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Technical Report

Scholarship for Service: IA Tutorials and Workshops for Educators

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Abstract

In 2003 and 2004 the Center for Information Systems Security Studies and Research (CISR) at the Naval Postgraduate School organized tutorials and workshops with the intent of increasing the capacity of the United States higher education enterprise to produce professionals in the fields of Information Assurance (IA) and computer security by hosting a series of workshops for education in Information Assurance. The target audience of the workshops has been 2-year, 4-year college, and university-level educators who have responsibility for teaching curricula that are, or could be, related to Information Assurance issues. Participation by instructors from institutions serving under-represented groups was high. Attendance at the tutorials was maximized both years. The participants indicated that they benefited substantially from both the tutorials and the subsequent gathering of IA educators at the Workshop on Education in Computer Security (WECS).

Scholarship for Service:
IA Tutorials and Workshops for Educators

Final Report for NSF Award Number 0210762

Overview

The primary objective of this project was to increase the capacity of the United States higher education enterprise to produce professionals in the fields of Information Assurance (IA) and computer security by hosting a series of workshops for education in Information Assurance. The target audience of the workshops has been 2-year, 4-year college, and university-level educators who have responsibility for teaching curricula that are, or could be, related to Information Assurance issues. Participation by instructors from institutions serving under-represented groups was high.

We developed and hosted a two-year series of invitational workshops for Information Assurance education. The format for each workshop was three sequential sessions: a tutorial session, a refereed paper session, and a working session. This sequence allowed newer practitioners to become knowledgeable about the basics of IA, provided an opportunity for experienced practitioners to present new ideas for discussion, and allowed both groups to interact in a problem solving context to develop solutions for point issues presented by the workshop.

The tutorial sessions, attended by 19 participants in 2003 and 20 participants in 2004, provided education to faculty about the fundamentals of information assurance and computer security and to improve their instructional capability in these areas. The paper sessions provided a forum for presentation and discussion of recent pedagogical and technical advances in the field. In addition, activities in the working session encouraged creative interaction regarding current issues for education in Information Assurance.

A significant effect of the commingling of experienced and inexperienced practitioners has been enhancement of the sense of community for IA educators, fostering collaboration and dialogue among institutions offering courses and programs in Information Assurance. The multi-year format has allowed faculty to spend time in their own environment and return to the workshop with experiential questions and insight.

For the tutorials, model materials for classroom presentation and demonstration were prepared, as well as example materials for laboratory experimentation. The workshop was publicized extensively to ensure participation of demographic groups currently underrepresented in the IA education community. In this respect, the program has been highly successful. The net effect of the proposed activities has been to directly increase the national capacity for education in Information Assurance as well as to extend the knowledge and expertise of IA to a range of participants that is more representative of the national profile.

Program Organization

This project developed and hosted a two-year series of invitational workshops. The format for each workshop was a *tutorial* session followed by a larger workshop with *refereed paper* and *working* sessions. This sequence allowed newer practitioners to become knowledgeable about the basics of IA, provided an opportunity for experienced practitioners to present new ideas, and then allowed both groups to interact in a problem solving context to develop solutions for point issues presented by the workshop.

In effect, the investigators had the job of organizing not only a set of tutorials but a small conference as well. Each of the workshops built upon the success of the earlier Workshops in Computer Security Education (WECS) that had been held in California. In 2003, the workshop was combined with the Third World Conference on Information Security Education (WISE), sponsored by the international Federation for Information Processing (IFIP). WISE attracted over 30 paper submissions and a larger number of participants. This two and a half day international conference followed the three days of tutorials. In the second year, NPS hosted a WECS workshop, which was attended by IA educators from throughout the US. The proceedings of the 2004 WECS included papers not only from experienced educators but papers by participants in the 2003 tutorials.

Each year participants in the tutorials were supported so that they could stay for the conference/workshop. This had the beneficial result of exposing the tutorial participants to other IA educators with philosophies and ideas different from those at NPS. An additional benefit of the program was the commingling of experienced and inexperienced practitioners that enhanced the sense of community for IA educators, fostering collaboration and dialogue among institutions offering courses and programs in Information Assurance.

Tutorial and Workshop Announcement

The workshops were publicized extensively to ensure achievement of the targeted attendance level as well as to help increase participation of demographic groups currently underrepresented in the IA education community. The first workshop was scheduled for late June and the second took place in early July 2004. These dates were chosen to facilitate faculty attendance. For tutorial participants a stipend for travel and local accommodations helped to encourage attendance and to defray costs. Both workshops were held at the Naval Postgraduate School (NPS), in Monterey, California.

A press release, an example of which is found in Appendix D, provided further visibility for the workshops.

Tutorial Material

A set of educational materials for use by workshop participants was developed. Materials for the core tutorial sections were based on the CISR curriculum. In some cases, the materials were a straightforward adaptation of CISR class and lab material to the tutorial format; in other cases, the materials were entirely new, or represented a substantial revision of existing instructional materials. Materials included course notes, graphic presentations, and classroom and lab exercises.

Lecture and lab material was centered on an existing course – Introduction to Information Assurance: Computer Security. The course was designed by CISR members with the goal to

provide necessary prerequisite information to students pursuing a broad range of IA topics, as well as to provide a background for all students to understand and respect the need for computer security. The course description is:

> *Provides a comprehensive overview of the terminology, concepts, issues, policies, and technologies associated with the field of Information Assurance. It covers the notions of threats, vulnerabilities, risks and safeguards as they pertain to the desired information security properties of confidentiality, integrity, authenticity and availability for all information that is processed, stored, or transmitted in information systems.*

Specific modules were identified for inclusion in the tutorials. Corresponding labs were then chosen from existing materials or developed. Additional materials were developed and included in the tutorials. Members of the CISR group were then chosen for specific modules and labs. Modules were then identified for pedagogy or example presentation, and labs for hands-on or demonstration.

An important objective of the tutorials was to provide instructors with insights regarding aspects of information assurance that are difficult to teach. Rather than merely review basic material, the tutorials focused on those difficult topics in an attempt to enable participants with the tools to make them successful IA educators.

The tutorials spanned three days with full agendas. The tutorial instructors, all from the Naval Postgraduate School, presented technical lectures, pedagogy lectures, and practical, hands-on laboratories. A copy of the agenda for the tutorials can be found in Appendix A.

Assessment

Following each tutorial a questionnaire was given to the participants to allow for assessment of the program. A sample assessment is provided in Appendix C. These provided valuable feedback on the different modules within the tutorial sessions. Since applicants were able to write in comments, some feedback reflected personal interests. Overall, there were a number of consensuses:

- The three-day length of the tutorials was appropriate.
- The part of the tutorials found most helpful was the labs.
- There is desire for information on the topics of ethics, Cyber law, and grant writing.
- Desire to have course notes and lab material available to use in their classrooms.
- Discussion groups during lunch and the breaks were very useful.

These comments influenced the tutorial materials and agenda in the second year.

A second year participants stated:

My metric for evaluating workshops is, "did I get a gold nugget for each hour invested?" I certainly got my nuggets per hour from this collection of presentations …

Followup

The multi-year format has allowed faculty attending the tutorials to spend time in their own environment and return to the workshop with experiential questions and insight. Returning participants were encouraged to present their experiences and results in the paper session.

To allow participants to share their experience in using the material presented in the workshop, they were asked to prepare either reports or papers. Papers were included in the proceedings of the WECS 6 workshop, which followed the tutorials in 2004. All participants from 2003 were invited to participate in the workshop and to present papers.

Reports were at least two pages, and papers were 5,000 words or seven pages. Participants were requested to address the following topics and questions:

- Your IA objectives for the 2003-2004 academic year
- What did you do to incorporate WECS5 materials?
- How many hours of WECS materials did you incorporate into lecture or laboratory course work?
- Did you do anything specifically for or with groups underrepresented in Computer Science?
- Did you develop any new materials?
- Did you have any publications from this work?
- Brief summary of success and/or lessons learned.

Project Participants

Project participants can be organized into three groups: tutorial instructors, technical support staff and tutorial participants.

Tutorial Instructors

The Center for Information Systems Security Studies and Research (CISR) is fortunate to have members with a wide variety of backgrounds, experience, and expertise. Coordinating the pool of knowledge and being able to have multiple presenters was a major factor in the success of the tutorials. The CISR members involved brought together over 100 combined years experience in information assurance and computer security, and backgrounds in the government, military, private industry, and professional affiliations.

Cynthia Irvine has been working in the area of high assurance systems for over 15 years. At the Naval Postgraduate School, she teaches an advanced graduate level course focused on the design and construction of high assurance secure systems.

George Dinolt has been a researcher and developer in the area of computer security for over 20 years. His current position of Associate Professor at the Naval Postgraduate School has him teaching advanced graduate level courses and being a thesis advisor.

Paul Clark is currently a Research Associate at the Naval Postgraduate School, lecturing graduate students and performing research in the area of computer security. His current area of interest revolves around the betterment of computer security education in the academic environment.

Deborah Shifflett is a Research Associate at the Naval Postgraduate School, where she primarily works as the financial officer for the Center for Information Security Systems Studies and Research (CISR) and is co-instructor for courses in Critical Infrastructure Protection.

John D. Fulp is a Lecturer in the Department of Computer Science at the Naval Postgraduate School. He is a 1987 graduate of the U.S. Naval Academy, and a 1996 graduate of the Naval Postgraduate School where he earned his Masters in Computer Science. Mr. Fulp is interested in providing quality IA education, and in promoting awareness, understanding, and successful implementations of Public Key Infrastructures (PKI).

Timothy Levin is a Senior Research Associate at the Naval Postgraduate and has spent over 15 years working in the design, development, evaluation, and verification of secure computer systems. His current research interests include management and quantification of security in heterogeneous networks, development of costing frameworks and scheduling algorithms for the dynamic selection of QoS security mechanisms, and the application of formal methods to secure computer systems.

Daniel Warren is a Lecturer at the Naval Postgraduate School and has spent the last 15 years working in the area of computer and network security. He routinely teaches highly successful condensed weeklong versions of NPS computer and network security courses to agencies such as DISA and SPAWAR.

Richard Scott Coté is a Lecturer at the Naval Postgraduate School, where he lectures, and performs research. He also holds certifications from both Microsoft and Cisco and continues to teach the Cisco Academy curriculum at his local community college, as well as leading a team of

local students in national competitions on Remotely Operated Vehicle (ROV) design and construction, recently taking first place in Discovery Channel's nation wide inaugural ROV Challenge.

Technical Support Staff

Naomi B. Falby is a research assistant at the Naval Postgraduate School. She has participated in the development of CyberCIEGE, an information assurance teaching tool in the form of a video game, and serves as a configuration management assistant for the Trusted Computing Exemplar Project. For this effort she assisted with local arrangements.

Matthew T. Rose provides support for the development of web-based and printed materials. He supported this project through the development of announcements, templates, forms, and other materials.

David R. Riebandt is a system administration technician in the CISR research group. He supported the project by setting up and maintaining laboratory and classroom demonstration equipment.

Scholarship Participants

The following sections provide details regarding the scholarship participants who attended the tutorials and workshops.

Participant Selection

Educators interested in attending the tutorials were required to submit an application. Questions on the application were intended to assess the potential impact of the applicant's attendance on the information assurance program at his or her home institution. The applicants were asked about their academic position and its relationship to the department likely to be supporting an IA program, teaching experience, how they influenced curriculum, and their previous background in information assurance. The questionnaire also addressed how applicants hoped to accomplish incorporating the tutorial material into lecture and/or lab course work.

Applicants were requested to show knowledge and background in computer science, allowing the organizers to screen applicants and restrict scholarship awards to those with the ability to follow the tutorials and participate in labs. All scholarship recipients were able to state various levels of individual, course, and department need for computer security education that could be passed on to the students.

Under-represented Populations

Because an objective of the program was to address IA education in traditionally under-represented populations, questionnaire sections regarding the under-represented groups at each institution were of significance in selecting participants. In asking how applicants planned on promoting participation in information assurance by under-represented groups, we were supplied with a surprising amount of data on the current activities of the applicants. Applicants also did an excellent job identifying the under-represented groups pertinent to their institution's location.

Participants demonstrated that they and/or their institution were already involved in promotion to under-represented groups. The individual scholarship recipients had under-represented group promotion involvements that ranged from an open-door policy regardless of curriculum, to being a minority and leading by example, to corporate and non-profit involvements. Institutional

involvement included: matching the ethnic percentages of the surrounding population, efforts to recruit females, and existing funded outreach programs for under-represented groups.

Answers by scholarship recipients reflected their ability to identify the under-represented groups of their community. Many of the participants have work and in communities where they deal with the traditional under-represented groups – ethnic minorities and females. Participants went further to identify other groups: at-risk youth, first generation college students, the rural area, geographically dispersed, Native American, displaced workers, military reservists, military veterans, limited transportation, single parents, conflicting work schedules, and faculty peers.

Participant Demographics

Complete information regarding the workshop participants is provided in Appendix B. This section will provide a synopsis of the participant demographics.

Scholarship participants for the 2003 program came from Arizona, California, Oregon, Washington, and Nevada. A larger geographic area was covered in 2004. Tables 1 and 2 show the geographic distribution of participants.

State	Participants
Arizona	1
California	12
Oregon	4
Washington	2
Nevada	1

Table 1. Number of Participants by State in 2003

State	Participants
Alabama	1
California	4
Colorado	1
Connecticut	1
Hawaii	3
Mississippi	1
Montana	2
New Mexico	1
New York	1
North Dakota	1
Oregon	1
Puerto Rico	2
Virginia	1

Table 2. Number of Participants by State in 2004

The types of schools represented changed between 2003 and 2004. In 2003 out of the 20 participants, 13 came from community colleges, while universities and four-year colleges wee

represented by five and two participants respectively. In 2004 there were no participants from four year colleges and universities comprised the majority, with 17 participants, while community colleges provided three participants. This change may have reflected the broader net cast in the second year of the program, as we attempted to engage faculty from states and commonwealths.

Outreach to colleges and universities serving traditionally under-represented populations was one of the key objectives of the capacity building program. Table 3 shows the number of participant institutions that had minority populations in various ranges. It can be seen that by more actively seeking colleges and universities with large minority populations, it was possible to better serve these groups, particularly in the second year of the program.

Percent Under-Represented Students At Participant Institution					
	0-20%	**21-40%**	**41-60%**	**61-80%**	**81-100%**
2003	5	7	4	2	1
2004	6	2	5	3	4

Table 3. Under-Represented Populations

Summary

The primary objective of the workshops was to increase the capacity of the United States higher education enterprise to produce professionals in the fields of Information Assurance (IA) and computer security by hosting a series of workshops for education in information assurance. The target audience for the workshops was college-level educators who have responsibility for teaching curricula that are, or could be, related to Information Assurance issues. Through carefully placed announcements to a wide range of colleges and universities, the workshops have successfully included teachers from institutions with a high percentage of traditionally under-represented populations.

The workshops have broadened the IA knowledge base for attendees, and have provided an overview of pedagogical methods and techniques that have proven successful for teaching Information Assurance topics. Feedback has indicated that the workshops have been valuable for teachers who are new to IA and need help in getting started in the field, for faculty who are starting to set up their IA curricula, as well as for experienced teachers who have benefited from the opportunity to exchange ideas about current technical topics and teaching approaches. The innovative format of the workshop has produced a fertile atmosphere for learning, exploration, and transfer of knowledge. Future workshops based on this format could continue to enlarge the number of institutions involved in IA education. In addition, this format could be applied to other disciplines.

Publications and Products

Publications

1. Falby, Naomi, Fulp, J.D., Clark, Paul C., Cote, R. Scott, Irvine, Cynthia E., Dinolt, George W., Levin, Timothy E., Rose, Matthew, and Shifflett, Deborah, "Information Assurance Capacity Building: A Case Study," *Proceedings of the Colloquium on Information Systems Security Education*, West Point, NY, June 2004, pp. 31-36.
2. Levin, Timothy E., and Clark, Paul, C., A Note Regarding Covert Channels, *in Avoiding Fear, Uncertainty and Doubt Avoiding Fear, Uncertainty and Doubt: Proceedings of the Sixth Workshop on Education in Computer Security*, Monterey, California, July 2004, pp. 11 – 15.
3. Fulp, J. D., The Bastion Network Project, in *Avoiding Fear, Uncertainty and Doubt, Avoiding Fear, Uncertainty and Doubt: Proceedings of the Sixth Workshop on Education in Computer Security*, Monterey, California, July 2004, pp. 65 – 70.
4. Eagle, Chris and Clark, John L., Capture-the-flag: Learning Computer Security Under Fire, in *Avoiding Fear, Uncertainty and Doubt: Proceedings of the Sixth Workshop on Education in Computer Security*, Monterey, California, July 2004, pp. 17 – 21.
5. Irvine, Cynthia E., and Thompson, Michael F., Expressing IS Policy Within a Security Simulation Game, in *Avoiding Fear, Uncertainty and Doubt, Proceedings of the Sixth Workshop on Education in Computer Security*, Monterey, California, July 2004, pp. 43-49.
6. Irvine, Cynthia E. and Rose, Matthew T. (editors), Avoiding Fear, Uncertainty and Doubt: *Proceedings of the Sixth Workshop on Education in Computer Security*, Monterey, California, July 2004.
7. Irvine, Cynthia E., and Armstrong, H. (editors) *Security Education and Critical Infrastructures,* Kluwer Academic Publishers, Norwell, MA, 2003.
8. Fulp, J. D., Training the Cyber Warrior, in *Security Education and Critical Infrastructures*, ed. C. Irvine and H. Armstrong, Kluwer Academic Publishers, Norwell, MA, 2003, pp. 261 – 273.
9. Rasmussen, Craig, Irvine, Cynthia E., Dinolt, George W., Levin, Timothy, and Burke, Karen L., A Program for Education in Certification and Accreditation, *Security Education and Critical Infrastructures*, ed. C. Irvine and H. Armstrong, Kluwer Academic Publishers, Norwell, MA, 2003. pp 131-149.

Products

The Center for Information Systems Security Studies and Research at the Naval Postgraduate School Maintains a website. Information regarding both of the tutorials and workshops are available as well as the proceedings of the 2004 workshop. The proceedings of the IFIP workshop in 2003 are available directly from the publisher.

http://cisr.nps.navy.mil/WECS5/index.htm

http://cisr.nps.navy.mil/WECS6/index.htm

Appendix A: WECS 6: Schedule of Events

Monday, 12 July

Time	Location	Event	CiSR Staff
0830	ME Aud.	Welcome, Opening Remarks, Schedule Overview	JD Fulp
0900	ME Aud.	(P) IA Pedagogy (Central Concepts/Ideas of IA curric.)	JD Fulp
0950	5-10 Min Break		
1000	ME Aud.	(C) Passwords (Vulnerability, Strength, Mnemonics)	Paul Clark
1030	ME Aud.	(C) Encryption (Symmetry, Strength, Hashing, CIANr)	Dr. George Dinolt
1130	*LUNCH*		
1230	Sp511	(L) Passwords & Encryption	Paul Clark
1330	5-10 Min Break & Movement to ME Auditorium		
1340	ME Aud.	(C) Malware/Threats (Virus, Worm, Trojan, etc.)	Daniel Warren
1500	5-10 Min Break		
1510	ME Aud.	(D) Virus & Steganography Demonstration	Daniel Warren
TBA	*Hors d'oeuvres at the Monterey Hilton*		

Tuesday, 13 July

0830	ME Aud.	(P) IA Textbooks (recommendations & lessons learned)	Paul Clark
0900	ME Aud.	(C) Discretionary vs Mandatory Access Control	Dr. George Dinolt
0950	5-10 Min Break		
1000	ME Aud.	(C) Assurance, Covert Channels, & Common Criteria	Dr. Cynthia Irvine
1050	ME Aud.	(D) Covert Channel Demo	Dr. Cynthia Irvine
1100	ME Aud.	(C) Critical Infrastructure Protection	Scott Cote
1130	***LUNCH*** and roundtable discussion: (P) organization of an IA curriculum		
1300	ME Aud.	(C) Computer Forensics	Chris Eagle
1400	5-10 Min Break & Movement to Sp511		
1410	Sp511	(L) Packet Analysis (Ethereal)	JD Fulp
1510	5-10 Min Break & Movement to ME Auditorium		
1520	ME Aud.	(P) Setting up an IA Lab	Paul Clark
Recommended visit to Farmers' Market on Alvarado St. ~1600-1900			

(P) → Pedagogy Topic, (C) → Content Lecture, (L) → Lab

Wednesday, 14 July

0830	ME Aud.	(C) Identity Theft	Bill Murray
0920	5-10 Min Break		
0930	ME Aud.	(C) Firewalls/Perimeter-Defense	JD Fulp
1000	5 Min Break & Movement to Sp511		
1010	Sp511	(L) Symantec Personal Firewall Configuration	JD Fulp
1130	***LUNCH***		
1230	Sp511	(L) Attacker's Perspective (*take breaks as convenient*)	Scott Cote
1510	ME Aud.	(C) The Administrative Element of IA	Bill Murray
1600	ME Aud.	Conference Wrap-up, Q&A, Critiques	Dr. Cyntia Irvine

(P) → Pedagogy Topic, (C) → Content Lecture, (L) → Lab

Appendix B: Participant Details

This appendix provides information regarding each scholarship participant for both years of the program.

Year 1 (2003) Scholarship Participants

Name	School	State	School Type	Minority
Anderson, Kevin	Sacramento City College	California	Community college	57%
Becker, David	Linn-Benton Community College	Oregon	Community college	10%
Bull, Everett	Pomona College	California	4-year college	27%
Gee, Henry	Evergreen Valley College	California	Community college	85%
Griffin, James	Cabrillo College	California	Community college	31%
Larson, Randol	Estrella Mountain Community College	Arizona	Community college	42%
McMahon, Brian	Cabrillo College	California	Community college	31%
Mehta, Jaishri	Mount San Antonio College	California	Community college	77%
Murphy, Thomas	Contra Costa College	California	Community college	35%
Nico, Kimberly	Cal Poly, San Luis Obispo	California	University	26%
Noga, John	Cal State University, Northridge	California	University	39%
Pannell, Diane	Community College of Southern Nevada	Nevada	Community college	40%
Rylander, Bart	University of Portland	Oregon	University	15%
Sande, Corrinne	Whatcom Community College	Washington	Community college	59% female
Snyder, Jill	Peninsula College	Washington	Community college	18% Note a.
Swanson, Parker	Linn-Benton Community	Oregon	Community	10%

	College		College	
Taha, Richard	City College of San Francisco	California	Community college	67%
Tikekar, Rahul	Southern Oregon University	Oregon	University	11% Note b.
Wang, Huaqing	Cal State University, Bakersfield	California	University	48%

Notes

a. Median student age is 36

b. Recruits first-generation college students from rural areas.

Year 2 (2004) Scholarship Participants

Name	**School**	**State**	**School Type**	**Minority**
Anderson, Charles	Western Oregon University	Oregon	University	12%
Bodwin, Zenaida	Northern Virginia Community College	Virginia	Community college	38%
Burroughs, Ann	Humboldt State University	California	University	18%
Cappelino, Marina	Genesee Community College	New York	Community college	7%
Cruz, Alfredo	Polytechnic University, Puerto Rico	Puerto Rico	University	Title V school
Englert, Burkhard	California State University, Long Beach	California	University	52%
Garcia, Steven	California State University, Bakersfield	California	University	48%
Gersting, Judith	University of Hawaii, Hilo	Hawaii	University	48%

Green, Lionel	Chief Dull Knife College	Montana	Community college	90% 89% Note a
Kettani, Houssain	Jackson State University	Mississippi	University	98% Note b
Lancor, Lisa	Southern Connecticut State University	Connecticut	University	21%
MacEvoy, Warren	Mesa State College	Colorado	4-year college	12%
Maruyama, Robert	Chaminade University of Hawaii	Hawaii	University	68%
Meyers, Donna	California State University, Bakersfield	California	University	48%
Narang, Hira	Tuskegee University	Alabama	University	76% Note b
Rodriguez-Jimenez, Othoniel	Polytechnic University, Puerto Rico	Puerto Rico	University	Title V school
Streff, Kevin	Dakota State University	Dakota	University	2%
Tahani, Hossein	New Mexico Highlands University	New Mexico	University	75%
Valgenti, Victor	Montana State University, Billings	Montana	University	9%
Zimermann, Alfred	Hawaii Pacific University	Hawaii	University	42%

Notes

a. American Indian / Alaskan Native

b. African American

Appendix C: Assessment

Questionnaire Feedback: Lecture and Lab Ratings Year 1

Type	Title	Score (5.00 scale)
P-lecture	IA Pedagogy	4.26
E-lecture	Passwords	4.69
E-lecture	Encryption	4.07
Lab	Passwords & Encryption	4.36
E-lecture	Malware	4.13
E-lecture	Critical Infrastructure Protection	4.00
E-lecture	Discretionary Vs. Mandatory Access Control	4.05
E-lecture	High-Assurance Systems	4.05
Lab	DAC and the Common Criteria	4.11
P-lecture	IA Textbooks	4.20
E-lecture	Covert Channels	4.05
E-lecture	The Administrative Element of IA	3.98
Brief	Using the Threats & Safeguards Tutorial CD	4.55
Lab	Work Through Several Selected Tutorial Examples	4.36
P-lecture	Setting up an IA Lab	4.00
Lab	Vulnerability Assessment	4.81
	Overall WECS 5 rating, lectures and labs	**4.23**

P-lecture: Pedagogy lecture

E-lecture: Example lecture

Questionnaire Feedback: Lecture and Lab Ratings Year 2

Type	Title	Score (5.00 scale)
P-lecture	IA Pedagogy	4.53
E-lecture	Passwords	4.07
E-lecture	Encryption	3.93
Lab	Passwords & Encryption	4.50
C-lecture	Malware/Threats	4.13
Demo	Virus and Steganography	4.60
C-lecture	Critical Infrastructure Protection	4.43
C-lecture	Discretionary and Mandatory Access Controls	4.07
C-lecture	Assurance, Covert Channels and Common Criteria	4.14
C-lecture	Forensics	4.47
Lab	Packet Analysis (Ethereal)	4.73
P-lecture	Setting Up and IA Lab	4.00
C-Lecture	Identity Theft	4.27
C-lecture	Firewalls/Perimeter Defense	4.60
Lab	Personal Firewall Configuration	4.27
Lab	Attacker's Perspective	4.73
C-lecture	The Administrative Element of IA	3.93
	Overall WECS 6 rating, lectures and labs	**4.34**

P-lecture: Pedagogy lecture

E-lecture: Example lecture

Appendix D: WECS 5 Press Release

PRESS RELEASE 30 JUNE 2003

The Naval Postgraduate School in Monterey, California recently hosted two important conferences in the area of computer security and information assurance. For the first time, and perhaps the only time, the WISE/WECS conferences were combined to reach both groups and place side by side the novice and those responsible for their nation's security. Both were sponsored by the National Science Foundation, and combined they included attendees and speakers that ranged from community college level computer teachers to the state of the art experts from government and international institutions.

The conferences were organized by the school's Center for Information Systems Security Studies and Research (CISR) headed by Dr. Cynthia Irvine. According to Irvine, CISR is "a group of faculty, staff and students who work to put together both research and educational programs in the area of information assurance. In other words, information operations primarily directed toward network defense."

CISR makes an important impact on the area of computer security both nationally and internationally. Irvine adds, "We've always had an impact within the military, but now we're having a ripple effect out to the civilian sector. In fact, we just graduated 11 of our civilian Scholarship for Service students – our first group – last week. They will all have jobs within the government. So we'll be having an even wider impact than we did before. The WECS workshop, I think, is a great way to enhance that impact and help build national capacity and awareness in information assurance."

One obvious way of reaching a broader range of people is through education. To this end, the Workshop in Education for Computer Security (WECS) was offered to "take people who are educators in community colleges and 4-year universities who are trying to start up information assurance in their computer science departments and teach them how to then teach their students. We want to make sure correct information is getting out, and that they can network and get the right resources," explained Naomi Falby, Conference Coordinator.

"It is intended to be a capacity building effort," added Irvine. This fifth WECS workshop took place from June 23-25, 2003 at the Naval Postgraduate School and was attended by 20 faculty members from 18 different two and four year institutions from California, Arizona, Nevada, Washington, and Oregon. Most received support to attend the workshop. Attendees took classes, worked on computer lab exercises, and were involved in discussion groups to help them formulate their information assurance curriculum. Lunches and social events were organized to establish a sense of community among the participants.

Used to working with the leading edge in the field of information assurance, Irvine said, "It's been fun to work with people from a large variety of colleges and teach them something new, and they're all very enthusiastic. We've presented them with our labs, teaching techniques…various kinds of textbooks they might be using in their classes."

Whereas CISR has had a large program in information assurance for over seven years, one WECS attendee, Everett Bull of Pomona College, said that at the college and university level,

these issues are just beginning to be discussed. “On campus, I’m one of those people that’s yelling about security, and it’s really interesting to see from here how threatening it is, the horror stories, because, probably like most colleges, our IT department isn’t particularly sophisticated. We have people that can get things done, but they’re pretty much poking around in the dark.” Thus, this workshop was exactly what he and faculty at other academic institutions needed.

Other reactions to WECS by its participants were enthusiastic. According to David Becker from Linn-Benton Community College, “Our intent (in attending the workshop) is to learn about security issues and how to incorporate them into our curriculum, and I think that’s been really useful.”

Randy Larson of Estrella Mountain Community College concurred saying, “It’s raising more questions which makes it more beneficial. I’m very passionate about information assurance, and I’m looking forward to adding that into several types of lower-level education as well because we also partner with various high schools within our community college system. I particularly believe that IA should start as soon as they start using the computer.” According to Falby, during the next year participants are required to report back on how they have incorporated workshop materials, examples, and teaching styles into their classroom and curriculum, thus insuring that information learned at the workshop will find its way into the public sector. “We’re not sure what we’re going to do, but we’re thinking of maybe putting in a full elective level course in information security,” commented Bull.

One unique addition to the WECS workshop was the inclusion of WECS participants in the WISE conference where they were able to hear from educators more experiences in field of computer security and get a glimpse of ongoing and future developments in the field of information security education.

The 3rd World Conference for Information Security Education (WISE) conference took place on the heels of WECS, June 26 – 28, 2003, and had the goal of international capacity building for educators already in the field of security education. Papers and presenters came from around the globe, spanning public, private, and military academic institutions. WISE3 attendees represented 13 foreign countries from five continents including the Canadian government, the University of Moscow, West Point, and Stockholm University, with industry representation by Cisco Systems, Inc. Two keynote presentations complemented the program: one by Dr. Peter Denning, Chair of the NPS Department of Computer Science, and a second by Dr. Dorothy Denning, also of NPS. Presentations included such topics as information assurance education in developing nations, graduate and undergraduate security programs, computer forensics, hands on laboratories and preparing students to defend against cyber attacks.

The WISE conference was sponsored by the International Federation for Information Processing and the National Science Foundation. Past WISE conferences were held in Perth, Australia and Stockholm, Sweden.

Future conferences will be the information security education workshop in Toulouse, France in 2004 and WISE 4 in Moscow