. Participation Reported

When asked how to improve the program, the parents generally felt that the program was "great the way it is". The only suggestions were "connection with other students and resources" and to "have in-class learning".

It is interesting that for an open-ended question, there was surprising agreement about the type of gains from this program. Yet, there were some interesting contrasts between parent and high school program completers' responses.

For parents, the most important gains were related to time management and preparation for college, for high school completers the most important gains were computer skills. One of the most interesting findings, were that time management skills and preparation for college were reported by a large portion of both groups, 50% of parents and 25% of Post High School Early Admit Cybersecurity Program Survey. Gains in computer skills were reported by 42% of Post High School Early Admit Cybersecurity Program Survey and 30% of parents. Cyber skill gains were reported by 17% of Post High School Early Admit Cybersecurity Program Survey and 20% of Parents Survey.

The opportunity to have experience with an online class was reported by 17% of Post High School Early Admit Cybersecurity Program Survey and 10% of parents. The final gains were listed by only one of the groups. Only the parents (10%) reported college credit as the most important gain. Only Post High School Early Admit Cybersecurity Program Survey reported preparation for cyber careers at 25% and intuitive thinking 8% (Figure 12).
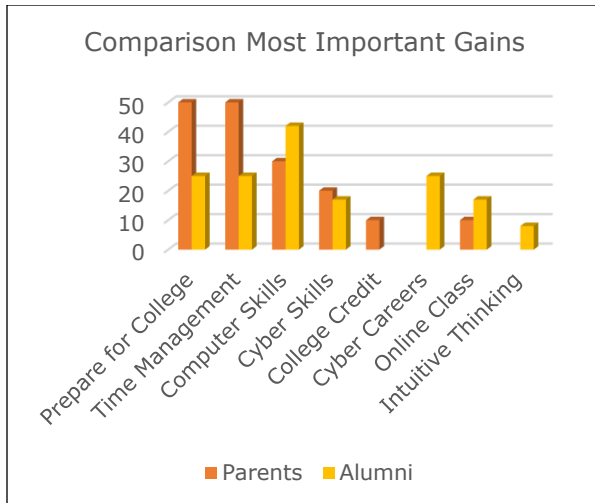
Figure 12. Most Important Gains

4. FINDINGS

The two most surprising findings from the Post High School Early Admit Cybersecurity Program Survey and Parent Survey are the importance that both groups placed on the gains in time management and preparation for college. While gains in computer skills and cyber skills were anticipated, the gains in these more general skills are notable. Since underrepresented students such as those in this project are more likely to leave STEM programs, it is important to understand which skills can be developed in high school to help them successfully navigate STEM programs until their completion. When you couple the results of the Post High School Early Admit Cybersecurity Program Survey with the results of survey of students who withdrew from the program along the way and teacher interviews, time management skills seem to be a major factor in whether students were successful in the program. This merits further research.

This program has been very successful in the recruitment of disadvantaged high school students. Consistently each year the program has had a higher percentage of females and members of diverse ethnic groups than are traditionally represented in cybersecurity. Of the Post High School Early Admit Cybersecurity Program Survey completing the survey 33% were female compared to 11% of the cybersecurity workforce worldwide. In addition, the findings this year's Post High School Early Admit Cybersecurity Program Survey demonstrate that the program has a large percentage of first generation college students. Forty-two percent of the Post High School Early

Admit Cybersecurity Program Survey in the program were first generation college students. Every high school completer in the program met some criteria of an underrepresented college student (gender, ethnicity and/or first-generation college student). Many of the students who completed the Post High School Early Admit Cybersecurity Program Survey were of Filipino descent. These students, while belonging to a large and important ethnic group in our society, have not been the target of much research related to their success in STEM fields and cybersecurity in particular.

All of these student completers and their parents reported that the program had a major impact on their lives. For the parents the most important gains were in college preparation and soft skills like time management. For the students who completed the Post High School Early Admit Cybersecurity Program Survey, these gains were important but they also reported major gains in cybersecurity and computer skills.

The difference in reporting of gains between the two groups makes sense because the students would know more the specifics of the skills that they are gaining in the classroom while the parents would be reflecting more on the big picture of changes that they are seeing in their daughters/sons. Despite the differences on the open-ended questions between Parents Survey and Post High School Early Admit Cybersecurity Program Survey, both parents and high school student completers overwhelmingly reported that the program increased their awareness of cybersecurity jobs and that the program prepared them to be successful in college level cybersecurity courses in the future.

The college credit, financial, and other assistance provided by the grant were important reasons for their son/daughter's participation in the program for the parents. For the students, their interest in a career in cybersecurity or related field, free tuition, and the encouragement of teachers or counselors were the most important reasons to participate.

All the high school completers from the program that have graduated high school are currently enrolled in college with 86% of them enrolled in a STEM discipline. Forty-three percent student completers from the program reported that they were majoring in computer science or a related field. This is an amazing success rate of recruiting and retaining underrepresented students into the STEM pipeline.

All of the high school program completers were more prepared to take future classes in cybersecurity and more confident to take college classes in general. From participating in this project, 92% of the high school student completers were more interested in a career in cybersecurity. Of the responding high school student completers, 87% reported that they were interested in taking additional classes in cybersecurity and correspondingly, 87% reported that they planned on doing further studies in cybersecurity. All students reported that this opportunity would help them be more successful in the future and that they would recommend this opportunity to others. These results demonstrate that the project is successfully accomplishing their goal to increase awareness and preparation of underrepresented college students (women, minorities, and first-generation college students) for careers in cybersecurity.

6. OVERALL CASE STUDY SUMMARY

This project has successfully achieved its overall goal to increase awareness and readiness of underrepresented high school students for successful matriculation into careers in cybersecurity by implementing an early admit cybersecurity career pathway for high school students. The project has also successfully met its objectives to: (1) Prepare students for careers in cybersecurity through career awareness, exploration and readiness activities and (2) Prepare students for college-level courses in cybersecurity program of studies through sequencing of information computer science and cybersecurity courses. The project for each of the three years successfully recruited women and other underrepresented high school students to courses that would prepare them for a cybersecurity pathway. Throughout this project, students, early-admit high school program completers, parents, teachers, and stakeholders have consistently reflected on the success of the program. Students, parents, and even those who withdrew from the program have reported an increase in awareness about cybersecurity jobs. Amazingly, even 88% of the students who withdrew from the program reported an interest in taking courses in cybersecurity in the future. Of the project Post High School Early Admit Cybersecurity Program Survey that have graduated high school all are enrolled in college and 86% are majoring in a STEM field.

7. REFERENCES

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Panganiban, L. (2016). *Easing the Sophomore Slump: The Effect of Family, Ethnic Identity, and Campus Climate on Filipino American Students' Experiences During Their Second Year of College.* Ph.D. dissertation. University of Washington.

Appendix 1 – NSF Post High School Early Admit Cybersecurity Program Survey

Thank you for participating in this study. Your participation is voluntary. The results will be used to highlight accomplishments to improve the program and for research purposes. Please be as honest and accurate as possible.

1.   What is your gender?

☐ Female
☐ Male

2.   What is your ethnicity?

☐ Part-Hawaiian   ☐ Native American
☐ African American   ☐ Chinese
☐ Filipino   ☐ Native Hawaiian
☐ Japanese   ☐ Korean
☐ Portuguese   ☐ Hispanic
☐ Samoan   ☐ Indo-Chinese
☐ Micronesian   ☐ Tongan
☐ Guananian/   ☐ White
   Charmorro
☐ Other Asian   ☐ Other Pacific
                           Islander
☐ Multiple, two or
   more

3. Please answer this question: parents' education. Select the one that applies.

   ☐   One or both of my parents has a graduate degree.
   ☐   One or both of my parents completed a university degree.

☐ One or both of my parents completed an associate's degree.
☐ One or both of my parents attended college but did not graduate.
☐ Neither of my parents attended college.
☐ Other (please specify)

4. When did you first learn about the UHMC Early Admit Program?

☐ Spring 2016
☐ Summer 2016
☐ Fall 2016
☐ Spring 2017
☐ Summer 2017
☐ Fall 2017
☐ I don't remember
☐ Other (please specify)

_____

5.   Which courses did you complete? (Select all that apply.)

☐ ICS 101
☐ ICS 169

- ☐ ICS 184
- ☐ ICS 171
- ☐ Other (please specify)

_____

6. Please use the scale below to rate your agreement with the following statements:

a. From my participating in this project, I am more aware of career opportunities in cybersecurity.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Slightly Agree
- ☐ Slightly Disagree
- ☐ Disagree
- ☐ Strongly Disagree

b. From my participating in this project, I am more interested in a career in a cybersecurity field.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Slightly Agree
- ☐ Slightly Disagree
- ☐ Disagree
- ☐ Strongly Disagree

c. From participating in this project, I feel they are more prepared to take future classes in cybersecurity.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Slightly Agree
- ☐ Slightly Disagree
- ☐ Disagree
- ☐ Strongly Disagree

d. I feel this opportunity will help my son/daughter be more successful in the future.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Slightly Agree
- ☐ Slightly Disagree
- ☐ Disagree
- ☐ Strongly Disagree

e. From participating in this project, I feel more confident about them taking college courses.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Slightly Agree
- ☐ Slightly Disagree
- ☐ Disagree
- ☐ Strongly Disagree

f. From participating in this project, I feel more knowledgeable about what might be involved in a career in cybersecurity.

▢ Strongly Agree
▢ Agree
▢ Slightly Agree
▢ Slightly Disagree
▢ Disagree
▢ Strongly Disagree

g. I have taken additional classes in cybersecurity since entering college.

▢ Strongly Agree
▢ Agree
▢ Slightly Agree
▢ Slightly Disagree
▢ Disagree
▢ Strongly Disagree

h. I am interested in taking additional classes in cybersecurity since entering college.

▢ Strongly Agree
▢ Agree
▢ Slightly Agree
▢ Slightly Disagree
▢ Disagree
▢ Strongly Disagree

i. I plan to do further studies in cybersecurity.

▢ Strongly Agree
▢ Agree
▢ Slightly Agree
▢ Slightly Disagree
▢ Disagree
▢ Strongly Disagree

j. I would recommend this class to others.

▢ Strongly Agree
▢ Agree
▢ Slightly Agree
▢ Slightly Disagree
▢ Disagree
▢ Strongly Disagree

7. What are the most important things your son/daughter gained from participating in the Early Admit Program?

8. Did you encourage your daughter/son to participate in the Early Admit Program?

▢ Yes
▢ No

9. If you encouraged your daughter/son to participate in the Early Admit Program, please explain why. If you did not encourage your daughter/son to participate in the Early Admit Program, please explain why not.

10. Which of the factors do you feel are important reasons for your son/daughter to participate in the Early Admit Program? Please check all that apply.

- ☐ Opportunity to earn college credit in high school
- ☐ Free tuition
- ☐ My son/daughter was interested in Computer Science before the program began
- ☐ My son/daughter was interested in Cybersecurity before the program began
- ☐ The number of jobs available in Cybersecurity
- ☐ The availability of jobs nearby in Cybersecurity
- ☐ Their friends were participating
- ☐ The extra assistance that was provided to help them be successful
- ☐ Other (please specify)

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11. Any other thoughts about this project, ideas for improvements, additional ways we can help the students be successful, etc.?

12. What is your son/daughter doing now they have graduated high school?

- ☐ UH Maui College
- ☐ Other College in Hawaii
- ☐ College on the US Mainland or Abroad
- ☐ Military
- ☐ Work
- ☐ Other (please specify)

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13. If you son/daughter is enrolled in college, what is their major?

- ☐ Computer Science or related field
- ☐ Slightly Agree
- ☐ Slightly Disagree
- ☐ Other (please specify)

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14. What could we do to recruit additional students to these courses?

Appendix 2 – NSF Cybersecurity Early Admit Parent Survey

Thank you for participating in this study. Your participation is voluntary. The results will be used to highlight accomplishments to improve the program, for research purposes, and to seek additional grant funding. Please be as honest and accurate as possible.

15. What is your gender?

- ☐ Female
- ☐ Male

16. What is the gender of your family member that participated in the Early Admit Program?

- ☐ Female
- ☐ Male

17. What is your ethnicity?

- ☐ Part-Hawaiian   ☐ Native American
- ☐ African American   ☐ Chinese

☐ Filipino   ☐ Native Hawaiian

☐ Japanese   ☐ Korean

☐ Portuguese   ☐ Hispanic

☐ Samoan   ☐ Indo-Chinese

☐ Micronesian   ☐ Tongan

☐ Guananian/   ☐ White
  Charmorro

☐ Other Asian   ☐ Other Pacific
                        Islander

☐ Multiple, two or
  more

18. When did you first learn about the UHMC Early Admit Program?

☐ Spring 2016
☐ Summer 2016
☐ Fall 2016
☐ Spring 2017
☐ Summer 2017
☐ Fall 2017
☐ I don't remember
☐ Other (please specify)

_____

19. How many courses did your son/daughter complete in the Early Admit Program"

☐ none
☐ one
☐ two
☐ three
☐ four
☐ I am not sure
☐ Other (please specify)

_____

20. Please use the scale below to rate your agreement with the following statements:

k.   From my son/daughter participating in this project, I am more aware of career opportunities in cybersecurity.

☐ Strongly Agree
☐ Agree
☐ Slightly Agree
☐ Slightly Disagree
☐ Disagree
☐ Strongly Disagree

l.   From my son/daughter participating in this project, I feel they are more prepared to take future classes in cybersecurity.

☐ Strongly Agree
☐ Agree
☐ Slightly Agree

☐ Slightly Disagree
☐ Disagree
☐ Strongly Disagree

m. I feel this opportunity will help my son/daughter be more successful in the future.

☐ Strongly Agree
☐ Agree
☐ Slightly Agree
☐ Slightly Disagree
☐ Disagree
☐ Strongly Disagree

n. From my son/daughter participating in this project, I feel more confident about them taking college courses.

☐ Strongly Agree
☐ Agree
☐ Slightly Agree
☐ Slightly Disagree
☐ Disagree
☐ Strongly Disagree

o. From my son/daughter participating in this project, I feel more knowledgeable about what might be involved in a career in cybersecurity.

☐ Strongly Agree
☐ Agree
☐ Slightly Agree
☐ Slightly Disagree
☐ Disagree
☐ Strongly Disagree

p. I would recommend this class to others.

☐ Strongly Agree
☐ Agree
☐ Slightly Agree
☐ Slightly Disagree
☐ Disagree
☐ Strongly Disagree

21. What are the most important things your son/daughter gained from participating in the Early Admit Program?

22. Did you encourage your daughter/son to participate in the Early Admit Program?

☐ Yes
☐ No

23. If you encouraged your daughter/son to participate in the Early Admit Program, please explain why. If you did not encourage your daughter/son to participate in the Early Admit Program, please explain why not.

24. Which of the factors do you feel are important reasons for your son/daughter to participate in the Early Admit Program? Please check all that apply.

☐ Opportunity to earn college credit in high school
☐ Free tuition

- ☐ My son/daughter was interested in Computer Science before the program began
- ☐ My son/daughter was interested in Cybersecurity before the program began
- ☐ The number of jobs available in Cybersecurity
- ☐ The availability of jobs nearby in Cybersecurity
- ☐ Their friends were participating
- ☐ The extra assistance that was provided to help them be successful
- ☐ Other (please specify)

25. Any other thoughts about this project, ideas for improvements, additional ways we can help the students be successful, etc.?

26. What is your son/daughter doing now they have graduated high school?

- ☐ UH Maui College
- ☐ Other College in Hawaii
- ☐ College on the US Mainland or Abroad
- ☐ Military
- ☐ Work
- ☐ Other (please specify)

27. If you son/daughter is enrolled in college, what is their major?

- ☐ Computer Science or related field
- ☐ Slightly Agree
- ☐ Slightly Disagree
- ☐ Other (please specify)

28. What could we do to recruit additional students to these courses?

Appendix 3 – Course Description of Cybersecurity College Courses

ICS 101 - Digital Tools for the Information World - Emphasizes production of professional level documents, spreadsheets, presentations, databases, and web pages for problem solving. Includes concepts, terminology, and a contemporary operation system.

ICS 169 - Introduction to Information Security - *Prereq: ICS 101 with grade C or better, or consent.* Provides the basic foundation to information security, including identifying threats, planning for business continuity, and preparing for various security attacks. Focus will be given to threats to financial security such as attacks on banking and other related financial information. Special emphasis on ethics and legal issues that covers hacking and other cybersecurity techniques and tactics.

ICS 184 - Introduction to Networking - *Prereq: ICS 101 with grade C or better, or consent.* Provides the student with the knowledge and skills to manage, maintain, troubleshoot, install, operate and configure basic network infrastructure, as well as to describe networking technologies, basic design principles, and adhere to wiring standards and use testing tools.

ICS 171 - Introduction to Computer Security - *Prereq: ICS 101 or consent.* Examines the essentials of computer security, including risk management, the use of encryption, activity monitoring, intrusion detection; and the creation and implementation of security policies and procedures to aid in security administration.

Highly Recommendation Course: ICS 110 - Introduction to Computer Programming - *Prereq: ICS 101 with grade C or better, or consent.* Teaches fundamental programming concepts including sequential,

selection, and repetition flow; variables and types; syntax; error types; compilation; linking; loading; and debugging. Introductions algorithms flow charts, UMI, and other analytic tools. Explains and practices problem solving and critical thinking methods.