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Pulliam, Sylvia Lynn Clark
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Pulliam, Sylvia Lynn Clark, Ed.D.

Peabody College for Teachers of Vanderbilt University, 1992

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PERCEPTIONS OF COMPUTER SCIENCE EDUCATORS CONCERNING COMPUTER ETHICS

by

Sylvia Lynn Clark Pulliam

Dissertation

Submitted to the Faculty of

George Peabody College for Teachers

of Vanderbilt University

in Partial Fulfillment of the Requirements

for the Degree of

DOCTOR OF EDUCATION

in

General Administrative Leadership

December 1992

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PERCEPTIONS OF COMPUTER SCIENCE EDUCATORS
CONCERNING COMPUTER ETHICS

by
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December 1992

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The purpose of this study was to explore the perceptions that computer science educators have about computer ethics. In particular, the opinions of college-level computer science faculty were examined.

Data for this study were gathered using questionnaires which were mailed to all 144 full-time faculty members teaching computer science courses in Kentucky colleges and universities which offer a computer science major or minor. Data were processed using the Statistical Analysis System software package. Chi square analysis and comparison of means were employed to determine whether demographic differences existed.

Accessing confidential databanks and copying commercial software were considered today's most important ethical issues. A majority of respondents considered computer ethics to be a global problem, at their institutions, and among all sample groups, especially computer science students. The study showed that schools should publish a computing ethics policy, and that computer ethics can and should be taught at the university level in a classroom setting, preferrably in a separate module within a larger elective course, taught by computer science faculty, primarily for college freshmen. The study also

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showed that faculty should be expected to discuss computer ethics in other courses. A computer ethics module or course should cover a wide variety of topics, including copying commercial software and viruses and worms, and employ a variety of teaching methods, especially case studies and lecture.

Some significant differences in responses were traced to demographics. Public university faculty were more likely than church-related faculty to agree that ethically inappropriate computer practices are common among noncomputer science faculty and prefer class discussion of instructor-provided case studies as a teaching method; public university faculty were less likely to select copying commercial software as today's most important ethical issue. Respondents from colleges and universities with an existing computer ethics course were more likely to consider computer ethics a local problem. Faculty who had discussed computer ethics were more likely to respond that computer ethics is a local problem, a school should develop its own computing ethics policy, and computer ethics can and should be taught in the classroom. Educators who had attended a class or seminar on computer ethics agreed unanimously that computer ethics is a global problem.

R. Wilburn Clouse 12/14/92

R. Wilburn Clouse, Major Professor Date

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TABLE OF CONTENTS

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APPENDIXES Page

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LIST OF TABLES

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CHAPTER I

INTRODUCTION

The account of a Cornell University computer science student who brought computer systems at MIT and other universities, the RAND Corporation, and NASA to a grinding halt (Forester & Morrison, 1990, p. 57) was an extreme example of the potential for wrongdoing when misusing a computer. While the potential has always existed for unethical use of computers, the widespread use of computer networks has greatly magnified the potential harm that such unethical computer use can generate.

In light of a concern about the possibility of utilizing computer technology for unethical means, the Computer Science Accrediting Board (CSAB) has required that colleges and universities must be able to document that computer ethics and values are included in the curriculum in order to receive CSAB accreditation. Most schools must change their curriculum to assure that they include a discussion of ethics and values for CSAB accreditation.

Computer ethics is often considered to include an assortment of concerns: software piracy; invasion of privacy; inaccurate data, either through sloppy validation procedures or deliberate misrepresentation of data; use of computers to commit a variety of crimes, such as embezzlement; and computer viruses, our newest highly-

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publicized concern. But we have no real agreement on the definition of computer ethics, what concerns it encompasses, or whether it can or should be taught in the college classroom.

Even among those who feel strongly that computer ethics can and should be taught in the classroom, there are differences of opinion as to whether these topics should be taught in a separate course or integrated within the computer science curriculum. A course emphasizing computer ethics is likely to look at the larger area of societal issues in computer applications (Gotterbarn, 1991). It probably includes reading of several treatises on the topic and a good deal of classroom discussion. It may also include writing about the topics read and discussed and a practical application of the principles covered in the classroom.

A curriculum that integrates computer ethics into existing courses is more likely to approach computer ethics from the perspective of technical issues already being taught (Miller, 1988). One method is to include case studies that ask questions such as "Who owns information?" in a programming class or "How reliable is reliable enough?" in a computer organizations course. In the latter case, students could examine software that appears to work under expected conditions, then discuss the designer's responsibility if the software does not perform appropriately when used in an unanticipated context.

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Ethical Implications of Computers

Computers are tools which can have a tremendous impact on lives, either positive or negative. Used properly, sophisticated computer data bases can aid in apprehending dangerous criminals (Shannon, 1987) or in protecting government agencies from individuals who are abusing the system. But abuse of data base searches, often in the form of uninformed negligence, can cause innocent people to lose their welfare payments, be denied credit, receive threats over other people's obligations, and even be imprisoned wrongly (Davis, 1987). Artificial intelligence, one branch of computer science, can be used to provide sophisticated, user friendly teaching aids for students. Or the same technology can be used to guide missiles capable of annihilating entire populations (Weizenbaum, 1986).

Because the potential for abuse of computer power is so pervasive today, it is easy for people to feel powerless if they consider trying to affect any changes (BloomBecker, 1986). But, as individuals and groups join hands to insist on ethical considerations when dealing with computers, those who are taking a stand for the responsible use of computers are bolstered in their confidence that they can make a difference in reducing the abuse of computer power. And those who have never before been involved receive encouragement to take up the cause.

Computers often have a certain aura about them that awes the public at large. But, as we are often reminded, a computer is a tool. There are very few uses that we make of computers that couldn't be accomplished without a

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computer. The main difference is that a computer is much faster and in itself more accurate than manual procedures. In fact, its greater speed and accuracy allow the computer to work in a time frame that may make the difference between a task being feasible or not. For instance, computer records can be scanned to see if a license plate on a speeding car reveals any information about its owner's criminal record (Davis, 1987). This could be accomplished manually, but probably not while the questionable vehicle is still in sight. Adjustments may be made on medical equipment in a real-time mode. If this were attempted by hand, the patient might die before the calculations could be made for a change in procedure.

Computers can simultaneously provide us with a feeling of intimacy with a project and a sense of detachment from the actual activities, especially if the computer is programmed to make decisions and not just to provide information so that we can make these decisions ourselves. This detachment may prevent us from maintaining a natural skepticism about number-processing. If one nurse told another to administer two cups of a medicine when the usual dose is two teaspoonfuls, the attending nurse would probably ask the consultant to recalculate the dosage, perhaps even refuse outright to give the treatment. But if the computer appears to tell the nurse to administer the same two cups of medication, the dosage is more likely to be given without question (Forester & Morrison, 1990). Paradoxically, while we seem to have unreasonable faith in the accuracy of information which comes out of a computer,

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we often are very careless about the data that we put into the computer, somehow expecting it to compensate for our oversights.

Society cannot afford to consider computers as omnipotent creations, nor to denigrate computers prejudiciously. The potential for unethical behavior in the use of a computer seems to be clear, whether we are talking about large issues such as the planning of nuclear war, clearly criminal cases such as embezzlement, or more subtle issues such as reading another's personal data without permission. The question remains, however, as to how we should deal with computer ethics in the classroom.

Beyond approaching the topic intellectually, many schools have developed their own codes of ethics to reinforce the importance of ethical usage of computer resources and to provide direction for both students and employees who intend to follow ethical principles. Such a document usually states the purpose of the institution, mentions that resources are limited, emphasizes the right of all users to privacy, outlines the nature of intellectual property rights, stresses the importance of user and system security, and discusses rules regulating authorized use of the system (Augustine, 1989). Once developed and approved, it is important for all the players, including top administrative and academic officers, faculty members and computing staffs, as well as student leaders, judicial bodies, and legal and purchasing departments, to explain the institution's ethical policies

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and to set the example for others by adhering to the policy scrupulously (Webster, 1991).

Purpose of the Study

The purpose of this study was to explore the perceptions of computer science educators about computer ethics. In the field of computer science, almost every topic of discussion is still a relatively new one. But ethical conduct is an ancient concept which has dictated standards of behavior for thousands of years. The application of ethical conduct to computer science is a new idea which is sometimes difficult to identify and agree on. In particular, the opinions of college-level computer science instructors were examined in order to find a common ground on how ethics should be applied within the new technology of computer science.

Questions to Guide the Study

The following questions guided this study of perceptions of computer educators concerning computer ethics:

1. To what extent do computer science educators believe that ethically inappropriate practices are taking place (both on their own campus and throughout society generally)?

2. What are the perceptions of computer science educators about which practices in computer science have ethical connotations?

3. To what extent do computer science educators perceive that computer ethics are an appropriate topic to

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be addressed in computer science classes? Which topics with ethical implications should be taught in the classroom?

4. If computer science ethics are taught at the college level, what teaching methods should be used? Which methods should be used on which topics?

5. What is the relationship between demographics and the way that computer science educators view computer ethics?

Definition of Terms

Computer professionals use many specialized terms, which may not be found in standard dictionaries even a few years old. Some of these terms include new words, others use familiar words, which are given a new definition when related to computer technology.

Most of the words used in this study are considered to be ordinary and therefore will not need special explanation. Others are defined within the text. But some terms have a meaning which is not used in everyday conversation, or require a specific explanation for this context. Those words are defined below.

Artificial intelligence--Artificial intelligence is a branch of computer science that attempts to imitate the thought processes of the human brain, such as reasoning, learning, self-improvement, and associative learning (Rochester & Rochester, 1991, p. 472). Programs that employ artificial intelligence "learn" from experience by storing information and applying it to new situations (Trainor & Krasnewich, 1987, p. 503), unlike traditional

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programs which include all decision factors in the original code.

Computer professionals--A computer professional is a person whose career is centered around using computers. Computer professionals are distinguished from computer users who simply use the computer as a tool in their own disciplines or interests (Chien & Mason, 1987).

Computer science--Computer science is the study of computers and possible uses of computers. Computer scientists begin from the perspective of the computer and offer expertise in the effective and efficient use of computers in solving human problems in other disciplines (Western Kentucky University Bulletin, 1991).

Data bank--A data bank is a large collection of data stored in a computer, which can be either government-controlled or a private enterprise (Arnold, 1991, p. 384). Criminal, legal, and medical data banks are some of the most referenced, but data banks also have been established for other uses, including hobbies. The term "data base" is also used; the term "data bank" is generally used to describe a large data base.

Ethics--Ethics is the discipline that deals with right and wrong, good and bad, moral and immoral. Ethics can be compared to law, which deals with what is legal and illegal (Arnold, 1991, p. 441). This dissertation discusses computer ethics specifically as they apply both to activities that affect computers directly and those activities which use computers as a tool for any task (Szymanski, Szymanski, Morris, & Pulschen, 1989, p. 894).

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Hacker--There are two meanings for the term hacker, one a narrow subset of the first. In the first case, a hacker is a computer enthusiast who uses the computer as a source of enjoyment (Arnold, 1991, p. 442; Long & Long, 1986, p. G.4). A hacker often sits at a computer and tries different approaches to reach a goal or to explore the computer's capability. This person usually has limited formal training and has an undisciplined approach to computers, but is often able to accomplish a great deal, especially in a specific area (Wilke, 1990). In the narrower sense, a hacker uses this talent to break into computer systems illegally, whether for criminal gain or just for the thrill of doing it (Goldstein, 1986, pp. 488, 595). The narrower definition is becoming more common (Arnold, 1991).

Modem--A modem is a device which allows the computer to communicate, usually over standard telephone lines, with other computers (Slotnick, Butterfield, Colantonio, Kopetzky, & Slotnick, 1986, p. A57). The modem modulates the digital signal from the computer into an analog signal which can be transmitted over telephone lines and then demodulates the analog signals that it receives into digital pulses that the computer can use (Hutchinson & Sawyer, 1990, p. 704).

These terms are included in the review of the literature presented in the following chapter. Other specialized terms are defined within the text.

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CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Ethics are a major concern in our society today. There are reports about students cheating in school, people stealing to buy illegal drugs, national leaders pulling secret "dirty deeds," parents abandoning their children, child and spouse abuse, murder, rape, perjury, and other obvious criminal activity. Ethics committees exist at the national and state levels to try to assure some conformity to ethical conduct in our government. But while leaders devote much time and energy to the subject of ethics, it is clear that the world is not always committed to ethical behavior. Even when a group can agree that they wish to follow an ethical approach, the proper pathway is not always clear.

Working in a Technical Environment

Enforcing an ethical standard in a technical environment presents an additional level of complexity. Unethical, even criminal, activities conducted in a polite white-collar context, free of guns and visible violence, are traditionally regarded with more acceptance than unethical activities that require the use of force or a weapon (Bommer, Gratto, Gravender, & Tuttle, 1987). So an embezzler of $1,000,000 might be given a slap on the wrist,

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fined, or fired; but a thief who claims to have a gun while stealing $1,000 from a store should expect to receive a lengthy prison term. Part of the reason for this double standard is that many people, including potential jurors, simply cannot relate to the idea of juggling numbers on a page in the same way that they can understand armed robbery. Whatever detachment one feels from crimes committed with pencil and paper, that detachment is greatly increased when a computer is the tool of the crime.

Throughout this review of the literature, one needs to remember the constant dichotomy relative to computers as they function in today's society. Computers provide workers with possibilities to improve their work beyond what was even conceivable without computers. But they also provide the means for far more efficient criminal activity than ever before. And often the technology and software for the first are virtually identical to that for the latter. With that dichotomy in mind, I have tried to balance the literature, showing some of the uses of computers that truly improve our society along with those that expedite sinister and criminal behavior.

Data Banks

An example of the euphoria that we often feel from tasks that we seem able to accomplish only through the use of computers is Scorecard, the work of Ron Wutrich, a computer analyst for the U.S. Marshals Service (Shannon, 1987). Scorecard is a relational data bank that contains information about fugitives. The program can search data

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entered from a variety of sources to locate some of the nation's most wanted suspects, who have, so far, eluded detection.

Before Scorecard, "if a drug trafficker was out more than 48 hours, he was basically home free," according to Howard Safir (cited in Shannon, 1987, p. 63), head of operations for the Marshals Service. But adding Scorecard to the basics of "shoe leather, hunches and luck" has made it possible to search out clues on a suspect and then ferret out links among those clues and identify associates. This is truly a worldwide effort, locating fugitives around the world as well as throughout the United States.

While Scorecard illustrates the contribution that can be made through the use of lists of data on people, we also find abuses of this technique. One common concern of computer ethicists is potential invasion of privacy. "Every day an American wakes up, he or she is less free as far as private information is concerned. . . . Privacy is being invaded on a wholesale basis" (Davis, 1987, p. 1), Representative Don Edwards, a California Democrat, warned as head of the House Subcommittee on Civil and Constitutional Rights in 1987. Private sector firms track credit ratings for over 100 million people, influencing decisions made about individuals by companies that may be in distant states. Government agencies have been created throughout the 20th century which track various aspects of our lives through massive record systems, such as the Federal Bureau of Investigation, Internal Revenue Service, Social Security Administrations, and state departments of

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motor vehicles, etc. (Dunlop & Kling, 1991). This invasion into our personal activities is made all the more dangerous because the "facts" are not always accurate.

Government data banks are very useful in comparing data bases to identify criminals and those trying to cheat the U.S. government. However, they can turn lives into nightmares through false accusations, an occurrence which is becoming increasingly common. A New Orleans sculptor has twice been arrested at gun point and put into jail once because a fugitive has been using his name and social security number. A mother of three in the Bronx was removed from welfare because a computer system had found that she had a $1,042 bank account. After searching for weeks for this mysterious bank account, while begging from friends in order to feed her family, she learned the source of this "unreported money" (Davis, 1987, p. 1), a neighbor had asked her to co-sign on her savings account in case she had an emergency and needed someone to handle her money for her. The Bronx mother had forgotten about this act of neighborliness. A San Jose math teacher received a $5,814 statement from the federal government for a deliquent student loan that had actually been made to another man with the same last name of Harris, but a different social security number, address, and alma mater. Eventually, his congressman intervened to set the record straight, but not before he was threatened and received a bad credit rating that caused him to be turned down for a car loan.

Abuse of records is not new, Davis' Wall Street Journal article makes clear. The Nazis consulted hand-

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written municipal documents to round up Jews during World War II. But with manual record-keeping techniques, governments could not actually do much with the massive data that they collected. Now, however, with the advent of sophisticated computerized data banks and the widespread availability of desktop computers, agencies can run tapes crammed with personal data and compare files for inconsistencies. More than ever, police, social workers, and bill collectors can call up data banks with their desktop computers.

A new investigative technique, called computer matching, permits the government to compare unrelated computerized files on individuals to identify people suspected of fraud, abuse, waste of government funds, and other violations of law. With increasing frequency, government agencies employ this technique to find discrepencies and possible misconduct among entire categories of individuals, such as federal employees or welfare recipients (Shattuck, 1984).

Welfare agencies can use federal records on income and state records on wages, automobile registration, student loans, veteran's benefits, old age benefits, and medical transactions (Davis, 1987). The Selective Service System searches 100 data banks for leads to registration evaders, including a list of children who once registered for free ice cream sundaes on their birthdays. Food-stamp administrators have 248 data banks which might reveal over-payments. Thirteen law enforcement data banks provide information on drug suspects to customs agents. Data

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matching is not a new technique, but computers have made it quick and cost effective. "Computer matching is an efficient and effective technique for coping with today's expensive, complex, and error-prone government programs. For instance, computer matching and other innovative techniques helped my office identify $1.4 billion in savings," asserts Richard Kusserow of the federal department of Health and Human Services (Kusserow, 1984, p. 542).

But the value of an agency's findings through these data bank searches is limited by the value and accuracy of the data (Davis, 1987). For instance, 10 women in the Bronx were told that they would lose their welfare benefits because they had recently married, when in fact they had not married. Apparently, illegal aliens in the area had stolen their identification papers to fake marriages to U.S. citizens in order to avoid deportation. Bronx Legal Aid Society has won all the marriage-match cases that it has appealed to welfare authorities, but others may not have been reported to them.

Computer matches are likely to continue, Davis points out, because of their financial benefit to the agencies using them. David Greenberg, a University of Maryland economist, has estimated from his studies of computer matches that an efficient welfare agency can save $2 in overpayments for every $1 that it spends making the match. David Kusserow, the inspector general for the Department of Health and Human Resources, is confident that computer searching has uncovered welfare and food stamp cheaters.

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But he feels that agencies should limit such record scanning to people who have applied for aid. (Apparently there is currently no such constraint.) Because few states today maintain such data banks, they rely on purchased data. This increases the possibility of incorect data accidently entering the system and then being virtually impossible to correct. IRS passed along invalid data from 50 financial institutions on one million individuals without checking their accuracy. Many systems use the social security number as the common identification, a sort of 5-year-old to grave national identifier, which the Civil Liberties Union considers to be a violation of privacy.

The FBI's National Crime Information Center contains the nation's most sensitive data, with 19 million files on fugitives, stolen vehicles, and criminal histories. The FBI is now considering the addition of information on individuals suspected of crimes to the records already on file for those actually accused of crimes. They would also be able to consult individual Social Security and tax records. Police officers are already able to check license plates and identifying personal information against records on those wanted for crimes.

Data Accuracy

Problems arise when the data entered into these banks are incorrect. Overall, the data in the National Crime Information Center are about 95% correct, but the amount of incorrect data is worthy of mention. In 1985, an FBI audit in Alabama revealed that 13% of the data on wanted persons were incorrect and that another 17% had been dropped just

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before the audit. In Mobile, 75% of the wanted persons were listed as weighing 499 pounds and standing 7′11", the maximum weight and height for the system. Mobile′s errors were attributed by the FBI′s assistant director for technical services to a "knucklehead adding information into the system. He didn′t think you had to have anything in the system except names" (Davis, 1987, p. 1).

A University of California at Los Angeles professor has been mistakenly arrested three time over a dozen years and once spent the Christmas season being herded in and out of holding pens, handcuffed to dangerous and violent criminals, and strip searched. The professor′s name was entered into an FBI computer after an imposter was involved in a real estate scam, and he has been unsuccessful at having the electronic record corrected (Richards, 1989).

Perhaps a lack of faith in the data is reflected when people ignore the "facts provided," Davis conjectures. After consulting their police computer system, New Orleans police arrested a woman who was 70 pounds lighter and 6" shorter than the one described in the computer. Los Angeles police arrested a black man even though a white man was being sought. In all the cases mentioned here, procedures have been altered to prevent a repeat of the same mistake, but the potential for these and new errors still exists.

Privacy

Even if the data in data banks are accurate, there is a larger ethical issue concerning the inclusion and

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distribution of that data. Privacy, accuracy, property, and access are four traditional areas regarding human rights, which are interwoven in the fabric of society (Dejoie, Fowler, & Paradice, 1991). Traditional noncomputer issues in these areas include (a) government and individual rights concerning search and seizure, (b) surveillance, (c) access to education, (d) property and data security, (e) right to disclosure and review of personal records, and (f) right to be compensated for one's efforts. These issues take on a different tenor in the arena of computers and information systems. Computer-related issues in the areas of privacy, accuracy, property, and access are (a) exposure by minute description, (b) the right of an individual to disclosure and review of computerized records and database relationships, (c) context and accuracy of that data, (d) right to access information, (e) responsibility for accuracy of programs and applications using that data, and (f) copyright laws and software ownership. Computerization hasn't changed the issues involved, but it has changed the specific situations in which they occur and has created new challenges and viewpoints (Dejoie et al., 1991).

One topic of concern that touches all four of these human rights areas of privacy, accuracy, property, and access is that of services which provide, or sell, information through personal computer networks. Popular information services such as CompuServe and Nexis provide home addresses and telephone numbers, the amount of someone's home mortgage, or other personal data to anybody

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who owns a computer and buys the service (Rothfeder, 1992). These data are publicly available, but now they can be accessed by millions of people through their computers. And some of the data may seem as if they should be considered private. For instance, Jeffrey Rothfelder reports that the location (Mulholland Drive, in Los Angeles), purchase price ($795,000), lending institution (Southern California Federal Savings and Loan), and amount of the loan ($499,950) for the house that talk-show host Arsenio Hall purchased in 1988 were readily and legally available.

For less than $50, "besides a few fibs," Rothfeder was also able to find Vice President Dan Quayle's "unpublished" home telephone number and address and his social security number and charge card numbers, as well as a detailed account of his credit history (which is excellent). Obtaining one piece of data, by whatever means, establishes credibility and opens the door for accessing more data. By filling in a bogus application with conflicting information and several areas left blank, Rothfeder was given a password to a superbureau with access to credit bureaus and other sources of data. Then he used account numbers and credit histories available through this superbureau to convince a clerk at Sears to give him Dan and Marilyn Quayle's home telephone number and address. Of course, it came with the admonition "Don't pass it around" (Rothfeder, 1992, p. 4).

This electronic tracking of our Vice President is a child's game compared to the electronic stalking of Rebecca

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Schaeffer. Schaeffer, the 21-year-old star of the situation comedy "My Sister Sam," was murdered by a crazed fan who had followed her actions electronically. Her murderer later told of learning such personal information as her address and telephone number, what car she drove, and her purchases, through computer databanks. Upon learning that she drove a pickup truck or charged dinner at a trendy restaurant in Beverly Hills, he would imagine himself riding with her or accompanying her on a romantic evening. Knowing her address enabled him to ring her doorbell. He then shot her when she opened the door but didn't respond to his advances the way that he had fanticized during his lengthy sessions at the computer (Rothfeder, 1992).

Our personal tastes and buying habits become a public commodity whenever we pay with a credit card or use one to cash a check, or when we provide information in exchange for a free pizza or video rental (Rheingold, 1991). Purchases of millions of individuals can be recorded and then sold to others as a marketing tool. Because this information is all available from public sources, it may not seem to be an invasion of privacy. But intrusion results from the compilation, organization, and subsequent distribution of large amounts of data. A single disk can reveal an individual's tastes, brand preferences, marital status, probably even sexual orientation and political opinions. George Orwell envisioned Big Brother as a totalitarian dictatorship using technology to eavesdrop on individuals, revealing itself through secret police who

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kick in citizens' doors. But totalitarian manipulators of populations and technologies are more likely to achieve dominance because we allow our supermarkets to sell information about our transactions. Computer programs linking bar codes, credit cards, and social security numbers will become the weapons of espionage.

In response to this concern for privacy, the U.S. Department of Health, Education, and Welfare has developed the Code of Fair Information as a foundation for basing future privacy rights. The code includes five principles (Rheingold, 1991):

1. There must be no personal-data record keeping where the very existence of these records is secret.

2. People must be able to learn what information about themselves is on a record and how this information is used.

3. People must be able to prevent personal data that were obtained for one purpose from being used for another purpose without their consent.

4. There must be a way for people to correct identifiable information about themselves.

5. Any organization which creates, maintains, uses, or disseminates identifiable personal data must ensure the reliability of the data and must take precautions to prevent misuses of the data.

Massive amounts of data about our personal lives are being sold and distributed to total strangers, whose motives for desiring the data are unknown to us; but occasionally, public pressure can cause some reversals in this trend. Lotus Development Corp. and Equifax Inc. bowed

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to privacy concerns when they scrapped plans for huge databases that would have made information on the shopping habits of 120 million U.S. households and 7 million businesses available to personal computer users ("Huge database scrapped", 1991). Computer Professionals for Social Responsibility (CPSR) was one of the most vocal groups opposing the marketing of what they claimed to be "a great deal of personal information that had been obtained without the consent of the people that were listed," according to Marc Rotenberg, Washington director of CPSR ("Huge database scrapped," 1991, p. C3).

Technology and Despair

Many people are not aware of the efforts of groups like CPSR or the Code of Fair Information and have simply given up on computers. "I believe that hopelessness and powerlessness in the face of computer technology's rapid advance contribute to despair." (BloomBecker, 1987, p. 3) Despair itself is a sense of sadness or regret, with the fear or belief that one lacks the power to change things, based on BloomBecker's reading of Joanna Scott Macy's 1983 book, Despair and Personal Power in the Nuclear Age. Making things better ourselves is the best way to gain hope that it is possible for things to be made better, but technological advances often frustrate the sense that an individual can make substantive changes. Partly due to the shadow of the bomb, even very young children have lost an understanding of reality and meaning; they defend themselves from the adult world with indifference and defiance (BloomBecker, 1986).

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Macy states that MIT research showed that as early as the third grade, thoughts about the future of our planet generated feelings of confusion, hopelessness, and fear of abandonment. By the fifth grade, children were angry at the stupidity and hypocrisy that they saw in the adult world. Anger was replaced by cynicism and gallows humor by the seventh grade, giving way to feelings of numbness among teenagers. Although these teenagers had critical choices to make, "the shadow of the bomb rots these choices of reality and meaning; the young people begin to erect defenses of indifference and defiance" (p. 4), according to BloomBecker's account of Macy's book.

Macy and BloomBecker believe that young people's despair is not caused entirely by the threat of nuclear devastation. Macy also includes the growing misery of half the world's population and the progressive destruction of life support systems as major causes of despair. BloomBecker adds hopelessness in dealing with the advance of computer technology as another cause of despair today.

Turning again to Macy's Despair and Personal Power in the Nuclear Age, the reader finds that a turning point often occurs when people begin to face their despair. At this point, one (a) recognizes the power within the individual, (b) broadens one's vision of what is possible, and (c) acquires the skills necessary to accomplish social change. BloomBecker recognized these steps within himself, as well as an appreciation for the need of each, as he began to overcome his despair at dealing with computer crime.

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BloomBecker recognized his personal power when he was invited to discuss the implications of the movie "War Games" on "Nightline," providing an audience of millions to hear his words. He decided that from then on he would use the term "Conscience in Computing," or in some other way reference computer ethics whenever he speaks to the media. This exposure has given a more positive thrust to the work of his National Center for Computer Crime Data. (Although most of us do not receive this kind of exposure to our work, we can still find an audience somewhere and raise the conscience of those around us with respect to their responsibility in the use of computers.)

Computer Crime

BloomBecker has a unique insight into despair that might result from interactions with computers in his role as a computer crime consultant. With sardonic humor, he states that he used to give a speech intitled "Computer Crime: Career of the Future?" which described much of the despair he felt in his role as computer crime consultant. His question mark was often replaced by an exclamation point, and "Computer Crime: Career of the Future!" was being heard by those expecting to attend a how-to session (BloomBecker, 1986, p. 4). Unfortunately, it seems to him that it is only the criminals, not the potential victims, who are interested in his messages. He has learned through the criminals that most people are stupid, lazy, or just don't care. As an example, he points out that people are stupid not to change a password when a vendor tells them

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to, they are lazy if they won't take the effort to follow proscribed security procedures, and they lack even minimal concern if they don't wonder why a clerk who earns $10 thousand a year bets $2 thousand a month.

Although BloomBecker bases many of his conclusions on his work with hundreds of criminals that have been caught, he contends that computer crimes are seldom detected; detection of computer crime is usually the result of lucky breaks. The 47 state computer crime laws that were in existence when he wrote were largely ineffective because:

1. Sometimes companies do not consider it worthwhile to detect computer crime. He mentioned a bank that was aware that small amounts of money were disappearing from customers' accounts. Rather than try to find the source of this petty larceny, the bank chose instead to pay off those who complained and ignore those who did not, in the name of cost-effectiveness.

2. Few detected crimes are reported. Victims are often reluctant to let it be known that they have poor computer security. BloomBecker mentions a computer criminal who blackmailed his employer. In return for not publicizing the crime, his employer gave him a letter of reference to a new employer, who became his next victim.

3. Few computer criminals who are prosecuted are seriously punished. In a study by the National Center for Computer Crime, headed by BloomBecker, only 1 out of 75 cases studied resulted in a prison sentence. Others led to minor jail time, restitution, and community service. Many

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people are not even aware that there are laws against computer crime.

Computer crime, of course, is itself a serious violation of ethics. But these three points illustrate that one's response to computer crime must itself embody ethical principles. The bank in the above example demonstrated an appalling lack of ethics with respect to its customers who were being systematically robbed. The company who preferred not to press charges ignored the reponsibility to the public at large by pretending that the employee had served them honestly and well. Lack of prosecution may often result from ignorance more than a rampant lack of ethics, as most people do not understand computers and the laws that deal with them. But this unwillingness to recognize computer crimes is at least in part responsible for ineffective detection and reporting of computer crimes, a cycle that can truly lead to despair with respect to our inability to change the problems of the world.

Need for Computer Ethics

As early as 1940, Isaac Asimov saw a need to use technological advances for the good of mankind (Waldrop, 1987). The 20-year-old science fiction fan and author had tired of literature repeating the myths of Faust and Frankenstein, where robots were created and later destroyed their creators. "My robots were machines designed by engineers, not pseudo-men created by blasphemers," Asimov stated (p. 29). His robots would follow the rational lines constructed into their brains, which would be imprinted

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with engineering safeguards called the three Laws of Robotics:

> 1. A robot may not injure a human or, through inaction, allow a human being to come to harm.
> 2. A robot must obey the orders given it by human beings except where such orders would conflict with the first law.
> 3. A robot must protect its own existence as long as such protection does not conflict with the first or second law. (Waldrop, p. 29)

But even when pursuing a goal of benevolence toward mankind, liberties can be lost when others determine to guide or control our actions. Robots that are designed to take over all work and difficult tasks would leave us without goals or usefulness, a true horror story. A secretarial service intended to filter out junk mail would be a potential tool for a big brother to control our personal communications.

Artificial intelligence (or AI) is the most likely means of controlling robots and in the case of computer-related activities may actually serve as robot. That discerning secretarial system, for example, would almost certainly be an AI program with the capability of determining whose messages get through to whom, what topics can be transmitted across a network, or who might be locked out temporarily for past misdeeds. A system that could filter out obscene phone callers or likely drug dealers could make the transition of identifying criminals to indentification of what someone considers subversive or disloyal speech.

Computers don’t come equipped with Asimov’s built-in ethical laws for robots. So AI has an even greater potential for producing undesirable outcomes. Programs

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which make a final decision on actions, without human intervention, have the greatest potential for harmful actions. This is true for a program that a human has written in an attempt to embody a bank's standards for screening loan applicants. It is also true for launch-on-warning devices intended to launch nuclear weapons against our enemies at the first warning. Fortunately--with our track record of producing false alarms--launch-on-warning has never been implemented in this country (Waldrop, 1987).

In the face of the combined power and threat of AI and robotics, one is faced with the prospect of developing a code of machine ethics. This theory must address such issues as: Is it ethical to abdicate responsibility for activities with world-wide consequences to a machine? Although computers may do a job better than humans, computers are not human and just follow orders as best they understand and are capable, so they may require a little hesitation and a chance for second thoughts (by humans); we should expend the energy to be certain that computers are never called on to decide the future of the human race, even if they seem capable of the task.

In fact, we embody ethical standards today in the AI programs that we write. We retain ultimate control over computers, because humans are their creators and have the final authority over their programs. Although the world changes through time, and we are in a time of rapid change, we adhere to certain long-term values. The Bible is still understandable to us and cherished today after thousands of

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years. We will still be human, no matter what changes machines may make (Waldrop, 1987).

Because of his national exposure, BloomBecker (1986) enjoys an unusual sense of power in his work, and Asimov found a ready audience for his fictional altruistic robots, but all computer users can recognize the need for concern and work toward "Conscience in Computing." Hacking, piracy, and privacy are three of the hottest computer issues today; and all three are pervasive, ambiguous, inexpensive, and legally complex (BloomBecker, 1986). So many people are involved in these activities and they are so difficult to detect and to differentiate from the norm that prosecution and deterrence are unlikely. The issue is clouded even more because there is often very little monetary loss to the victim and the perpetrator is usually very young. There were approximately 1,000 hacker bulletin boards in 1985, with many of these bulletin boards being used to assist one another in pirating software as well as hacking, or unauthorized computer use. And "who, I ask, will charge a twelve year old with conspiracy to violate the copyright laws if she comes home from computer camp with a shoebox full of games copied in violation of the manufacturer's copyright?" (BloomBecker, 1986, p. 7). So, there clearly is a need for computer ethics.

This need for computer ethics is not being met, so it is essential to broaden our horizons so that we can meet this need. The computer industry failed to develop an ethical base among its practitioners, and now that this technology has moved into our homes and public domain,

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there is no corresponding ethic to move with it, according to computer security consultant Robert Campbell in his address to Congress. Donn Parker adds that computer crime is the result of the lack of ethical standards within the computer profession. The National Center for Computer Crime Data found that 92% of school districts in the United States had at least one computer by 1985, but almost none had a computer ethics course. They found silence on computer ethics on the part of both religious and business leaders.

There is urgency to meet this need, which the National Center has equipped itself to do. They are excited about their work in spreading the belief in the need for computer ethics with their "Conscience in Computing" program. The National Center has found a growing audience for their message through opportunities to speak and to publish.

Three of the reasons BloomBecker gives "why computer ethicists sometimes get the blues" (p. 8), due to the general lack of attention given to computer ethics are:

1. Budgets. The bottom line is often our first line of defense against computer ethics. School budgets seldom include funds for someone to teach computer ethics. Businesses which make short-term profit their only goal are not interested in establishing a long-term foundation for secure and humane growth. But this logic is self-defeating. It is as unreasonable for a business to neglect moral training as it is for an automobile assembly line to neglect the installation of brakes. Both would be inviting disaster.

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2. Technophobia. Many top corporate executives still have a great insecurity concerning computers. They have adopted the ostrich position concerning computer security, refusing to make decisions involved in adopting and maintaining computer technology in their businesses, even though many will admit that "We're waiting to be hit" (p. 8).

3. Technophilia. While one group of the population fears computers unreasonably, another group is unreasonably devoted to them. They are interested only in its technological power and the capacity of the computer and ignore the ethical questions involved in virtually every consequential appplication. Many technophiles assume that change always means progress and that progress is always good.

Social Change

But there is a basis for hope in countering the effects of budgets, technophobia, and technophilia (BloomBecker, 1986). An individual is not alone in the fight to preach computer ethics. Although most publications emphasize the delivery of technical information to an ever-larger audience of users rather than news of the social implications of computing, a fund of experience has now accumulated for anyone willing to look for it.

The Association of Data Processing Service Organizations (ADAPSO) has begun an effort for draft warranty and customer service standards which are consumer oriented. This effort was in response to extreme behavior

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on both sides of a growing conflict between software providers and software users. Due to concern about software piracy, many software dealers attempt to establish contractual relations with software buyers through licenses prominantly displayed beneath the software's clear plastic shrink-wrap packaging. These are often pro-seller and anti-buyer licenses which attempt to eliminate the buyer's right for fair compensation if the software is unfit for the task specified. Some software manufacturers then went one step further by trying to pass intrinsically anti-consumer "shrink-wrap laws" in different state legislations (BloomBecker, 1986, p. 9). Only the first such law has been passed, in Louisiana. Californians have countered by introducing a bill which requires better warranties on software. The bill's sponsor has agreed to withdraw the bill in favor of the ADAPSO standards.

Computers are being used today in a variety of social and political arenas. Several hundred community and social service organizations sent representatives to a 1986 conference on "Computers and Social Change: New Tools for Community and Political Organization," which provided them with ideas of projects and programs which use computers to reach their goals. Computer Professionals for Social Responsibility is a political group which considers computer ethics education, computer equity, computer matching, military issues such as the Strategic Defense Initiative, and other timely issues. It is my observation that these activities can be seen as the epitome of good or

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of bad that can come from using computers, depending on the specific use and one's point of view.

Society can look forward to the future with hope in the area of computer ethics, because people are beginning to feel their power to affect a positive change and because there are tools now in place for aiding in the teaching of computer ethics. Computer simulations test out ethical theories. BloomBecker refers to a game theory puzzle, a computer simulation program which requires a person to determine whether to trust another. It turns out that the best strategy involves trusting the other unless one has specific reason not to trust the other. The movie "War Games," in which a group of teen-age hackers play a "game" that actually starts a nuclear war, had a message that was overshadowed by the sizzle of the movie's teenage hackers: Nuclear war cannot be won by any player. I am bothered by these examples, because the game and movie referenced could have been written to demonstrate different results. But the potential for well-reasoned computer simulation is great.

Codes of Ethics

Many organizations have responded to this concern about computer ethics by developing formal codes of ethics (Freedman, 1983). Certainly, computer scientists should not use their expertise to commit crimes, but codes of ethics go beyond legal requirements. One chief issue is the broad question of competence and fulfilling job requirements. Computer professionals may find themselves in a situation where they are not capable of performing

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according to the requirements made of them. Inability to do a job is not in itself unethical, but individuals have a responsibility not to make others believe that they are doing more than they actually are doing.

This is often a sensitive issue, because it may be difficult to determine who is responsible--the persons making the original demands, the analyst who evaluated the project and decided who should be able to accomplish what during a given amount of time, or the programmers or other professionals given the job of implementing the original plans. The problem is often intensified because of unreasonable expectations and time restrictions placed on a management information systems (MIS) manager by corporate management, pressuring the MIS manager to promise more than can be delivered.

Many MIS managers work with their staffs to develop a code of ethics, addressing such issues as accepting gifts or free lunches from vendors, judging each other, general honesty, and overall responsibility. J. Crawford Turner, Jr., who was international president of the Data Processing Management Association (DPMA) and operations communications manager of the Knoxville Utility Board in 1983, stated that "The MIS manager has to be concerned . . . because he can affect more lives in a very short time than a doctor or a lawyer" (Freedman, 1983, p. 34).

Roger Mills (cited in Freedman, 1983), former chair of the professional standards and practices committee of the Association of Computing Machinery (ACM), emphasizes the need to institute effective controls on a data base. Both

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Turner and Mills charge individuals with a commitment to go beyond any corporate or organizational code of ethics in following their own personal ethical codes. But they also feel that potential effectiveness of these codes is dependent on effective enforcement procedures.

Many professional computer science organizations have created their own codes of ethics for members (Couger, 1989; Freedman, 1983; Martin & Martin, 1990). ACM reflects that the "Recognition of professional status by the public depends not only on skill and dedication but also on adherence to a recognized Code of Professional Conduct" (Association for Computing Machinery, n.d.). ACM's Canons of Conduct call on its members to: act at all times with integrity, strive to increase competence and prestige of the profession, accept responsibility for their own work, act with professional responsibility, and use their special knowledge and skills for the advancement of human welfare. Several ethical considerations and disciplinary rules back up each of the five canons.

The Institute of Electrical and Electronic Engineers (IEEE) has a similar code of ethics which states that

> Engineers, scientists and technologists affect the quality of life for all people in our complex technological society. In the pursuit of their profession, therefore, it is vital that IEEE members conduct their work in an ethical manner so that they merit the confidence of colleagues, employers, clients and the public. (Institute of Electrical and Electronic Engineers, n.d., n.p.)

The code consists of four broad articles with suppporting admonishments. The four articles call on members to maintain high standards of diligence, creativity, and

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productivity in the area of personal professionalism, at work, in relations with employers and clients, and in community responsibilities.

DPMA's code of ethics states that a member has an obligation to management, to fellow members, to society, to an employer, and to the nation and that each member should act in accordance with these responsibilities. A DPMA member pledges to "accept these obligations as a personal responsibility, and . . . actively discharge these obligations" (Data Processing Management Association, n.d., n.p.).

The three codes mentioned so far are rather generic codes of conduct, similar to a code of conduct for many noncomputer organizations (Martin & Martin, 1990). The International Society for Technology in Education (ISTE) has developed a more information-specific code of conduct. ISTE's ethical code for computer-using educators contains nine principles which call on its members to accept responsibility in the areas of: curriculum issues, computer access, privacy and confidentiality, teacher-related issues, student issues, community issues, school organization issues, software issues, and hardware issues (International Society for Technology in Education, n.d.).

Teaching Computer Ethics

Sometimes computer ethics can be taught indirectly. University of California at Berkeley has developed some teaching techniques for Project Equals which are designed to make minorities and women more comfortable in studying computers (BloomBecker). This project has some hands-on

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teaching modules which provide an enjoyable setting for teaching computer ethics. Schools also can teach computer ethics by example through a program such as the one at Red Bank, New Jersey, which is committed to the ethical use of computers and programs. A school can insist that its faculty not violate copyright agreements and not tolerate copying or other computer abuses.

Many educators feel, however, that more formal ethical training is required. According to Bear (1986), most educators today recognize the need to teach more than technical skills to their students. He claims that this is a natural outgrowth of a national expectation for moral education in general and a recognition that schools have the social responsibility to foster the development of socially and morally responsible future students. The difficutly lies not in recognizing the value of such training, but in finding direction in terms of methods and materials. In fact, he refers to two meetings where educators seemed to leave with the feeling that ethics cannot be taught.

Parker's (1983, p. 197) book, Fighting Computer Crime, identifies four roles of computers which generate many computer-specific legal and ethical issues:

1. Repositories and processors of information. Opportunities for unauthorized use of services and information abound.

2. Producers of new forms and types of assets. These new types of assets, such as computer software, may not be subject to the same concepts of ownership as other assets.

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3. Instruments of acts. How much responsibility do the providers and users of computer services have.

4. Symbols of intimidation and deception. Computers can generate images in people's minds of machines that are absolutely correct, infallible, subject to blame, scapegoats for human error, and anthropomorphic, which should not be overlooked in evaluating their place in society.

Bear lists the following issues which relate to the roles outlined above and are appropriate for inclusion in high school curriculum:

> Copyright law and issues
> Privacy
> Computer crime and abuse
> Freedom of information versus privacy
> Hacking
> Fair and equitable distribution and use of computers
> High tech/high touch
> Responsibilities of programmers and users
> Vandalism
> Plagiarism
> Government control of information
> Computers and the military
> Computers and job displacement
> Classroom computing rules
> Computerphobia
> Video games
> Personal versus impersonal computers
> Computer errors
> The information age
> The cashless society
> The electronic cottage
> Supercomputers
> Artificial intelligence
> Robotics. (p. 116)

Bear feels computer science educators should be the ones to teach computer ethics, but only after learning how to do so through co-teaching or inservice education provided by the guidance counselor, school psychologist, social studies teacher, and teacher of the gifted, and that

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the topics should be integrated throughout the computer literacy course. For instance, copyright issues should be covered while making legal copies of programs, and privacy could be addressed while developing a data base, etc.

There is an implied goal of altering students' ethical standards by teaching computer ethics, beyond just an academic understanding of the topic (Cohen & Cornwell, 1989; Cougar, 1989). Cohen and Cornwell studied student behavior and attitudes toward ethics before and after they had studied computer ethics in an academic setting, which they called the "treatment" for poor ethical awareness. They found that studying computer ethics led to more ethical behavior and that integrating the subject into the curriculum seemed to be the best approach. Cougar felt that he received the best results through classroom discussions of specific, sometime difficult, ethical situations.

Technological Detachment

Ralph Nader has stated

> that the most important issue facing us . . . is how to overcome the widespread feeling among people that they don't count in terms of affecting the use of power in the world. . . . Nothing proceeds to remedy victimization in this world of ours until ... they feel self-confident that they can find out about issues and act on them. (BloomBecker, pp. 10-11)

Joseph Weizenbaum (cited in BloomBecker, 1986) has also tried to deal with this issue in his talk, "Not Without Us". The threat of worldwide destruction is near at hand. In Germany, the people have become used to viewing nuclear weapons facilities and walking past holes

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in the street that are intended to be filled with nuclear land lines. In the United States, such facilities are out of everyday sight, but they are still there.

Americans remain unconvinced by government statements that the Soviets are effectively as close to us as to Europe or that such nations as Cuba or Nicaragua could pose a threat to us. American war experiences allow us to feel that "it can't happen here" (BloomBecker, 1986, p. 2). It is natural to use psychological mechanisms to block ever-present dangers from our consciousness, but we shouldn't allow this natural tendency to prevent us from employing potentially life-saving behavior.

Weizenbaum admonishes,

> It is a prosaic truth that none of the weapon systems which today threaten murder on a genocidal scale, and . . . condemns countless people, especially children, to poverty and starvation . . . could be developed without the earnest, even enthusiastic, cooperation of computer professionals. It cannot go on without us!" (p. 2)

He wonders what this says about computer professionals.

Researchers in the field of artificial intelligence play an especially vital role in the development of sophisticated weapons. But many researchers engage in a kind of Orwellian "double-speak," or linguistic euphemism, which disguise the manifestations of their work. We are so enthusiastic about computer systems that understand, see, make judgments and decisions, etc., that we are anesthesized to their potential end use. A student may devise a system which throws a ball from a kitten to a bear, accompanied by appealing animation and polite messages such as "Kitty, give your ball to a friend," or

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"Thank you my dear kitten" (p. 4). But Weizenbaum contends that this is the same kernel of research needed to have a fighter pilot transmit a bomb to a specific target. Such an approach takes the software development used for mass destruction and passes it off as child's play. I feel that we can certainly make a strong argument for the value of such technology, as in the 1991 Gulf War, but we should recognize it for what it is.

David Noble, a historian of technology, reports that scientists and engineers often claim--and may even believe--that they are purveyors of great things for society through techonological progress (Noble, 1984). But he claims that these scientists and engineers, like most other folks, are caught up in their own agendas as they reach for such goals as professional success and personal satisfaction in their work. Therefore, they don't recognize whether society at large benefits or suffers as a result of technological advances.

Because technicians are generally funded by those who have political, military, and economical power, they naturally are more familiar with the concerns of the powerful and begin to adopt the goals of those in control as their own personal goals. Thus, improved efficiency, which often takes the form of tighter controls over workers, becomes an end in itself. Because of their insulation from ordinary workers, technicians may recognize that they have eliminated the drudgery for the working people without realizing that they have also eliminated the need for the workers altogether.

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Computers, especially, have been the heavy in this relentless march toward technological advancement. They have been brought into factories in order to provide operators with a better means to control equipment. But, over time, new industries have been designed around the computerized equipment, and eventually the computers have evolved so that they control the human operators themselves.

The advent of computer controls in industry has had the negative impact, from the workers' point of view, of eliminating jobs, either directly as employees are laid off, or silently, as new employees are not hired to replace those lost through natural attrition. Groups who are traditionally affected the most by these lost jobs are blacks, women, and those under 22 or over 45.

The technological transformation in industry and the introduction of computers in the workplace are often viewed as a sort of second industrial revolution and thus greeted enthusiastically. But people today have forgotten the pain and turmoil that accompanied the first industrial revolution. Noble sees a drain of resources, concentration of power, tightening of control, and despair in the current compulsion to automate.

Computer Hackers

Computer hackers provide a direct assault on the privacy of computer users (Wilke, 1990). Their invasions of privacy can include such activities as simply reading our files or maliciously altering them for their personal

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benefit. Wilke reported on one such hacker, Frank Darden, who received his first computer for Christmas when he was 16. He spent hours in his room with his computer and became so engrossed that he dropped out of high school and immersed himself in a new subculture, replete with voyeurs and electronic vandals sporting exotic code names such as "Knight Lightening," "The Prophet," or "The Leftist" (Darden's name). Hackers operate in a solitary environment but communicate through their modems with people of all ages and backgrounds from around the world.

Darden frequently engaged in "war dialing," a "brute force" approach whereby the computer runs through the night, automatically dialing every number in a telephone exchange, and records every number that hits a "carrier tone" which signals a computer on the other end. A typical night would reveal about 100 computers, "each one a potential treasure chest," Darden asserts (Wilke, 1990, p. A4). The next night, Darden would take these numbers, determine the types of computers responding, and try to break into the systems. He developed automatic password-cracking procedures and a program that allowed him to capture passwords of legitimate users. "Once you get that, you've got an open door," he says (p. A4). Darden also shared phone numbers and system-cracking tips with other hackers.

Darden's intrusions were mostly relatively innocent fare, according to Wilke. He began at age 17 by breaking into a big computer at Hayes Microcomputer Products, Inc. and looking around. "I didn't take anything, I was just

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trying to see if it could be done," he says (p. A4). Hayes tightened security when they discovered the breach. Darden enjoyed the "cat-and-mouse" approach. He would send messages to a company's printer to let the operators know that he was there. He enjoyed getting into credit bureau files and looking up credit reports for his parents (he didn't have a credit record) and his friends. Eventually, he achieved his biggest thrill, by breaking into a Bell-South computer in Atlanta used to maintain and control the phone system. Darden would have been able to reroute telephone calls or bring down switching centers. "If we'd wanted to we could have knocked out service across the Southeastern U.S. The fact that I could get into the system amazed me. But we were careful not to damage anything," he claims (p. A4). He admits only to eavesdropping on phone lines of other hackers.

In fact, Darden and many other hackers adhere to their own self-styled code of ethics. Phrack (for phone-freak hacking), an electronic magazine published over computers for hackers, offers the following "code of ethics": "Do not intentionally damage any system" or alter files "other than ones you need to ensure your escape," and "Don't be afraid to be paranoid. Remember, you are breaking the law" (p. A1).

But the courts do not recognize this hackers' code of ethics and treat the deeds of people like Darden as criminal trespassing under a 1988 law. And no matter how innocent a person's intentions may be, a hacker's legacy may still be destructive. Some of the tips shared by

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Darden were apparently used in more damaging forays by other members of the elite clique of hackers known as the Legion of Doom. The targeted organization and the Secret Service do not know a person's motives, so they investigate full-force. BellSouth spent $1,500,000 and used 42 investigators to find its intruders. The Secret Service then followed through by arresting Darden and two others on felony charges of conspiracy and wire fraud.

Ed Darden, Frank's father, has a new perspective on his Christmas gift after being held at gunpoint by 12 Secret Service men who broke into his home and confiscated his son's computers along with stacks of files and disks, then arrested his son for trespassing. "I'd have thought twice about it. Maybe we should have given him a bicycle" (p. A4).

Not all hackers are children. At 32, Leonard Rose was an alleged member of the Legion of Doom, according to agents of the Secret Service and Justice Department, who claim he possessed programs that could have been used by others to break into computers (Wilke, 1991). Rose used the name "Terminus" in his network communications, but his attorney claims that Rose was not a member of the Legion of Doom.

Rose's case opens many related ethical issues. He was not charged with breaking into computers or with conspiring to do so. And, in fact, he was never actually tried for that. He pleaded guilty to lesser charges of misappropriating, sharing and modifying parts of Unix, software licensed by American Telephone and Telegraph, and

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received two concurrent 1-year prison terms (considered by many to be a rather stiff sentence). So the constitutional issues of free speech that some attorneys say are part of hackers' rights were never addressed.

But Fred Foreman, Chicago's U.S. Attorney, emphasized that hacking is serious business that the federal government is determined to stop (Wilke, 1991). "People who invade our telecommunications and related computer systems for profit or personal amusement create immediate and serious consequences for the public," he stated and promised that, "Those who choose to use their intelligence and talent in an attempt to disrupt these vital networks will find themselves vigorously prosecuted" (p. B4).

Security

Hackers may violate the security of a company, or even a nation, by accessing confidential data. It is often enough for an intruder to learn about certain activities to cause a breach of security; the breach is even more serious if the intruder appears to alter the data. Today's proliferation of computer networks increase the vulnerability of most of our nation's computers.

Clifford Stoll, Berkeley astronomer, discovered just how vulnerable supposedly "secure" data can be (Stoll, 1989). He became aware of an intruder into the Lawrence Berkeley Laboratory (LBL) because of an accounting error of less than $1.00. Most of his colleagues shrugged off the small discrepancy and attributed it to "rounding errors" that may occur when totaling several values that have been rounded off to the nearest cent, but Stoll convinced LBL

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management to allow him to track the intruder's possible future unauthorized entries.

Although at first Stoll suspected that the intruder was a prankster or pranksters from the neighboring University of California campus, he eventually followed a trail which led to West Germany. Along the way, this hacker had entered 30 accounts on a network which links several military installations (MILNET). None of the networks carried classified information, but much of the data were sensitive, especially if large amounts were collected. They certainly were not intended for foreign perusal.

The hacker's success was based more on patience and diligence than on high-tech wizardry. He would enter a system through an innocuous account, make himself system supervisor, and then get access to all other accounts on that network. The easiest systems to enter were the ones where supervisory accounts had no password. Generally, he could enter a system through guessing obvious passwords, such as "password," "system," or "root." Other times, he would get in through well-known security holes that supposedly had been patched but actually hadn't been fixed. Once in the system, he had more leisure to create new accounts and guess passwords for other accounts. Since many systems use one-way encryption, their encrypted passwords were often contained on open files. By simply trying the owner's name or encrypting every word in the dictionary and comparing each to these encrypted passwords on his own computer, he could enter other accounts. While

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his success rate was only about 5%, he attempted so many entries that he acquired an impressive number of successes.

Stoll is now lauded as a hero for his year-long search for the intruder, but at the time his efforts in tracking him down were often dismissed as paranoia. Those who might have helped him placed roadblocks in his way. When warned that their networks' security had been breached, many supervisors assured Stoll that was impossible, only to call him later and admit that their systems had been violated. Their reaction at this point was often to close the security hole and destroy any files know to have been created by the intruder. Even this often stymied Stoll's work, as he was trying to keep most pathways open in order to entrap the hacker. Even the FBI at first refused to help, with all the individuals he spoke with claiming "that's not my baliwick."

But while managers were blocking Stoll's way, network users were keeping open plenty of doors for intruders. Stoll lamented that the best of hardware and software security methods are worthless if not used effectively. Many users set up accounts with no passwords. Others use their last name or initials or other obvious words. Most people have one password for all their accounts, so if someone learns one password, that person knows the password to all accounts. Stoll entreats network users to change passwords frequently, to use passwords that aren't obvious, to make them fairly long, and to include some non-alphabetic characters, so that the password isn't in any dictionary. The user shouldn't write down the password, or

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tell a friend or record it in a file anywhere. Above all, updates to a system which are intended to heighten its security should be installed promptly and carefully. Such simple precautions might have prevented the snafu he uncovered.

Communication

While breaking into another's computer system by using subterfuge to access private phone numbers and passwords is clearly a violation of law, use of electronic mail (E-mail) is often a more subtle call (Branscum, 1991). Take the case of Alana Shoars, who was fired from her job as electronic-mail supervisor at Epson America after questioning why her supervisor was reading employee E-mail without enployees' knowledge. Epson claims that Shoars "was terminated for just cause" (p. 63), and her firing had nothing to do with E-mail or the privacy issue.

Shoars claims that she had been asked by the company to market E-mail services, assuring employees that E-mail communications were private and secure. When she discovered that her supervisor was routinely monitoring a portion of the mail, she felt personally responsible as E-mail supervisor to try to stop this invasion of privacy, which is a constitutional right in California. While pointing out that their computers carried a great deal of data besides E-mail and that supervisors who administer the system must sometimes view that data, company spokesmen deny that E-mail has been routinely monitored.

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Shoars has filed wrongful-termination and class-action suits against Epson. One company response has been to notify employees that it can't guarantee privacy of any data, a step that other companies have also taken in an attempt to protect themselves from lawsuits. But it is uncertain just how much this disclaimer protects them from liability. Many employees are responding to this news by encrypting the data they transmit by E-mail, according to Michael Blum, specialist in electronic communications issues, bringing up a new question, "to what degree should employers have the keys?" (Branscum, 1991, p. 66). Since executives routinely give their E-mail passwords to assistants and there is always a group of network administrators and others with the technical ability to eavesdrop on our communications, E-mail is not the private, secure correspondance that many have believed it to be.

The question posed by Branscum is, when do we cross the line between needed expediency and safeguards for an organization and violation of ethics, perhaps even violation of the law? Until that question is answered, Shoals offers the advice, "get the company policy on E-mail in writing" and "an old rule my grandfather taught me. Don't put anything in writing that you would be ashamed to see on the front page" (p. 67).

The ability to communicate with a large audience through a modem has created ethical and legal dilemmas not even considered a few years ago. Privacy of electronic communications does not seem to be the only issue in Prodigy's new membership agreement and revised message

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guidelines (Branscum, 1991). Prodigy is an information service provided primarily for small and home users through a unique arrangement that includes IBM, MacIntosh, and Sears. It announced a new fee structure last year that generated an organized response by protestors who sent out thousands of messages to advertisers and other members. Prodigy's reaction was to disconnect and terminate abruptly about a dozen people and to place limits on advertising communications, use of messaging software, and chain letters.

As usual, there are two points of view in this case. Branscum talked with Geoffrey Moore, director of market programs and communications at Prodigy, who points out that Prodigy is not E-mail. "This was costing us an enormous amount of money," he claims. "What we didn't anticipate and what we can't ignore is having a tiny minority send out huge amounts of mail" (p. 67). He considers it harrassment to send out thousands of unsolicited messages a day (as many as 50,000) and reports that Prodigy received many complaints against the terminated members. Prodigy's membership agreement allows for either party to terminate without warning. According to Moore, Prodigy did give warning before terminating memberships, but not much warning to the more flagrant offenders. "I don't think you realize how much this is costing us" (p. 70).

On the other side of the issue are people like Henry Niman, a cancer researcher who sent out hundreds of messages on Prodigy concerning the price hike and related developments as part of the protest. When Prodigy

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terminated his account, he lost access to electronic banking and messages in his mailbox, which included a critical message concerning a patient's medical treatment. So, interruption in his membership had serious consequences both to him and to at least one patient. It is interesting to me that he (or at least those who have reported his story) seems to consider loss of banking privileges to be in the same class of concern as loss of critical patient information.

Those who have sided with Niman and other protestors feel that dissent, while possibly outrageous as well as expensive, is not a crime. They object to Prodigy's termination without warning and limitations placed on new membership agreements.

The latest chapter in this conflict is Prodigy's expanded agreement absolving itself of any responsibilities toward members. The agreement states, in part, "Prodigy may terminate any Membership without notice for violation of this Agreement . . . at its sole discretion" (Branscum, 1991, p. 72). It is not responsible for delivering private messages or continuing access to financial services for terminated members. Fair or not, as a private company, Prodigy can set its own rules in the absence of regulation.

The stage has been set for a long debate concerning electronic communications and privacy (Branscum, 1991). The primary question is whether Prodigy is a magazine, as it claims, and should have the right to edit and prohibit postings or if its interactive mode makes it more of a common carrier, like the phone company, that should be more

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open to public access. The outcome of this debate will have a great impact on the community of people which is created whenever people are networked together by common access to computers and modems.

General Ethical Climate

The issue of computer ethics is part of a growing concern about ethics throughout our nation, especially in the business community. A survey of 1,400 women conducted by Working Woman magazine concluded that ethics are lacking in business ("Ethics are lacking," 1990). And the figures would tend to indicate that adherence to ethical standards diminishes with the level of success. Of the women who consider themselves highly successful, 78% were more willing to bend and break the rules than others. Overall, 53% of the respondents felt that it was sometimes necessary for successful people to compromise their principles to get ahead. More than 60% would be willing to use a report stolen from a computer; 37% of those who have taken an ethical stand feel that it has helped their careers; 30% say it has hurt theirs. Two thirds consider it acceptable to receive costly gifts from a salesperson. Flirting in order to make a sale was known by 43% of the women, sex with a client by 10%, and sex with the boss by 29%.

Summary

Adherence to a code of ethical conduct calls on individuals to subscribe to a standard other than strict monetary profit. But, when dealing with a technical subject, it is often difficult to anticipate what one's

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ethical concerns should be. And it is interesting to me how often money seems to be the driving force behind deciding what is considered ethical.

Computers open up whole new worlds where these computers may be the culprit's tool or provide the means for resolution of an ethical problem. Computer data banks provide new methods for tracking down criminals, but they also provide new means for abuse of innocent people. The possibilities for this abuse are increased when individuals have communication links that provide them access to several sources of data about other individuals and use that information for personal benefit. Incorrect data records may cause undue harm to those who are the object of careless or malicous data entry. The vastness of these data banks and the perceived invulnerability of computers often give people a feeling of powerlessness and despair that is common when faced with many forms of advanced technology.

Any crime that could be committed without the use of a computer can be performed in a manner that is faster, more efficient, and probably easier to hide with a computer. But companies that are the victims of computer crime often consider it to their short-term advantage to ignore the offense, because of the costs involved with detecting a crime and identifying the criminal, fear of losing business due to negative publicity, and the knowledge that few criminals receive punishment appropriate for the severity of the crime. Computer hacking is another crime that is seldom prosecuted, due to the youthfulness of most hackers

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and the difficulty most potential jurors have in recognizing their activities as criminal.

While the need for computer ethics is great, some progress is now being made to address that issue. Professional groups have been organized to promote responsible and ethical use of computers, and people are being educated to recognize the need for ethical standards. The time has come to address this pervasive concern. Thus, this dissertation has been written with the intent to evaluate the pervasity of unethical activities and the concern of computer science educators about this topic.

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CHAPTER III

METHODOLOGY

As stated in Chapter I, the purpose of this study was to explore the perceptions that computer science educators have about computer ethics. The study focused on the opinions of college-level computer science instructors in Kentucky. The data for the study were gathered during the summer and fall semesters of 1992.

Population and Sample

All 144 full-time faculty members who teach computer science classes in any Kentucky college or university which offers a bachelor's degree with a major or minor in computer science were surveyed. Computer related courses are taught under a variety of titles in a wide range of departments. Therefore, the sample was found in departments such as computer science, finance and management information systems, math and computer science, computer studies, computer information systems, and engineering math and computer science. They may be in the college of arts and sciences, business, engineering, or science, technology, and health.

Responses were received from all eight of Kentucky's state universities: University of Kentucky, Kentucky State University, University of Louisville, Western Kentucky University, Eastern Kentucky University, Northern Kentucky

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University, Murray State University, and Morehead State University, and the following 11 church-related and private schools: Asbury College, Bellarmine College, Brescia College, Campbellsville College, Centre College, Cumberland College, Georgetown College, Kentucky Wesleyan College, Pikeville College, Thomas More College, and Union College.

Since only 56 computer science faculty responded to the initial survey within 3 weeks, another copy of the instrument was mailed to each person who had not yet responded. Another 31 computer science educators responded to the second mailing within 3 weeks, bringing the total number of responses to 87 (60.4%). These respondents became the sample. This procedure is described below in more detail in the section Data Gathering Procedures.

Instrumentation

An instrument was developed which expands on the questions that are guiding the study. In developing the instrument, the following steps were taken.

Step 1--Original Version

After an extensive review of the literature, several ideas and trends were observed and quesions were developed about computer ethics in a university environment. Out of this, a questionnaire was developed, grounded in theoretical concept based on the literature review. A collection of items dealing with the topic were assembled and then reviewed, to be certain that each one pertains to one of the research questions. Each item has been identified according to its relevant research question.

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The questionnaire is intended to answer the larger questions that were posed in the section titled Questions to Guide the Study. A list of topics that are potential ethical issues was compiled for three questions guiding the study: What are the perceptions of computer science educators about which practices in computer science have ethical connatations, Which topics with ethical connotations should be taught in the classroom, and Which methods should be used on which topics? The topics are: socialization skills, databanks on suspected criminals, gender-related issues, minority issues, social responsibility, computer crime, copying software, accessing confidential databanks, validity of data, reliability of software, teenage hackers, adult hackers, Computer Aided Instruction, VDT health risks, boredom from routine, on-the-job stress, worker displacement, employee loyalty, "whistle-blowing," and viruses and worms.

The following survey items relate to the first guiding question, "To what extent do computer science educators believe that ethically inappropriate practices are taking place?"

1. Do you feel that computer ethics is a global problem?

2. Is computer ethics a problem at your institution?

3. Indicate the extent to which you feel that ethically inapproriate computer practices are taking place among suggested groups.

In addressing the second question, "What are the perceptions of computer science educators about which

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practices in computer science have ethical connotations?" participants answered these questions.

1. Indicate the extent to which you feel each topic is an important ethical issue.

2. In your teaching of computer science, what unethical situations have you encountered?

The following items focus on the first portion of Question 3, "To what extent do computer science educators perceive that computer ethics is an appropriate topic to be addressed in computer science classes?" The items ask about direct classroom instruction on computer ethics as well as other methods which might be used to teach ethical use of computers.

1. Should a school or department develop and publish its own computing ethics policy?

2. Can ethical use of computers be taught?

3. Do you agree with the statement, "we should teach computer ethics in a classroom setting"?

4. Using a scale from 1 (no importance) to 5 (extreme importance), indicate the importance of including computer ethics as part of the curriculum at the following levels: (a) college or university, (b) high school, (c) middle school, (d) elementary school.

5. If computer ethics is taught as a course, do you agree that the school should ask the faculty to discuss the topic in other courses as well?

6. If computer ethics is taught as a course, do you agree that a computer ethics course should be required?

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7. If computer ethics is taught as a course, do you agree that a student would probably behave more ethically upon completion of such a course?

The following items are related to the second portion of Question 3, "Which topics with ethical implications should be taught in the classroom?"

1. Indicate the topics that you would like to see in the computer ethics course and indicate what teaching method you believe would be the most appropriate for teaching that topic.

2. If you offer a course or module on computer ethics, would you please describe this course and/or attach a copy of the course syllabus or outline?

The next items go with the first portion of Question 4, "if computer science ethics is taught at the college level, what teaching methods should be used?"

1. How would you rank certain teaching methods to use in teaching a computer ethics course at the college level?

2. Rank the suggested groups according to which you consider the most appropriate for teaching the computer ethics course, if one is to be taught at your school.

3. How would you rank the suggested placements in the curriculum for teaching computer ethics at the college level?

4. What do you think would be the best method for teaching computer ethics?

5. At what level should the course on computer ethics be offered?

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One item is used to answer the second portion of Question 4, "Which [teaching] methods should be used on which topics?". This item is also described above in the discussion of the second portion of Question 3, Indicate the topics that you would like to see in the computer ethics course and indicate what teaching method you believe would be the most appropriate for teaching that topic.

The instrument includes demographic questions to identify participants according to type of institution, name of department, aproximate enrollment, gender, tenure status, highest earned degree, field of study, rank, years experience teaching computer science, age, level of courses taught, whether their department offers a course or module in computer ethics, whether their school has a computer ethics policy, and whether they have discussed computer ethics with colleagues or have attended classes or seminars on computer ethics. These data have been analyzed to answer Question 5, "What is the relationship between demographics and the way that computer science educators view computer ethics?"

Step 2--First Review

I consulted with the Project Consultant for Research and Statistics at Western Kentucky University, to assure that the questions are written in such a way that they can be analyzed without ambiguity.

Step 3--Expert Opinion

A group of experts in the field of computer ethics were solicited for their opinions about the instrument.

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They were asked to respond to the questionnaire in three ways: (a) to indicate whether they feel that the individual items serve to answer the larger research-guiding questions, (b) to recommend other items that they feel would be useful for the survey, and (c) to make other suggestions or to comment in any way that they see fit. They were each given a copy of the drafted instrument along with the sections titled Purpose of the Study and Questions to Guide the Study and were requested to return it, with their responses.

The people selected to serve on the panel of experts are professors in computer science, computer information sciences, sociology, and/or philosophy. Most of them are frequent speakers and have written several articles or books on computer ethics. The group includes the developer of a capstone course on computer ethics, the originator of a "paramedic" approach to computer science ethics, and participants in the development of a university computing ethics policy.

Step 4--Refinement

Advice offered by the experts was incorporated into the instrument. Their responses focused primarily on refining the wording of questions and the addition of demographic questions. They pointed out that "ethics" is singular, even though it ends with an "s." They suggested that the response "N" might be called "No Opinion" rather than "Neutral;" it was changed to mean "Neutral or No Opinion." School "size" became "enrollment" and "institute" was replaced with "institution." Sociology

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faculty was added to the list of suggested faculty for a computer ethics course. The demographic section was reorganized to separate questions about the individual from those about the institution. Five topics were added to the list of possible ethical issues.

Step 5--Pilot Test

This updated draft was given to four out-of-state colleagues like those in the population, primarily to see if the questions were clearly understood by those taking the survey and to learn whether they interpret the questions in the way intended. These people provided additional input into the formation of questions and instructions. They suggested more demographic questions, especially about the institution, and a place for optional comments. They also recommended that questions which call for rankings use the highest number for highest ranking and the number one for lowest ranking. There was also 1 suggestion that the whole exercise was a waste of time. Since the implied suggestion to forego the survey contradicted other advice, this suggestion was not implemented.

Step 6--Final Version

More changes were made to the instrument, incorporating the suggestions from those who responded to the pilot survey. At this point, and often in previous steps, suggestions of the dissertation committee were sought and accepted. The final version of the instrument, which was used in the survey, is in Appendix A.

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Data Gathering Procedures

All 144 full-time faculty members in the computer science departments at 4-year colleges and universities in Kentucky which offer a computer science major or minor were surveyed. Each of the faculty members received a copy of the instrument, with a request to respond to the survey within 3 weeks. Since fewer than 50% responded to the first mailing, follow-up requests were mailed to those who had not yet responded, allowing another 3 weeks for response. The 87 faculty members who responded to the first request or within 3 weeks of the second mailing made up the sample.

It was important to assure the participants of anonymity. The easiest way to do that would have been not to track the individual questionnaires at all. However, that would have made it impossible to follow up on those who did not return the first survey. Since each participant was asked to sign a consent form, after the first responses were returned, the names of those who had responded were marked off the original list of all people surveyed. The questionnaires themselves were kept in a locked file cabinet. Since a second mailing was needed, duplicate questionnaires were sent to those whose names still remained on the list of names. Once all the data were accumulated, the list of names was destroyed, so that no one would be able to track an individual response. The questionnaires were also destroyed once the data were entered into the computer.

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Analysis of Data

The data collected from those surveyed were converted to an ASCII file, using dBASE III Plus on the Zenith 386 system. This file was then uploaded through the Novell network at WKU to the IBM 4380 at the University of Kentucky. The data were processed using the Statistical Analysis System (SAS) on UK's mainframe, which is available for use on jobs at WKU.

Comparison of means and chi-square have been employed to determine whether differences exist among various groupings of independent variables, such as type of school, years of teaching experience, and whether the respondent had attended a course or seminar on computer ethics.

Limitations

Kentucky is essentially a southern state, even though it is geographically on the border of the southeast United States. This same area is also frequently referred to as the Bible Belt and is an area which has a large percentage of conservative Christians. Because of this geographic tradition, it is possible that the results of this survey might not be totally representative of the nation as a whole. However, college faculty members often hail from distant areas, so it is felt that college teachers would be less homogeneous than the population at large.

The reliability of this survey will be limited because the instrument has not been used before and may not be used again. There has been no field test of the instrument or measure of reliability.

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CHAPTER IV

ANALYSIS OF DATA

The analysis of data is divided into eight parts, a discussion of demographic data followed by analysis of instrument items corresponding to each research question that guided the study. These guiding questions were introduced in Chapter I and are discussed below, along with the related items on the instrument. The instrument itself is divided into a demographic section followed by three parts intended to answer the guiding research questions. Part I asked general questions about computer ethics and computer ethics education. For Part II, respondents were asked to answer questions about a computer ethics course, based on the assumption that they had been given the authority to design a computer ethics course at their institution. Part III provided the participants with an opportunity for open-ended responses. Appendix A includes a copy of the instrument as it was administered.

Of the 144 Kentucky faculty members surveyed, 87 responded to the questionnaire, 67 (77%) from public institutions, 14 (16%) from church-related institutions, and 6 (7%) from private institutions. These and other demographic characteristics of the respondents' institutions were gathered from answers to the demographic section of the instrument and are summarized in Table 1.

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Table 1

Institutional Demographic Characteristics

	Frequency	% *
Type of institution		
Church-related institution	14	16.1
Public institution	67	77.0
Private institution	6	6.9
Approximate enrollment		
Less than 5,000	21	26.6
5,000 -- 9,999	10	12.6
10,000 -- 19,999	21	26.6
20,000 or more	27	34.2
Name of department (5 most frequent responses)		
Computer Science	32	36.8
Engineering Math & Computer Science	11	12.6
Computer Information Systems	7	8.0
Computer Studies	6	6.9
Math, Statistics & Computer Science	6	6.9
College or division (5 most frequent responses)		
Arts & Science	19	21.8
Business	18	20.7
Engineering	12	13.8
Science, Technology & Health	8	9.2
Science	6	6.9
Computer ethics course or module		
Course	10	12.7
Module	31	39.2
Neither	38	48.1
If so, is it required?		
No	8	21.1
Yes	30	78.9
Computer ethics policy		
No	36	45.6
Yes	43	54.4
Approximate computer science enrollment		
Less than 100	10	16.7
100 -- 499	31	51.6
500 -- 1,499	11	18.4
1,500 or more	8	13.3
Approximate computer science majors		
Less than 100	35	52.2
100 -- 249	24	35.9
250 or more	8	11.9

* Percentages reflect only those responding to the question

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Thirty-two (37%) taught in computer science departments and 11 (13%) taught in engineering math and computer science. Forty-eight (61%) respondents were from institutions with enrollments of at least 10,000. Most were from schools which offered either a course (10, or 13%) or module (31, or 39%) on computer ethics and 43 (54%) had a computer ethics policy in place.

Table 2 shows that 75 (86%) of the respondents were male, 48 (55%) were tenured, 56 (67%) had taught for 10 years or less, and 60 (70%) had earned doctorate degrees. Average age was 44.7. A majority had studied either computer science (29, or 33%) and/or math (27, or 32%). Twenty-nine (37%) had the rank of associate professor. Sixty-nine (79%) of those who responded had discussed computer ethics with colleagues, but only 19 (22%) had attended classes or seminars on computer ethics.

Research Questions

Question 1--Extent of Inappropriate Practices

> To what extent do computer science educators believe that ethically inappropriate practices are taking place?

Instrument items 1 and 2 asked whether educators believed that computer ethics is a problem globally and at their institution. The answer to both these questions was yes, but to varying degrees. Seventy-two (84.7%) of the respondents felt that computer ethics was a global problem, but only 44 (53.7%) considered computer ethics a problem at their institution.

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Table 2

Individual Demographic Characteristics

	Frequency	%
Gender		
Female	12	13.8
Male	75	86.2
Tenure		
No	39	44.8
Yes	48	55.2
Highest earned degree (most frequent responses)		
PhD	57	66.3
M.S.	13	15.1
Other Master's or unspecified Master's	11	12.8
EdD	3	3.5
Field of study (most frequent responses, last 3 overlap)		
Mathematics	24	28.6
Computer science	23	27.4
Information systems / CIS / MIS	7	8.4
Computer science and another field	5	6.0
Mathematics and another field	3	3.6
Rank		
Instructor	7	8.9
Assistant professor	20	25.3
Associate professor	29	36.7
Professor	23	29.1
Years teaching computer science		
5 or less	23	27.4
6 -- 10	33	39.3
11 -- 20	22	26.2
More than 20	6	7.1
Discussed computer ethics with colleagues		
No	18	20.7
Yes	69	79.3
Attended classes or seminars on computer ethics		
No	68	78.2
Yes	19	21.8
	Means	
Courses in a typical year		
Freshman	1.46	
Sophomore	1.13	
Junior	1.36	
Senior	0.89	
Graduate	0.59	
Age	44.7	

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Instrument item 7 asked the participants to indicate the extent to which they felt that ethically inappropriate computer practices were commonly taking place among certain groups. Frequency distribution of responses to instrument item 7 are given in Table 3. Possible responses were strongly agree, agree, neutral or no opinion, disagree, or strongly disagree.

Table 3

Frequency Distribution of Responses to Item 7

ITEM 7: Indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place among the following groups.

	Strongly Agree		Agree		Neutral/ No Opin		Dis- agree		Strongly Disagree	
Group	f	%	f	%	f	%	f	%	f	%
Computer professionals in business & industry	12	14	39	46	21	25	11	13	1	1
Individuals who use computers as part of their jobs	10	12	42	50	24	29	7	8	1	1
Computer science students	13	15	51	60	14	17	5	6	2	2
Other college & university students	13	15	42	49	18	21	10	12	2	2
Computer science faculty	5	6	21	25	36	42	18	21	5	6
Other faculty	10	12	24	29	38	45	9	11	4	5
Computer clubs or local interest groups	12	14	32	38	32	38	6	7	2	2
Operators of bulletin board systems	16	19	28	33	33	39	6	7	1	1

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Means analysis was performed for item 7 after assigning numeric values to responses, giving a 5 for strongly agree, 4 for agree, 3 for neutral or no opinion, 2 for disagree, and 1 for strongly disagree. Means and standard deviation for item 7 are given in Table 4. For each group of people mentioned in item 7, the mean value was more than 3.0. The general consensus was that students are more likely to engage in unethical practices than faculty. Computer science students ranked highest, with a

Table 4

Means and Rank Order of Responses to Item 7

Item 7: Indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place among the following groups.

Group	Mean*	SD*	Rank**
Computer science students	3.80	0.856	1
Other college & university students	3.64	0.962	2
Individuals who use computers as part of their jobs	3.63	0.847	3
Operators of bulletin board systems	3.62	0.917	4
Computer professionals in business & industry	3.60	0.932	5
Computer clubs or local interest groups	3.55	0.911	6
Other faculty	3.32	0.978	7
Computer science faculty	3.04	0.969	8

* To calculate mean and standard deviation, responses were assigned numeric values: 5 = Strongly Agree, 4 = Agree, 3 = Neutral or No Opinion, 2 = Disagree, 1 = Strongly Disagree

** 1 = highest ranking; 8 = lowest ranking

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mean of 3.80, followed by other college and university students with a mean of 3.64. Next, in order, were individuals who use computers as part of their jobs, operators of bulletin board systems, computer professionals in business and industry, and computer clubs or local interest groups. Faculty members were ranked as the least likely to behave unethically, with a mean of 3.32 for noncomputer science faculty, and only 3.04, for computer science faculty.

Question 2--Practices With Ethical Connotations

> What are the perceptions of computer science educators about which practices in computer science have ethical connotations?

Two very different instrument items were presented to address this question. The first, item 8, presented 25 topics and asked each person surveyed to "indicate the extent that you feel each topic is an important ethical issue." Items were rated from severe issue to not an issue. Values were assigned for this item, with 5 for a severe issue, 4 for a substantial issue, 3 for a moderate issue, 2 for a minor issue, and 1 for not an issue. The second item was a free-form question in Part III asking about the respondent's observation of inappropriate computer practices.

Table 5 shows responses to all suggested topics in instrument item 8. More than half (minimum of 46) of those surveyed felt that all topics except computer aided instruction and boredom from routine were at least moderate issues. Accessing confidential databanks was considered a

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Table 5

Frequency Distribution of Responses to Item 8

ITEM 8: Please circle your response to indicate the extent that you feel each topic is an important ethical issue.

	Severe		Subst.		Moder.		Minor		NotAn	
	Issue		Issue		Issue		Issue		Issue	
Topic	f	%	f	%	f	%	f	%	f	%
a. Effect of computers on socialization skills	5	6	18	21	24	28	22	26	16	19
b. Databanks on suspected criminals	15	18	32	38	20	24	9	11	8	10
c. Gender-related issues	6	7	21	25	27	32	12	14	19	22
d. Minority issues	3	4	21	25	28	33	16	19	17	20
e. Social responsibility	15	18	29	35	26	31	7	8	7	8
f. Use of computers to commit crimes	39	46	27	32	13	15	4	5	2	2
g. Copying commercial software	39	46	33	39	10	12	3	4	0	0
h. Accessing confidential databanks	45	53	23	27	14	17	2	2	1	1
i. Validity of data(GIGO)	18	21	29	34	30	36	6	7	2	2
j. Reliability of software	15	18	30	35	30	35	7	8	3	4
k. Teenage hackers	12	14	30	35	25	29	17	20	1	1
l. Adult hackers	18	21	27	32	22	26	18	21	0	0
m. Computer Aided Instruction	8	9	16	19	16	19	20	24	25	29
n. Potential VDT health risks	6	7	19	22	23	27	23	27	14	17
o. Boredom from routine	3	4	16	19	22	26	28	33	15	18
p. On-the-job stress	5	6	23	27	20	24	24	29	12	14
q. Worker displacement resulting from computers	5	6	18	21	28	33	22	26	12	14
r. Employee loyalty	4	5	11	13	31	37	23	27	15	18
s. "Whistle-blowing"	6	7	17	20	36	42	10	12	16	19
t. Viruses and worms	28	33	36	42	15	18	5	6	1	1
u. Monitoring electronic mail	21	25	37	44	21	25	5	6	1	1
v. System security	33	40	33	40	16	19	1	1	1	1
w. Networks	17	20	38	45	18	21	8	10	3	4
x. Electronic transfer of funds	23	27	34	40	16	19	6	7	6	7
y. Military applications	25	29	27	32	17	20	9	11	7	8

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severe issue by 45 (53%) respondents, followed by copying commercial software and the use of computers to commit crimes, which were each considered a severe issue by 39 (46%) of the respondents.

A mean was calculated for each suggested topic in instrument item 8, ranging from highs of 4.28 for accessing confidential databanks and 4.27 for copying commercial software to lows of 2.57 for boredom from routine and 2.55 for computer aided instruction. Table 6 shows means, standard deviation, and order ranking for all suggested topics. Fifteen topics had a mean response of at least 3.0 out of a possible 5.0, and five topics had a mean response of at least 4.0.

Four people responded none to the Part III question, "In your teaching of computer science, what unethical situations have you encountered?" Another 14 gave no response to the question. About half of the respondents (43) named one unethical situation they had encountered. Others mentioned as many as eight different situations, with one given as "and lots more." The overall mean was 1.36 situations per respondent.

Since respondents used their own words in answering this question about unethical situations they have encountered, similar concerns were often expressed with different words. Similar responses were grouped together for purposes of analysis. The largest group (41, or 47%) listed piracy or copying of copyrighted software as unethical situations that they had encountered. Another 33 (38%) listed plagiarism and cheating, such as copying

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Table 6

Means and Rank Order of Responses to Item 8

ITEM 8: Please circle your response to indicate the extent that you feel each topic is an important ethical issue.

Topic	Mean*	SD*	Rank**
h. Accessing confidential databanks	4.28	0.908	1
g. Copying commercial software	4.27	0.808	2
f. Use of computers to commit crimes	4.14	1.002	3
v. System security	4.14	0.852	4
t. Viruses and worms	4.00	0.926	5
u. Monitoring electronic mail	3.85	0.906	6
x. Electronic transfer of funds	3.73	1.148	7
w. Networks	3.69	1.018	8
i. Validity of data(GIGO)	3.65	0.972	9
y. Military applications	3.64	1.243	10
j. Reliability of software	3.55	0.994	11
l. Adult hackers	3.53	1.053	12
e. Social responsibility	3.45	1.134	13
b. Databanks on suspected criminals	3.44	1.186	14
k. Teenage hackers	3.41	1.003	15
s. "Whistle-blowing"	2.85	1.160	16
p. On-the-job stress	2.82	1.163	17
c. Gender-related issues	2.80	1.242	18
q. Worker displacement resulting from computers	2.79	1.114	19
n. Potential VDT health risks	2.76	1.182	20
d. Minority issues	2.73	1.148	21
a. Effect of computers on socialization skills	2.69	1.175	22
r. Employee loyalty	2.60	1.077	23
o. Boredom from routine	2.57	1.101	24
m. Computer Aided Instruction	2.55	1.341	25

* To calculate mean and standard deviation, responses were assigned numeric values: 5 = Severe issue, 4 = Substantial issue, 3 = Moderate issue, 2 = Minor issue, 1 = Not an issue.

** 1 = highest rank; 25 = lowest rank

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another student's programs or homework. Hacking and/or security violations were mentioned by 14 people, or 16% of those surveyed. Responses are transcribed in Appendix B.

Question 3 (1st Part)--Computer Ethics As Classroom Topic

> To what extent do computer science educators perceive that computer ethics is an appropriate topic to be addressed in computer science classes?

Respondents answered questions concerning their attitudes toward teaching computer ethics in the classroom, at what level computer ethics should be included in the curriculum, and other approaches to the topic. Items 3, 4, 5, 6, 10, and 11 addressed this question.

A majority of those surveyed believed that computer ethics should be addressed in some manner at the university level, but there was less agreement on requiring a computer ethics course or including computer ethics in the curriculum below the university level. Responses to instrument items 3 and 4 are outlined in Table 7. Seventy-eight (91.8%) of those responding, agreed that a school or

Table 7

Frequency Distribution of Responses to Items 3 and 4

ITEM 3: Should a school or department develop and publish its own computing ethics policy?

ITEM 4: Can ethical use of computers be taught?

	NO		YES	
	f	%	f	%
ITEM 3:	7	8.2	78	91.8
ITEM 4:	5	6.1	77	93.9

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department should develop and publish its own computing ethics policy. Seventy-seven (93.9%), believed that the ethical use of computers can be taught.

Sixty-one (70%) of the respondents indicated that including computer ethics in the curriculum at the college or university level is of extreme importance or great importance. Responses to instrument item 5 can be found in Table 8. Forty-nine (56%) of the educators considered it to be of extreme importance or great importance to include computer ethics at the high school level. Respondents were divided over the importance of including computer ethics in the middle school curriculum, with 31 (35.6%) considering it to be of moderate importance; 26 (30%) considering it to be of extreme importance or great importance; and 29 (34%) considering it to be of slight importance or no importance.

Table 8

Frequency Distribution of Responses to Item 5

ITEM 5: ... indicate the importance of including computer ethics as part of the curriculum at the following levels:

	Extreme Import.		Great Import.		Moderate Import.		Slight Import.		No Import	
Level	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
College or university	26	30	35	40	16	18	10	12	0	0
High school (grades 9-12)	20	23	29	33	24	28	12	14	2	2
Middle school (grades 7-8)	12	14	14	16	31	36	19	22	11	13
Elementary school (grades 1-6)	12	14	9	10	16	18	30	35	20	23

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The majority of participants (50, or 58%) indicated that including computer ethics at the elementary school level is of slight importance or no importance.

Table 9 shows the means and standard deviations for responses to item 5. Means ranged from a high of 3.89 for the college or university level down to 2.57 for the elementary school level. A rank has been assigned to each level, based on mean responses to each proposed teaching level.

Table 9

Means and Order Ranking of Responses to Item 5

ITEM 5: ... indicate the importance of including computer ethics as part of the curriculum at the following levels:

Level	Mean*	SD*	Rank**
College or university	3.89	0.970	1
High school (grades 9-12)	3.61	1.060	2
Middle school (grades 7-8)	2.97	1.205	3
Elementary school (grades 1-6)	2.57	1.326	4

* To calculate mean and standard deviation, responses were assigned numeric values: 5 = Extreme importance, 4 = Great importance, 3 = Moderate importance, 2 = Slight importance, 1 = No importance.

** 1 = highest ranking, 4 = lowest ranking

When not pressed for a specific level, four out of five participants agreed or strongly agreed that we should teach computer ethics in a classroom setting. Table 10 presents the frequency of responses to items 6, 10, and 11. Almost as many agreed or strongly agreed that an

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institution with an ethics course should ask faculty to discuss the topic in other courses as well. There was no such consensus about whether a computer ethics course should be required. Instrument items 6, 10 and 11 posed these questions, using the code described earlier, ranging from strongly agree to strongly disagree.

Table 10

Frequency Distribution of Responses to Items 6, 10, and 11

ITEM 6: We should teach computer ethics in a classroom setting.

ITEM 10: The school should ask the faculty to discuss the topic in other courses as well.

ITEM 11: A computer ethics course should be required.

	Strongly Agree		Agree		Neutral/ No Opin.		Disagree		Strongly Disagree	
	f	%	f	%	f	%	f	%	f	%
ITEM 6:	24	35	31	45	10	15	4	6	0	0
ITEM 10:	30	35	36	42	14	17	5	6	0	0
ITEM 11:	11	13	17	20	24	28	17	20	16	19

Means were calculated for items 6, 10, and 11 using the conversion described earlier, with 5 for Strongly Agree down to 1 for Strongly Disagree. Means and standard deviation for these items are shown in Table 11. Responses were not ranked, because there is no relationship between the three items.

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Table 11

Means of Responses to Items 6, 10, and 11

ITEM 6: We should teach computer ethics in a classroom setting.

ITEM 10: The school should ask the faculty to discuss the topic in other courses as well.

ITEM 11: A computer ethics course should be required.

	Mean*	SD*
ITEM 6:	4.09	0.853
ITEM 10:	4.07	0.870
ITEM 11:	2.88	1.295

* To calculate mean and standard deviation, responses were assigned numeric values: 5 = Strongly Agree, 4 = Agree, 3 = Neutral or No opinion, 4 = Disagree, 5 = Strongly Disagree

Question 3 (2nd Part)--Which Topics To Teach

> Which topics with ethical implications should be taught in the classroom?

The instrument presented a list of possible topics for inclusion in a computer ethics course and asked those surveyed to select the topics that they would include in such a course. Respondents also were given an opportunity to suggest other topics that they would include in a computer ethics course and to describe computer ethics courses taught at their institutions. Educators selected the topic which they considered to be the most important. Instrument items 16 and 17 (item 17 is unnumbered on the instrument, following item 16) and the second question of Part III address this guiding question.

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Instrument item 16 asked respondents to identify the ethical issues they would like to see integrated into a computer ethics course. Topics are listed in Table 12 and ranked, according the number of people who selected that topic for a course. For each selected issue, respondents then indicated the teaching method they would like to use to present the topic. Only the selection or rejection of a topic is discussed here; teaching methods are discussed below in the section for the second portion of Question 4.

Eighty educators (96% of those who responded to that item) agreed that the topic of copying commercial software should be included in a computer ethics course if one were offered. Twenty-two topics were selected by more than half of those who responded as topics that they would include in a course if they were given the responsibility for designing one. Boredom from routine was the least likely to be selected; it was chosen by 32 (41%) of those who responded to the question.

Educators were presented an additional entry at the end of the list of suggested topics and were asked to suggest other topics that they would like to see in a computer ethics course. Only five people made suggestions, and there was no consenses among them. These suggestions are presented in Appendix B.

Instrument item 17 appears after item 16 but is not numbered on the instrument. It asked the question, "From this list, what do you consider the single most important ethical issue facing computer professionals today?" This count is shown in Table 13. Copying commercial software

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Table 12

Frequency Distribution and Rank Order of Responses to Item 16

Item 16: Indicate the topics from the following list that you would like to see in the computer ethics course.

Topic	f	%**	Rank*
g.Copying commercial software	80	96.4	1
t.Viruses and worms	78	95.1	2
h.Accessing confidential databanks	77	93.9	3
v.System security	76	93.8	4
u.Monitoring electronic mail	75	91.5	5
f.Use of computers to commit crimes	75	90.4	6
e.Social responsibility	67	82.7	7
i.Validity of data(GIGO)	63	79.7	8
l.Adult hackers	63	78.7	9
x.Electronic transfer of funds	63	78.7	10
w.Networks	63	77.8	11
k.Teenage hackers	61	76.2	12
j.Reliability of software	60	75.9	13
b.Databanks on suspected criminals	57	70.4	14
s."Whistle-blowing"	55	68.7	15
q.Worker displacement resulting from computers	52	65.8	16
a.Effect of computers on socialization skills	51	63.7	17
y.Military applications	50	64.1	18
n.Potential VDT health risks	44	54.3	19
p.On-the-job stress	43	54.4	20
c.Gender-related issues	41	51.9	21
r.Employee loyalty	41	51.9	22
d.Minority issues	36	45.6	23
m.Computer Aided Instruction	34	43.6	24
o.Boredom from routine	32	41.0	25
z.Other ________________	11		26

* 1 = highest rank; 5 = lowest rank

** % based on those who responded for each topic, ranging from 78 to 83

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Table 13

Frequency Distribution and Rank Order of Responses to Item 17

ITEM 17: From this list, what do you consider the single most important ethical issue facing computer professionals today?

Topic	f	%**	Rank*
g.Copying commercial software	18	24.0	1
e.Social responsibility	10	13.3	2
h.Accessing confidential databanks	9	12.0	3
f.Use of computers to commit crimes	8	10.7	4
v.System security	7	9.3	5
t.Viruses and worms	4	5.3	6
i.Validity of data(GIGO)	3	4.0	7
j.Reliability of software	3	4.0	7
k.Teenage hackers	3	4.0	7
c.Gender-related issues	2	2.7	10
l.Adult hackers	2	2.7	10
a.Effect of computers on socialization skills	1	1.3	12
q.Worker displacement resulting from computers	1	1.3	12
u.Monitoring electronic mail	1	1.3	12
x.Electronic transfer of funds	1	1.3	12
y.Military applications	1	1.3	12
z.Other ______________	1	1.3	12
b.Databanks on suspected criminals	0		
d.Minority issues	0		
m.Computer Aided Instruction	0		
n.Potential VDT health risks	0		
o.Boredom from routine	0		
p.On-the-job stress	0		
r.Employee loyalty	0		
s."Whistle-blowing"	0		
w.Networks	0		

* 1 = highest rank; 25 = lowest rank (Only shown for 16 topics which received some response)

** % based on those who responded (75)

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was named most often, by 18 respondents. Ten people named social responsibility as the single most important ethical issue, nine selected accessing confidential databanks, and eight named the use of computers to commit crimes. Thirteen other topics were selected by at least one person.

Respondents who offered a course or module on computer ethics were also asked in Part III to describe this course and/or attach a copy of the course syllabus or outline. These comments are transcribed in Appendix B and outlines are shown in Appendix C.

Question 4 (1st Part)-- Teaching Methods

> If computer ethics is taught at the college level, what teaching methods should be used?

The instrument asked several questions about curriculum for an institution that intends to instruct students in computer ethics. Respondents were asked to indicate their preferred placement of computer ethics in the curriculum, the best faculty group to teach a computer ethics course, the level at which it should be taught, and the best teaching methods for instruction in computer ethics. Instrument items 9, 13, 14, and 15 address this guiding question.

When asked in instrument item 9 where to place the teaching of computer ethics, the largest group of respondents (30, or 35%) preferred to include computer ethics "as a separate module in a larger course." Table 14 shows frequency of responses to item 9. The separate module format also received the highest mean value (3.62).

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Table 15 shows mean responses to item 8. The second most popular placement was "through personal example of faculty and staff," with a mean of 3.42 and 24 respondents (28%) selecting it first. "Encouraging students to take an ethics course in another department" was the least preferred approach of those included on the instrument, with a mean value of 2.09. It received only five responses (7%) of the highest rating and had the most (40, or 47%) responses of the lowest rating.

Table 14

Frequency Distribution of Responses to Item 9

ITEM 9: Rank the following placements in the curriculum for teaching computer ethics at the college level, with 5 being the highest ranking and 1 being the lowest ranking. (Use each value once.)

	High <------------------------> Low									
Placement in Curriculum	5		4		3		2		1	
	f	%	f	%	f	%	f	%	f	%
Separate computer science course	13	15	13	15	11	13	16	19	32	38
Module in larger course	30	35	14	16	24	28	13	15	4	5
Example of faculty & staff	24	28	23	27	21	25	10	12	7	8
References in computer science curriculum	12	14	29	34	16	19	24	28	4	5
Ethics course in another department	6	7	5	6	20	24	14	17	40	47

Computer science educators believed that they were the group best suited for teaching a computer ethics course, either alone or as part of a team, according to their

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Table 15

Means and Rank Order of Responses to Item 9

ITEM 9: Rank the following placements in the curriculum for teaching computer ethics at the college level, with 5 being the highest ranking and 1 being the lowest ranking. (Use each value once.)

Placement in Curriculum	Mean	SD	Rank*
Module in larger course	3.62	1.342	1
Example of faculty & staff	3.55	1.249	2
References in computer science curriculum	3.25	1.154	3
Separate computer science course	2.52	1.501	4
Ethics course in another department	2.09	1.259	5

* 1 = highest rank; 5 = lowest rank

responses to instrument item 13. Frequency of responses to instrument item 13 are presented in Table 16; mean responses are shown in Table 17. Asked to "rank the following groups according to which you consider the most appropriate for teaching the computer ethics course," respondents ranked computer science faculty first, with a mean of 3.88 and 33 (39%) first-place selections. The choice of a team of computer science and other faculty ran a close second, receiving 32 (38%) first-place selections and a mean of 3.87. Only two (2%) of the people selected sociology faculty as the most appropriate group to be teaching the course, giving that group a mean of 2.23.

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Table 16

Frequency Distribution of Responses to Item 13

ITEM 13: Rank the following groups according to which you consider the most appropriate for teaching the computer ethics course, with 5 the highest ranking and 1 the lowest.

Faculty Group	High <------------------------> Low									
	5		4		3		2		1	
	f	%	f	%	f	%	f	%	f	%
Computer science faculty	33	39	24	29	16	19	6	7	5	6
Philosophy/religion faculty	5	6	13	16	21	25	26	31	19	23
Sociology faculty	2	2	6	7	26	31	25	30	25	30
Team of computer science & other faculty	32	38	33	39	4	5	6	7	9	11
Ethicists	7	8	10	12	28	33	19	23	20	24

Table 17

Means and Rank Order of Responses to Item 13

ITEM 13: Rank the following groups according to which you consider the most appropriate for teaching the computer ethics course, with 5 the highest ranking and 1 the lowest.

	Mean	SD	Rank*
Computer science faculty	3.88	1.186	1
Team of computer science & other faculty	3.87	1.297	2
Ethicists	2.58	1.214	3
Philosophy/religion faculty	2.51	1.177	4
Sociology faculty	2.23	1.034	5

* 1 = highest ranking; 5 = lowest ranking

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In response to instrument item 14, which asks "At what level should the course on computer ethics be offered?" more than half (46, or 55.4%) recommended that it be offered to freshmen. The course was generally considered more important at lower levels, with sophomores, juniors, and seniors receiving 28, 18, and 13 responses, respectively. The sum of the responses is more than the number of respondents, because some people (22, or 26.5%) selected more than one level. In fact, five respondents (6.0%) recommended that it be taught first to freshmen then later to seniors.

Instrument item 15 asked the respondents to "Rank the following teaching methods to use in teaching a computer ethics course." Table 18 summarizes the frequency of responses to item 15; Table 19 shows means and ranking of responses to item 15. Of the suggested methods, class discussion of instructor-provided case studies was selected by a majority (46, or 55%) as the best method, and also received the highest mean response, of 6.01. Group reports were considered the least appropriate method of the ones suggested, with no one selecting it as the best method and a mean response of 3.07.

Question 4 (2nd Part)--
Teaching Methods/Topics

Which methods should be used on which topics?

After asking respondents to select topics to be included in a computer ethics course, instrument item 16 goes on to ask, "If you answer Yes, please continue across and indicate what teaching method you believe would be the

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Table 18

Frequency Distribution of Responses to Item 15

ITEM 15: Rank the following teaching methods to use in teaching a computer ethics course, with 7 being the highest ranking and 1 the lowest.

	High <------------------------------------> Low													
Method	7		6		5		4		3		2		1	
	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Lecture by instructor	15	18	4	5	16	19	11	13	11	13	4	5	23	28
Class discussion of case studies	46	55	18	22	9	11	3	4	1	1	3	4	3	4
Individual assessment of case studies	13	16	28	34	15	19	11	13	7	8	7	8	2	2
Written reports on research	0	0	14	17	10	12	20	24	16	19	19	23	5	6
Oral reports on research	4	5	5	6	15	18	13	16	23	28	10	12	14	17
Group projects	3	4	7	8	12	15	18	22	17	21	19	23	7	8
Group reports	0	0	6	7	14	17	16	19	12	15	14	17	21	25

most appropriate for teaching that topic." It is the part of Item 16 that deals with the teaching method to be used for each topic which is being discussed here.

The instrument suggests four teaching methods for each of the proposed topics: lecture, case studies, individual student research, and group project. Table 20 shows the responses to the question about what teaching method should be used for which topic in instrument item 16. Every method was preferred by at least some respondents as the

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Table 19

Means and Rank Order of Responses to Item 15

Item 15: Rank the following teaching methods to use in teaching a computer ethics course, with 7 being the highest ranking and 1 the lowest.

Method	Mean	SD	Rank*
Class discussion of case studies	6.01	1.558	1
Individual assessment of case studies	5.00	1.615	2
Lecture by instructor	3.77	2.186	3
Written reports on research	3.63	1.519	4
Group projects	3.51	1.572	5
Oral reports on research	3.43	1.674	6
Group reports	3.07	1.651	7

* 1 = highest rank; 7 = lowest rank

best method for each topic. Lecture was preferred by more people for more topics, being chosen 558 times for the 25 suggested topics, compared to 514 for case studies, 229 for individual student research, and 261 for group projects. Lecture was selected as the most appropriate method by the most people for 13 of the suggested topics; case studies was selected as most appropriate by most people for 12 of the suggested topics; individual student research and group projects were not the most popular method for any topic.

The total number of responses varies for each entry, because only those who responded with Yes to the first part

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Table 20

Frequency Distribution of Responses to Item 16

ITEM 16: Indicate the topics from the following list that you would like to see in the computer ethics course. If you answer Yes, please continue across and indicate what teaching method you believe would be the most appropriate for teaching that topic, using the code:

Topic	--- Method*			--	Most
	L	C	S	G	Pop
a.Effect of computers on socialization skills	22	10	12	9	L
b.Databanks on suspected criminals	21	27	8	5	C
c.Gender-related issues	11	15	12	7	C
d.Minority issues	11	15	7	8	C
e.Social responsibility	27	19	16	13	L
f.Use of computers to commit crimes	26	33	9	12	C
g.Copying commercial software	44	23	10	10	L
h.Accessing confidential databanks	29	34	8	10	C
i.Validity of data(GIGO)	27	22	11	9	L
j.Reliability of software	24	16	15	12	L
k.Teenage hackers	21	27	8	11	C
l.Adult hackers	22	26	7	13	C
m.Computer Aided Instruction	12	13	4	10	C
n.Potential VDT health risks	22	7	10	7	L
o.Boredom from routine	10	12	4	8	C
p.On-the-job stress	15	13	10	7	L
q.Worker displacement resulting from computers	15	18	11	12	C
r.Employee loyalty	15	13	9	6	L
s."Whistle-blowing"	22	17	6	10	L
t.Viruses and worms	28	36	15	10	C
u.Monitoring electronic mail	32	29	8	12	L
v.System security	30	28	7	21	L
w.Networks	28	17	8	17	L
x.Electronic transfer of funds	23	28	7	11	C
y.Military applications	21	16	7	11	L
z.Other ________________	4	3	2	1	
TOTALS	558	514	229	261	

* L for Lecture C for Case studies
S for individual Student research G for Group project

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of item 16 responded to the second part of each entry. Since most people did not respond with a teaching method for the entry marked "other," the 10 responses that were received for that entry were not included in totals. But they are recorded here for information only. Table 20 shows how many people felt that the indicated method was appropriate for teaching that topic in a computer ethics course. The most frequently preferred method for each topic is also shown at the end of each line.

Question 5--Demographics & View of Computer Ethics

> What is the relationship between demographics and the way that computer science educators view computer ethics?

Special attention was given to whether teaching in a private or church-related institution rather than a public institution would impact the educators' attitudes toward computer ethics. Because there were only six respondents from private institutions, the number was determined to be too small to be statistically valid. Therefore, only responses from church-related and public institutions are compared here. All items on the instrument were analyzed by performing chi square on each response by type of institution for church-related and public schools. Three responses were statistically significant, with probability of 0.05 or less. Selected items were analyzed by performing additional chi square analysis by other demographic data. Six additional responses were found to be statistically significant. These differences are discussed below.

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Type of institution. Of the 87 responses that were received, 14 were from church-related institutions, 67 from public institutions, and 6 from private institutions. Three individual responses to the 17 items on the instrument were statistically significant based on institution type. Two of the three significant responses are single entries within a larger item.

Instrument item 7 asked the respondent to "indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place" among eight suggested groups, with responses that range from strongly agree down to strongly disagree. Table 21 shows that educators from church-related and public institutions had statistically significant differences in their evaluation of noncomputer science faculty. Eight (12%) public school faculty strongly agreed and 20 (30%) public school faculty agreed that ethically inappropriate computer practices were commonly taking place among "other" faculty (noncomputer science faculty). Four (6%) public school faculty strongly disagreed and 9 (14%) disagreed that ethically inappropriate activities were common among "other" faculty. This compares to only 1 (8%) person from church-related schools who strongly agreed and 1 (8%) other who agreed that ethically inappropriate practices were common among noncomputer science faculty. No one from church-related schools either strongly disagreed or disagreed with the statement. Twenty-five (38%) of the public school respondents and 11 (85%) of the church-related school respondents responded neutral or no opinion for the group.

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Table 21

Chi Square Distribution of Responses to Item 7 By Type of Institution

ITEM 7: Indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place among the following groups.

Group	Strongly Agree	Agree	Neut /No Opin	Dis-Agree	Stron Dis-agree	Sum: Inst Type
a) Computer professionals in business & industry						
Church-related	1	9	2	1	0	13
Public	11	26	17	10	1	65
Total for response	12	35	19	11	1	78
Chi square = 3.833; Prob = 0.429 *						
b) Individuals who use computers as part of their jobs						
Church-related	1	10	2	0	0	13
Public	9	28	20	7	1	65
Total for response	10	38	22	7	1	78
Chi square = 5.376; Prob = 0.251 *						
c) Computer science students						
Church-related	1	10	2	0	0	13
Public	12	37	10	5	2	66
Total for response	13	47	12	5	2	79
Chi square = 2.900; Prob = 0.575 *						
d) Other college & university students						
Church-related	0	9	3	1	0	13
Public	11	29	15	9	2	66
Total for response	11	38	18	10	2	79
Chi square = 4.309; Prob = 0.366 *						
e) Computer science faculty						
Church-related	0	2	8	3	0	13
Public	4	17	28	12	5	66
Total for response	4	19	36	15	5	79
Chi square = 3.266; Prob = 0.514 *						
f) Other faculty						
Church-related	1	1	11	0	0	13
Public	8	20	25	9	4	66
Total for response	9	21	36	9	4	79
Chi square = 10.042; Prob = 0.040 **						
g) Computer clubs or local interest groups						
Church-related	1	6	5	1	0	13
Public	9	25	25	4	2	65
Total for response	10	31	30	5	2	78
Chi square = 0.921; Prob = 0.921 *						
h) Operators of bulletin board systems						
Church-related	2	4	5	2	0	13
Public	11	22	27	4	1	65
Total for response	13	26	32	6	1	78
Chi square = 1.471; Prob = 0.832 *						

* not significant ** significant at 0.05 level

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In ranking teaching methods for a computer ethics course, faculty from different types of institutions had significantly different opinions on whether class discussions of instructor-provided case studies was the best method for teaching the course. Table 22 shows responses to instrument item 15, "Rank the following teaching methods to use in teaching a computer ethics course," for seven suggested teaching methods. Class discussion of case studies was the only teaching method receiving significantly different responses based on type of institution. Most public school faculty gave class discussion of case studies the highest ranking, with 38 (59%) giving it the highest value of 7 and 16 (25%) giving it a 6. Six (46%) church-related school faculty gave discussion of case studies the highest ranking of 7 and 1 (8%) gave it a 6. In contrast, one (2%) of public school faculty gave class discussion of case studies the lowest ranking of 1 and three (5%) gave it a 2, compared to no church-related school faculty who gave class discussion of case studies the lowest ranks of 1 or 2.

Educators from church-related and public institutions agreed that copying commercial software was the single most important ethical issue facing computer professionals today, but after that, consensus broke down among the faculty from different types of institutions. Table 23 shows the responses to instrument item 17, which is unnumbered on the instrument but follows item 16. This table shows the number of people within each group who consider each topic to be the most important issue. Topics

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Table 22

Chi Square Distribution of Responses to Item 15 By Type of Institution

ITEM 15: Rank the following teaching methods to use in teaching a computer ethics course, with 7 being the highest ranking and 1 the lowest.

	High <-	-	-	-	-	-	-> Low	Sum of
Method	7	6	5	4	3	2	1	Inst Type
a) Lecture by instructor								
Church-related	3	0	1	0	3	1	5	13
Public	11	4	15	10	6	2	17	65
Total for response	14	4	16	10	9	3	22	78
Chi square = 7.260; Prob = 0.297 *								
b) Class discussion of case studies								
Church-related	6	1	4	2	0	0	0	13
Public	38	16	5	0	1	3	1	64
Total for response	44	17	9	2	1	3	1	77
Chi square = 17.530; Prob = 0.008 **								
c) Individual assessment of case studies								
Church-related	1	6	2	4	0	0	0	13
Public	10	21	12	6	7	6	2	64
Total for response	11	27	14	10	7	6	2	77
Chi square = 7.947; Prob = 0.242 *								
d) Written reports on individual research								
Church-related	0	1	1	3	5	3	0	13
Public	0	12	9	14	10	15	5	65
Total for response	0	13	10	17	15	18	5	78
Chi square = 5.086; Prob = 0.406 *								
e) Oral reports on individual research								
Church-related	0	1	2	4	2	2	2	13
Public	3	4	10	9	20	8	11	65
Total for response	3	5	12	13	22	10	13	78
Chi square = 3.506; Prob = 0.743 *								
f) Group projects								
Church-related	0	0	2	7	1	3	0	13
Public	3	5	10	11	14	15	6	64
Total for response	3	5	12	18	15	18	6	77
Chi square = 10.172; Prob = 0.118 *								
g) Group reports								
Church-related	0	0	2	4	2	3	2	13
Public	0	5	10	12	10	9	18	64
Total for response	0	5	12	16	12	12	20	77
Chi square = 3.006; Prob = 0.699 *								

* not significant ** significant at 0.01 level

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are also ranked in Table 23, with rank 1 being the most selected issue by that group, etc. Ranking is shown only for those topics selected by at least one person within that group. There are several ties, with mulitiple issues receiving the same rank. In order to save space, topics which were not selected by anyone are not shown. Percentages reflect the percentage of people within the group who made this selection. Table 23 shows that six (50%) educators from church-related schools considered copying software to be the single most important ethical issue facing computer professionals today, followed by two each (17% each) selecting software reliability and adult hackers and one each (8% each) naming social responsibility and networks. Twelve educators (22%) from public schools considered copying software as the single most important ethical issue, followed by 8 each (15% each) identifying social responsibility and computer crimes; 6 each (11% each) who named accessing databanks and system security, 4 (7%) identifying viruses and worms; 3 (6%) who selected teenage hackers; 2 (4%) choosing gender issues; and 1 each (2% each) selecting socialization skills, data validity, worker displacement, military applications, and other (proposed by this individual to be use of databases on individuals by government agencies and corporations).

Earlier tables rank the way that all respondents evaluated the extent of unethical practices among certain groups (see Table 4), the importance of ethical issues (see Table 5), curriculum placement for computer ethics (see Table 14), appropriate group to teach a computer ethics

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Table 23

Chi Square Distribution of Responses to Item 17 By Type of Institution

ITEM 17: From this list, what do you consider the single most important ethical issue facing computer professionals today?

Response to	Type of institution						
Item 17	Church			Public			Total
	f	%	Rank	f	%	Rank	
a. Socialization skills	0	0		1	2	9	1
c. Gender issues	0	0		2	4	8	2
e. Social responsibility	1	8	4	8	15	2	9
f. Computer crimes	0	0		8	15	2	8
g. Copying software	6	50	1	12	22	1	18
h. Accessing databanks	0	0		6	11	4	6
i. Data validity	0	0		1	2	9	1
j. Software reliability	2	17	2	0	0		2
k. Teenage hackers	0	0		3	6	7	3
l. Adult hackers	2	17	2	0	0		2
q. Worker displacement	0	0		1	2	9	1
t. Viruses & worms	0	0		4	7	6	4
v. System security	0	0		6	11	4	6
x. Networks	1	8	4	0	0		1
y. Military applications	0	0		1	2	9	1
z. Other	0	0		1	2	9	1
Total							
Frequency	12			54			66
%	18.18			81.82			100.00

Chi square = 33.136; Prob = 0.018 (significant)

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course (see Table 17), and preferred teaching methods (see Table 19). Tables 24 through 28 present responses to the same items, ranking mean responses which have been grouped according to type of institution.

Table 24 analyzes the way that each group responded to instrument item 7, which asked them to "indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place among the following groups." Educators from all three types of institutions agreed that computer science faculty were the most ethical group considered. Respondents from both church-related and public institutions ranked computer science students as the group most likely to behave unethically and ranked other students near the middle. But respondents from private institutions reversed that, ranking computer science students near the middle and other students as most likely to behave unethically. There was also division of opinion concerning other faculty. Faculty from private institutions ranked them as third most likely to behave unethically, but faculty from other institutions ranked noncomputer science faculty as next to least likely to behave unethically.

Table 25 shows how computer science faculty from different types of institutions evaluated the relative importance of ethical issues. It evaluates responses to instrument item 8, which asked each respondent to "indicate the extent that you feel each topic is an important ethical issue." Copying commercial software was ranked first or second highest by each group. Viruses and worms and

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Table 24

Means and Order Ranking of Responses to Item 7 By Type of Institution

ITEM 7: Indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place among the following groups. **

Group	Type of institution								
	Church			Public			Private		
	Mean	SD	Rank*	Mean	SD	Rank*	Mean	SD	Rank*
Computer professionals in business & industry	3.77	0.725	3	3.55	1.000	5	3.67	0.516	4
Individuals who use computers as part of their jobs	3.92	0.494	1	3.57	0.918	4	3.67	0.516	4
Computer science students	3.92	0.494	1	3.79	0.937	1	3.67	0.516	4
Other college & university students	3.62	0.650	4	3.58	1.024	3	4.33	0.516	1
Computer science faculty	2.92	0.641	8	3.05	0.999	8	3.17	1.329	8
Other faculty	3.23	0.599	7	3.29	1.049	7	3.83	0.753	3
Computer clubs or local interest groups	3.54	0.776	5	3.54	0.920	6	3.67	1.211	4
Operators of bulletin board systems	3.46	0.967	6	3.58	0.900	2	4.33	0.516	1

* 1 = highest ranking; 8 = lowest ranking

** The following conversion has been made in order to calculate means and standard deviation: 5 = Strongly Agree; 4 = Agree; 3 = Neutral or No opinion; 2 = Disagree; 1 = Strongly Disagree

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Table 25

Means and Order Ranking of Responses to Item 8 By Type of Institution

ITEM 8: Please circle your response to indicate the extent that you feel each topic is an important ethical issue.*

Group	----- Type of institution -----					
	Church		Public		Private	
	Mean	Rank	Mean	Rank	Mean	Rank
a. Effect of computers on socialization skills	2.46	25	2.79	18	2.17	23
b. Databanks on suspected criminals	3.69	11	3.38	14	3.50	11
c. Gender-related issues	3.00	19	2.83	16	2.00	24
d. Minority issues	3.08	17	2.65	22	2.83	18
e. Social responsibility	3.38	15	3.51	11	3.00	15
f. Use of computers to commit crimes	3.92	6	4.15	4	4.50	2
g. Copying commercial software	4.38	2	4.21	2	4.67	1
h. Accessing confidential databanks	4.15	4	4.29	1	4.50	2
i. Validity of data(GIGO)	3.85	8	3.59	9	3.83	8
j. Reliability of software	3.62	12	3.48	12	4.17	5
k. Teenage hackers	3.46	14	3.33	15	4.17	5
l. Adult hackers	3.62	12	3.44	13	4.33	4
m. Computer Aided Instruction	2.62	24	2.56	24	2.33	22
n. Potential VDT health risks	2.85	22	2.70	21	3.33	12
o. Boredom from routine	2.92	21	2.46	25	3.00	15
p. On-the-job stress	3.31	16	2.72	19	2.83	18
q. Worker displacement resulting from computers	3.08	17	2.71	20	3.00	15
r. Employee loyalty	2.69	23	2.63	23	2.00	24
s. "Whistle-blowing"	3.00	19	2.82	17	2.83	18
t. Viruses and worms	4.46	1	3.89	5	4.17	5
u. Monitoring electronic mail	3.85	8	3.89	5	3.33	12
v. System security	4.23	3	4.17	3	3.67	9
w. Networks	3.77	10	3.71	8	3.33	12
x. Electronic transfer of funds	3.92	6	3.79	7	2.67	21
y. Military applications	4.00	5	3.56	10	3.67	9

* The following values were used to calculate means: 5 = Severe issue; 4 = Substantial issue, 3 = Moderate issue, 2 = Minor issue, 1 = Not an issue

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accessing confidential databanks were also considered important ethical issues by each group. All groups agreed that employee loyalty, Computer Aided Instruction, and effect of computers on socialization skills were relatively unimportant ethical issues.

In examining differences between the institutions shown in Table 25, educators from church-related institutions also included system security and military applications among the five most important ethical issues. Public institution educators also identified system security and monitoring electronic mail among the five most important ethical issues. Educators from private schools also considered use of computers to commit crimes, reliability of software and teenage hackers as top ethical issues.

Computer science faculty evaluated several potential placements of computer ethics instruction for instrument item 9, which asked them to "Rank the following placements in the curriculum for teaching comptuer ethics at the college level." Responses to item 9 are broken down according to institute type in Table 26.

Faculty from all types of institutions gave a high ranking to teaching computer ethics in a separate module within a larger course and a low ranking to encouraging students to take an ethics course in another department. Personal example of faculty and staff received the highest ranking by faculty at church-related institutions and the second highest ranking by faculty at public institutions,

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but tied with two other topics for the lowest ranking by faculty at private institutions.

Table 26

Means and Order Ranking of Responses to Item 9 by Type of Institution

ITEM 9: Rank the following placements in the curriculum for teaching computer ethics at the college level, with 5 being the highest ranking and 1 being the lowest ranking.

Group	Type of institution								
	Church			Public			Private		
	Mean	SD	Rank*	Mean	SD	Rank*	Mean	SD	Rank*
Separate C.S. course	2.15	1.345	4	2.56	1.490	4	2.83	2.041	3
Module in larger course	3.77	1.166	2	3.62	1.250	1	3.33	1.506	1
Example of faculty & staff	4.15	1.068	1	3.50	1.268	2	2.83	0.983	3
References in C.S. curriculum	3.23	1.013	3	3.26	1.207	3	3.17	0.983	2
Ethics course in other dept.	2.15	0.899	4	2.02	1.259	5	2.83	1.835	3

* 1 = highest ranking 5 = lowest ranking

Table 27 breaks down responses to instrument item 13 by type of institution. Item 13 asked respondents to "Rank the following groups according to which you consider the most appropriate for teaching the computer ethics course." All groups gave computer science faculty a high rating, ranking it first or second. But there was less agreement on sociology faculty or a team of computer science and other faculty. Faculty from church-related and public institutions ranked a team of computer science and other

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faculty first or second and sociology faculty last, but faculty from private institutions ranked a team of computer science and other faculty fourth out of five and sociology faculty second.

Table 27

Means and Order Ranking of Responses to Item 13 by Type of Institution

ITEM 13: Rank the following groups according to which you consider the most appropriate for teaching the computer ethics corse, with 5 being the highest ranking and 1 the lowest.

Group	Type of institution								
	Church			Public			Private		
	Mean	SD	Rank*	Mean	SD	Rank*	Mean	SD	Rank*
Computer science faculty	3.77	1.092	2	3.95	1.165	1	3.33	1.633	1
Philosophy/religion faculty	2.77	1.092	3	2.46	1.200	4	2.50	1.225	5
Sociology faculty	2.31	1.109	5	2.14	0.916	5	3.00	1.789	2
Team of C.S. & other faculty	4.15	0.987	1	3.88	1.305	2	3.17	1.722	4
Ethicists	2.38	0.961	4	2.58	1.273	3	3.00	1.095	2

* 1 = highest ranking 5 = lowest ranking

Respondents from all types of institutions considered class discussion of instructor-provided case studies and individual written assessment of instructor-provided case studies to be the two best teaching methods to use in a computer ethics course, as shown in Table 28. When asked in instrument item 15 to "rank the following teaching methods to use in teaching a computer ethics course," all

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groups gave a low ranking to group reports and placed written reports by students on individual research solidly in the middle. There were more differences of opinion on oral reports on research and lecture by instructor. Oral reports on research tied for second place among private school educators, was placed in the middle at fourth place by church-related school educators, and ranked sixth out of seven by public school educators. Lecture by instructor was the third choice of public school educators but was

Table 28

Means and Order Ranking of Responses to Item 15 By Type of Institution

ITEM 15: Rank the following teaching methods to use in teaching a computer ethics course, with 7 being the highest ranking and 1 the lowest.

Group	Type of institution								
	Church			Public			Private		
	Mean	SD	Rank*	Mean	SD	Rank*	Mean	SD	Rank*
Lecture by instructor	3.23	2.455	6	3.92	2.153	3	3.33	2.066	7
Class discussion of case studies	5.85	1.214	1	6.20	1.394	1	4.33	2.805	2
Individual assessment of case studies	5.31	1.032	2	4.92	1.693	2	5.17	1.941	1
Written reports on research	3.38	1.193	4	3.66	1.603	4	3.83	1.329	4
Oral reports on research	3.38	1.557	4	3.35	1.662	6	4.33	2.066	2
Group projects	3.62	1.044	3	3.48	1.633	5	3.50	2.074	5
Group reports	3.08	1.382	7	3.03	1.681	7	3.50	2.074	5

* 1 = highest ranking 7 = lowest ranking

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placed sixth out of 7 by church-related school educators and last by public school educators.

Institutional computer ethics policy in place. Chi square analysis was performed on 6 different instrument items based on the demographic question, "Does your school or department currently have a computer ethics policy in place?" The items examined were items 1, 2, 3, 4, 6, and 12. Only one analysis was found to be statistically significant. That analysis and one other are shown below.

Presence of an institutional computer ethics policy had a significant relationship to the way respondents answered instrument item 2, "Is computer ethics a problem at your institution?" Responses are shown in Table 29. Faculty from schools where the department or insitution had a computer ethics policy (28, or 70%) were significantly more likely to consider computer ethics a local problem than faculty from other institutions (14, or 39%).

Table 30 compares responses to the question "Should a school or department develop and publish its own computing ethics policy?" from institutions with a computer ethics policy to responses from institutions without a computer ethics policy. More than 90% of both groups responded yes to this question as posed in instrument item 3. There was not a significant difference in responses of the two groups.

Discussion of Computer ethics. Chi square analysis was performed to determine whether discussion of computer ethics was related to responses to the same instrument

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Table 29

Chi Square Distribution of Responses to Item 2 by Local Institutional Computer Ethics Policy

ITEM 2: Is computer ethics a problem at your institution?

Independent variable: Does your school or department currently have a computer ethics policy in place?

Response Item 2	Policy in Place No f	%	Yes f	%	Total
No	22	61	12	30	34
Yes	14	39	28	70	42
Total	36	48	40	53	72

Chi square = 7.418; Prob = 0.006 (stat. significant)

Table 30

Chi Square Distribution of Responses to Item 3 by Local Institutional Computer Ethics Policy

ITEM 3: Should a school or department develop and publish its own computing ethics policy?

Independent variable: Does your school or department currently have a computer ethics policy in place?

Item 3	Policy in Place No f	%	Yes f	%	Total
No	3	8	2	5	5
Yes	33	92	40	95	73
Total Frequency	36	46	42	54	78

Chi square = 0.412; Prob = 0.521 (not significant)

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items examined above, items 1, 2, 3, 4, 6, and 12. Four of the six analyses were found to be statistically significant, based on the answer to the demographic question, "Have you discussed computer ethics with your colleagues?" These significant analyses are shown below.

Educators who have discussed computer ethics with colleagues were significantly more likely to consider computer ethics a global problem, although most respondents from both groups agreed that computer ethics was a global problem. Table 31 shows the responses to instrument item 1, which asks "Do you feel that computer ethics is a global problem?" Sixty (90%) of the respondents who had discussed computer ethics with colleagues responded with Yes, compared to 12 (67%) who had not discussed computer ethics with colleagues.

Table 32 shows that people who had discussed computer ethics with their colleagues were statistically more likely to respond positively to instrument item 3, "Should a school or department develop and publish its own computing ethics policy?" Sixty-six (96%) of respondents who had discussed computer ethics with their colleagues responded with Yes; 12 (75%) of those who had not discussed computer ethics with colleagues responded with Yes. A majority of both groups agreed that computer ethics was a global problem.

Computer science educators who have discussed computer ethics with colleagues were statistically more likely to say that ethical use of computers can be taught, as shown in Table 33. A majority of educators from both groups

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Table 31

Chi Square Distribution of Responses to Item 1 by Discussion of Computer Ethics

ITEM 1: Do you feel that computer ethics is a global problem?

Independent variable: Have you discussed computer ethics with your colleagues?

Response	Discussion of Computer Ethics				
Item 1	No		Yes		Total
	f	%	f	%	
No	6	33	7	10	13
Yes	12	67	60	90	72
Total	18	21	67	79	85

Chi square = 5.736; Prob = 0.017 (stat. significant)

Table 32

Chi Square Distribution of Responses to Item 3 by Discussion of Computer Ethics

ITEM 3: Should a school or department develop and publish its own computing ethics policy?

Independent variable: Have you discussed computer ethics with your colleagues?

Response	Discussion of Computer Ethics				
Item 3	No		Yes		Total
	f	%	f	%	
No	4	25	3	4	7
Yes	12	75	66	96	78
Total	16	19	69	81	85

Chi square = 7.330; Prob = 0.007 (stat. significant)

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responded that ethical use of computers can be taught, but 65 (97%) of such educators responded Yes to instrument item 4, "Can ethical use of computers be taught?" compared to 12 (80%) of the other educators.

Table 33

Chi Square Distribution of Responses to Item 4 by Discussion of Computer Ethics

ITEM 4: Can ethical use of computers be taught?

Independent variable: Have you discussed computer ethics with your colleagues?

Response Item 4	Discussion of Computer Ethics No f	%	Yes f	%	Total
No	3	20	2	3	5
Yes	12	80	65	97	77
Total	15	18	67	82	82

Chi square = 6.197; Prob = 0.013 (stat. significant)

Respondents who have discussed computer ethics with their colleagues were more likely to agree or strongly agree with the statement in instrument item 6, "We should teach computer ethics in a classroom setting." Table 34 shows that 49 (87%) of those who have discussed computer ethics strongly agreed or agreed that we should teach computer ethics in the classroom, while only six (46%) of the remaining respondents strongly agreed or agreed with that statement. No one from either group strongly disagreed with the statement. Only 69 people (79% of those who returned the questionnaire) responded to item 6.

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Table 34

Chi Square Distribution of Responses to Item 6 by Discussion of Computer Ethics

Item 6: We should teach computer ethics in a classroom setting.

Independent variable: Have you discussed computer ethics with your colleagues?

Response Item 6	Discussion of Computer Ethics No f	 %	 Yes f	 %	 Total
Disagree	2	15	2	4	4
Neutral or No opinion	5	38	5	9	10
Agree	5	38	26	46	31
Strongly Agree	1	8	23	41	24
Total	13	19	56	81	69

Chi square = 12.418; Prob = 0.006 (stat. significant)

Attendance at computer ethics class/seminar. Responses to instrument items 1, 2, 3, 4, 6, and 12 were analyzed to determine whether attendance at computer ethics classes or seminars made a significant difference in those responses. Chi square was performed on each item, with the response to the demographic question, "Have you attended classes or seminars on computer ethics?" as the independent variable. Only the comparison for item 1 was found to be statistically significant. That analysis and one other are shown in tables 35 and 36.

All 18 (100%) of respondents who had attended classes or seminars on computer ethics responded Yes to instrument

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item 1, "Do you feel that computer ethics is a global problem?" Table 35 shows how that response compares to the 54 (80%) who responsed positively from those who had not attended classes or seminars on computer ethics.

Table 35

Chi Square Distribution of Responses to Item 1 by Attendance At Computer Ethics Class/Seminar

ITEM 1: Do you feel that computer ethics is a global problem?

Independent variable: Have you attended classes or seminars on computer ethics?

Response Item 1	Attendance at class/seminar				Total
	No		Yes		
	f	%	f	%	
No	13	19	0	0	13
Yes	54	81	18	100	72
Total	67	79	18	21	85

Chi square = 4.123; Prob = 0.042 (stat. significant)

In contrast to Table 35, Table 36 shows that there was virtually no difference between the responses to instrument item 4 of those who had attended computer ethics classes or seminars compared to those who had not. Item 4 asked the question, "Can ethical use of computers be taught," and received a 94% positive response from both groups.

Other demographic comparisons. Chi square was also performed on the same instrument items analyzed above by four other demographic questions, but no significant differences were found. The other demographics questions

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Table 36

Chi Square Distribution of Responses to Item 4 by Attendance at Computer Ethics Class/Seminar

ITEM 4: Can ethical use of computers be taught?

Independent variable: Have you attended classes or seminars on computer ethics?

Response Item 4	Class/Seminar Attendance No f	%	Yes f	%	Total
No	4	6	1	6	5
Yes	61	94	16	94	77
Total	65	79	17	21	82

Chi square = 0.002; Prob = 0.967 (not significant)

considered were: "What is your gender?," "Are you tenured?," "Field of study?," and "Years experience teaching computer science?."

Summary of Findings

Most computer science faculty at Kentucky colleges and universities considered computer ethics an important issue which should be addressed in a formal way at the university level. Half of the respondents were from institutions with an existing computer ethics course or module and slightly more than half had a departmental or school-wide computer ethics policy. Most had discussed computer ethics with their colleagues but had not attended classes or seminars on computer ethics.

A majority of respondents considered computer ethics to be a problem both globally and at their institution and

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among all of the groups of people suggested, especially computer science students. They identified accessing confidential databanks and copying commercial software as the two most important ethical issues and agreed that 23 out of 25 issues presented on the instrument were of at least moderate importance. The unethical situation most likely to have been encountered was copying of copyrighted software.

More than three fourths of the educators responded that a school or department should develop and publish its own computing ethics policy and that computer ethics can be taught. Most agreed that computer ethics should be taught at the university level, favoring a classroom setting in a school that also asks the faculty to discuss computer ethics in other courses, but most did not agree that a computer ethics course should be required.

Twenty-two of the 25 topics presented on the instrument were selected by a majority of respondents as topics that they would include in a computer ethics course if they were given the responsibility of designing one. Copying commercial software and viruses and worms were the two topics most often selected.

The preferred place to teach computer ethics was in a separate module within a larger course. If a separate computer ethics course was to be taught, computer science educators believed that they were the group best suited for the task, either alone (first choice) or as part of a team (close second choice). Class discussion of instructor-provided case studies and individual written assessment of

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instructor-provided case studies were the two most popular teaching methods for a computer ethics course.

In considering which teaching method was best for which computer ethics topic, every method was preferred by at least some respondents as the best method for each topic. Lecture was selected as most appropriate for more topics, followed by case studies. Most respondents suggested a variety of methods within the course, and some suggested a variety of methods for individual topics.

There were three statistically significant differences in the way that educators from church-related and public institutions responded to the questions. Public school computer science educators were more likely to strongly agree or agree that ethically inappropriate computer practices are commonly taking place among noncomputer science faculty. Public school faculty were also more likely to prefer class discussion of instructor-provided case studies as a teaching method for a computer ethics course. Copying commercial software was named most often by both church-related and public school faculty members as the single most important ethical issue facing computer professionals today, but respondents from church-related institutions were more than twice as likely to select the topic.

Faculty from an institution that had a computer ethics policy in place were more likely to consider computer ethics a local problem than faculty from an institution without a computer ethics policy.

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There was a closer relationship between whether or not a faculty member had discussed computer ethics with colleagues and their responses to several instrument items. Educators who had discussed computer ethics with colleagues were more likely than those who had not had such discussion to consider computer ethics a global problem, to respond that a school or institution should develop and publish its own computing ethics policy, and to agree that computer ethics can and should be taught in the classroom.

Respondents who had attended a class or seminar on computer ethics were unanimous in stating that computer ethics is a global problem, compared to an 80% response by those who had not attended such classes or seminars. Some of the implications of these findings are given in the following chapter.

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CHAPTER V

SUMMARY, DISCUSSION, AND IMPLICATIONS

Summary of the Study

Computer ethics applies the ancient concept of ethical behavior to the modern technology of computer science. This study examined the perceptions that computer science educators have toward computer ethics in general and, specifically, toward teaching computer ethics. The study focused on computer science faculty at Kentucky colleges and universities.

The following questions guided this study of computer ethics:

1. To what extent do computer science educators believe that ethically inappropriate practices are taking place?

2. What are the perceptions of computer science educators about which practices in computer science have ethical connotations?

3. To what extent do computer science educators perceive that computer ethics is an appropriate topic to be addressed in computer science classes? Which topics with ethical implications should be taught in the classroom?

4. If computer science ethics is taught at the college level, what teaching methods should be used? Which methods should be used on which topics?

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5. Is there a relationship between demographics and the way that computer science educators view computer ethics?

In order to answer these research questions, an instrument was developed and distributed to computer science faculty members at Kentucky colleges and universities which offered a major or minor in computer science. All 87 faculty who returned the first questionnaire or responded within 3 weeks of a second mailing made up the sample. The data from the survey were collected during the summer and fall semesters of 1992. A copy of the instrument is included in Appendix A. Chapter IV contains a detailed analysis of the data.

Discussion of the Findings

In relation to Question 1, to what extent do computer science educators believe that ethically inappropriate practices are taking place?, computer science faculty responded that computer ethics was a problem both at their institutions and globally, and that ethically inappropriate practices were commonly taking place among many groups of individuals. However, respondents seemed less concerned about their colleagues than other groups of people. Only 44 respondents (54%) considered computer ethics a problem at their institutions, compared to 72 (85%) who considered computer ethics a problem globally. Comments volunteered for instrument items 1 and 2 suggested that ethical issues which two of the respondents had encountered were not strictly related to computers: "I think it's not computer

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related, but a general problem of responsibility" and "To date we have avoided the hacking, system security, and virus problem. Copying assignments is sometimes a problem." While 64 (75%) either agreed or strongly agreed that ethically inappropriate practices were commonly taking place among computer science students, only 26 (31%) agreed or strongly agreed that ethically inappropriate practices were common among computer science faculty. Apparently, they did not feel that they had a strong influence on their students; they considered themselves slightly more inclined toward ethical behavior than other faculty, but they considered computer science students less ethical than other students. Perhaps this high level of unethical activity among computer science students could be attributed to an abundance of available hardware and technical skills without the corresponding maturity and awareness of the issue.

In relation to Question 2, what are the perceptions of computer science educators about which practices in computer science have ethical connotations?, educators were most likely to consider accessing confidential databanks (mean of 4.28 out of possible 5.00) and copying commercial software (mean 4.27) as important ethical issues. A majority of respondents (at least 46, or 55%) rated 23 out of 25 suggested topics as ethical issues of at least moderate importance. Fifteen of the 25 topics received a mean response of more than 3.0 out of 5.0. Again, some faculty felt that certain topics were not limited to computers: "Some of these issues are not just computer

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science issues, but form a large part of our fabric of life" and "The marked topics seem to be not-related to computers." The wide range of topics which are important ethical issues and the blurring of distinction between computer ethics and general ethics make it difficult to isolate a few topics which can be considered important issues for a discussion of computer ethics.

When responses were given numeric values in order to calculate their means some generalizations can be made concerning their relative ratings. The five topics with the highest mean values were traditional, distinctly computer-related concerns: accessing confidential databanks (mean 4.28 out of 5.00), copying commercial software (mean 4.27), use of computers to commit crimes (mean 4.14), system security (mean 4.14), and viruses and worms (4.00). The next tier of important topics included the hard-core computer topic of networks (mean 3.69) as well as the application of computers to workplace and national arenas, such as monitoring electronic mail (mean 3.85), electronic transfer of funds (mean 3.73), and military applications (mean 3.64). The next group of topics emphasized personal responsibility in dealing with computers, with topics of validity of data (mean 3.65), reliabiliy of software (mean 3.55), adult hackers (3.53), social responsibility (mean 3.45), databanks on suspected criminals (mean 3.44), and teenage hackers (mean 3.41). People must feel either that adult hackers are more dangerous than teenage hackers, or that they should know better; while adult hackers were given the 12th highest

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mean response, teenage hackers fared slightly better, coming in 15th. The issues with the lowest means were generally social concerns related to computer use, such as Computer Aided Instruction (mean 2.55), boredom from routine (mean 2.57), employee loyalty (mean 2.60), effect of computers on socialization skills (mean 2.69), minority issues (mean 2.73), potential VDT health risks (mean 2.76), worker displacement resulting from computers (mean 2.79), gender-related issues (mean 2.80), on-the-job stress (mean 2.82), and "whistle-blowing" (mean 2.85).

When asked what unethical situations respondents have encountered, the second most commonly mentioned topic (33, or 38%) was plagiarism and cheating, such as copying another student's programs or homework. As earlier comments have suggested, this is not just a computer ethics concern; plagiarism and cheating are traditional ethical concerns in an academic setting that have been given a new twist in a computerized environment. Perhaps this topic should have been included in the list of potential topics, since the study surveyed college and university educators. The other most commonly mentioned topics were piracy or copying of copyrighted software (41, or 47%) and hacking and/or security violations (14, or 16%), responses that coincide with responses to the list of suggested topics of important ethical issues. Hacking and security violations are specific computer concerns. Another concern applied to people who encouraged others to violate copyright codes, such as "colleagues wanting/offering copies of proprietary software" and "bringing by students [of] software packages

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and encouraging me to install them on my own PC." These free-form answers appear in Appendix B.

In relation to the first portion of Question 3, to what extent do computer science educators perceive that computer ethics is an appropriate topic to be addressed in computer science classes?, over 90% of Kentucky's computer science educators responded that a school or department should develop its own computing ethics policy (78, or 92%) and that ethical use of computers can be taught (77, or 94%). A majority strongly agreed or agreed that computer ethics should be taught at the college level (51, or 70%) in the classroom (55, or 80%) and that faculty should discuss the topic in other courses as well (56, or 77%), but they did not recommend that a computer ethics course should be required (28, or 43%). The responses seem somewhat ambivalent; apprently the consensus is that it's good to offer computer ethics instruction, but not before the college level, and it should not be required. Comments indicated that the matter of whether computer ethics can be taught was complicated: "Over a lifetime with other ethics--yes" and "But only if the proper personal code of ethics already exists."

A majority considered computer ethics to be an issue of extreme importance or great importance at the college level (61, or 70%) and at the high school level (49, or 56%), but not at the middle school or elementary school levels. But the fact that 12 respondents (14%) indicated that it was extremely important to include computer ethics even at the elementary school level, reflects the deep

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concern that some educators have about ethical use of computers and the need to instill computer ethics in children. So does the comment, "The younger the better! College is almost too late."

In relation to the second portion of Question 3, which topics with ethical implications should be taught?, educators were most likely to include copying commercial software (80, or 96%), viruses and worms (78, or 95%), accessing confidential databanks (77, 94%), system security (76, 94%), monitoring electronic mail (75, or 92%), and use of computers to commit crimes (75, or 90%) in a computer ethics course. These six topics are the same six topics receiving the highest mean response to an earlier question about important ethical issues, although the order is somewhat different. It was a little surprising to learn that the topic of viruses and worms was the second most selected topic for a computer ethics course, since it did not rank as high (fifth) when educators indicated, in response to an earlier question, to what extent the topics were ethical issues. Social responsibility (67, or 83%), validity of data (63, or 80%), and adult hackers (63, or 79%) were the next most frequently mentioned topics; all were ranked lower as important ethical issues. There may have been a slight tendency among computer science educators to design a course which includes some issues that they do not consider quite such pressing ethical issues in an effort to present a balance of technical topics with societal concerns for their students.

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Out of 25 proposed topics for a computer ethics course, 22 were selected by more than 50% of respondents to be included in a computer ethics course, suggesting that most educators preferred a broad range of topics if a computer ethics course is to be designed for a college or university. Even the least popular topic, boredom from routine, was selected by 32 (41%) of the respondents to be included in a computer science course. The wide range of topics appropriate for such a course can make a computer ethics course unwieldy to design. As one person commented, "This should be enough for a 2-semester course."

When asked to identify the single most important ethical issue facing computer professionals today, copying commercial software (18, or 24%) was selected most often, which is consistent with responses to earlier instrument items, followed by social responsibility (10, or 13%), accessing confidential databanks (9, or 12%), use of computers to commit crimes (8, or 11%), and system security (7, or 9%). Social responsibility, ranked as the second most important single ethical issue, was earlier listed 13th among the 25 suggested topics of ethical importance. Perhaps there were not a great number of respondents who considered social responsibility an important issue, but many of those who did considered it the single most important of the issues presented on the quesionnaire.

In relation to the first portion of Question 4, if computer ethics is taught at the college level, what teaching methods should be used?, respondents preferred to have computer ethics taught in some manner other than as a

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separate ethics course, especially if the course was not taught in the computer science department. When asked to evaluate five possible placements in the curriculum for computer ethics, the highest mean evaluation was for a separate module within a larger course (3.62 out of 5.00). Thirty respondents (35%) also ranked the module approach as the best placement in the curriculum. Personal example of faculty and staff (mean 3.55) and references in regular computer science curriculum (mean 3.25) were also ranked above the 3.00 level. Only a separate computer science course or courses (mean 2.52) and encouraging students to take an ethics course in another department (2.09) ranked below 3.00. So, computer science faculty seem to have a relatively high opinion of their ability to teach computer ethics, even without a special course for that purpose.

So perhaps it is not surprising that respondents were more likely to select computer science faculty (mean 3.88 out of 5.00) or a team of computer science and other faculty (mean 3.87) for teaching a computer ethics course, if one were to be offered. Ethicists (mean 2.58), philosophy or religion faculty (mean 2.51), and sociology faculty (mean 2.23) all were ranked far behind. Wide acceptance of the team approach, which would include other faculty, suggests that computer science educators view a computer ethics course differently than a purely technical course, where noncomputer science faculty might not be welcome.

Respondents preferred to introduce computer ethics to freshmen, possibly continuing exposure to computer ethics

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in later years. This attitude is compatible with the earlier stated appeal of teaching computer ethics by example or throughout the curriculum, rather than in a special course. Forty-six (55%) of the respondents recommended teaching computer ethics to freshmen, with fewer selecting each subsequent level, on down to 13 for seniors. But 22 (27%) recommended teaching computer ethics at more than one level, apparently to reinforce its importance. Overall, respondents must consider the first year of college to be the optimum point to teach computer ethics, since earlier responses gave lower rankings to teaching computer ethics before the college level.

Case studies were a popular method for teaching a computer ethics course, since class discussion of instructor-provided case studies (mean 6.01 out of 7.00) and individual written assessment of instructor-provided case studies (mean 5.00) received the highest rankings. Group activities were not popular, since group reports (mean 3.07) were ranked last and group projects (mean 3.51) were ranked fifth out of seven. Oral reports on individual research (mean 3.43), also requiring a group setting for presentation, ranked sixth out of seven. More traditional teaching approaches of lecture by instructor (3.77) and written reports on research (3.63) were ranked near the middle, placing third and fourth out of seven. One educator recommended a variety of methods: "A combination of b-g (all proposed teaching methods except lecture by instructor) would be best."

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In relation to the second portion of Question 4, which methods should be used on which topics?, every proposed method was preferred by some respondents for each topic. After reading that class discussion of case studies and written assessment of case studies were the two generally preferred teaching methods for a course in computer ethics, it would be reasonable to expect that case studies would be preferred most often for teaching specific topics. However, case studies (514) came in second out of four, behind lecture (558), when respondents selected a teaching method for each of 25 suggested topics. These two methods were much preferred over group projects (261) and individual student research (229) for specific topics. The individual topic with the most consensus was copying commercial software, with 44 selecting lecture for that topic, compared to 23 selecting case studies, 10 selecting individual student research, and 10 selecting group projects. Perhaps educators feel that copying commercial software is not a topic that they feel comfortable opening up for class discussion, and they would rather depend on their lectures to make the point that it is both illegal and unethical to copy software that is protected by copyright.

Several respondents selected more than one teaching method for some of the topics. The diversity of responses indicates that a variety of approaches should be used, with lecture and case studies used more frequently than individual student research and group projects. One person summed it up: "No course should be only one method . . .

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all these should be put together as the instructor sees fit."

In relation to Question 5, what is the relationship between demographics and the way that computer science educators view computer ethics?, some significant differences were found, based on type of institution, whether an institution had a computer ethics policy in place, whether an educator had discussed computer ethics with a colleague, and whether the respondent had attended a computer ethics class or seminar.

Faculty from public institutions were significantly more likely than faculty from church-related institutions to agree or strongly agree that inappropriate computer practices are commonly taking place among noncomputer science faculty, to rank class discussion of case studies as the best method for teaching computer ethics, and to select the use of computers to commit crimes, social responsibility, or system security as the single most important ethical issue facing computer professionals today. They agreed with respondents from church-related institutions that copying commercial software was the single most important ethical issue facing computer professionals, but faculty from church-related institutions (6, or 50%) were still more likely to select copying commercial software than public school faculty (12, or 22%). Faculty from private institutions were not included in this analysis, because the six private school respondents were deemed too small a data sample for comparisons to be meaningful.

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While these specific differences were of interest, there was no larger pattern among them. Before the data were analyzed, it was suspected that church-related and private school faculty members would have a similar perspective, while public school faculty members might have a different perspective. But that was not necessarily true. Private school responses were not included in chi square analyses, but they were included in the the means and order ranking shown in tables 24 through 28. A close look at tables 24 through 28 shows that sometimes public school faculty ranked in the middle on one issue, or at one end of the spectrum but near one of the other groups. No one group was more likely to stand by itself than any other. Out of 80 chi square analyses which were performed based on type of institution for public and church-related schools, only three were statistically significant: the extent that ethically inappropriate computer practices are commonly taking place among noncomputer science faculty, ranking of class discussion of instructor-provided case studies as a teaching method for a computer ethics course, and selection of the single most important ethical issue facing computer professionals today. Therefore, the responses from different institution types were actually quite similar.

Faculty from schools with an existing computer ethics policy were almost twice as likely as other faculty (28, or 70%, compared to 14, or 39%) to consider computer ethics a local problem. Perhaps these computer ethics policies were written in response to problems on campus, or perhaps they

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help to make faculty more aware of ethical issues. Somewhat surprisingly, the presence of a computer ethics policy had practically no relationship to perception about the need for a policy, since more than 90% of both groups (40, or 95%, of those with a computer ethics policy, compared to 33, or 92%, of those without a computer ethics policy) perceived that a computing ethics policy was desirable. Apparently most educators thought that it was generally a good idea for a school to develop a computer ethics policy, but those whose schools had actually done so were more likely to consider it necessary.

Respondents who had discussed computer ethics with colleagues were significantly more likely than other computer science educators (a) to view computer ethics as a global issue (60, or 90%, compared to 12, or 67%), (b) to believe that a school should develop a computing ethics policy (66, or 96%, compared to 12, or 80%), (c) to respond that the ethical use of computers can be taught (65, or 97%, compared to 12, or 80%), and (d) to agree that we should teach computer ethics in a classroom setting (mean response of 4.25 compared to 3.38). Four out of six chi square analyses which were performed on this independent variable were statistically significant. So, learning whether or not an individual educator has discussed computer ethics with colleagues may be the best indicator of that person's responses. Actually, since four out of five respondents (69, or 79%) reported that they had discussed computer ethics with their colleagues, it may not be unreasonable to suppose that the other 21% were

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unusually insulated from ethical concerns; therefore, they were more likely to deny that computer ethics was a global problem or that a school should develop a computer ethics policy or to believe that computer ethics should be taught, especially in the classroom. However, the differences may not be as great as they first appear, because a majority of people from both groups responded positively to all these items; the differences were just in the degree of positive response.

Respondents who had attended classes or seminars were more likely than other educators to consider computer ethics a global problem, with 100% of those who attended classes or seminars agreeing with the statement, compared to 81% of those who hadn't attended classes or seminars. Attendance at classes and seminars had no measurable impact on whether respondents perceived that computer ethics could be taught (94% for both groups). It is likely that those who attended courses or seminars on computer ethics already considered the topic to be an important global issue and that this perception was strengthened by the course or seminar. Again, these groups had more similarities than differences.

No statistically significant differences were found when chi square analysis was performed based on gender, tenure, field of study, or years of experience.

Implications of the Study

The more that faculty members are exposed to the topic of computer ethics, whether through seminars or informal conversations or the presence of a computer ethics policy,

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the more they are likely to consider computer ethics an issue important enough to be addressed in the curriculum.

According to the responses to this survey, a school which wants to instill a sense of ethical use of computers in its students might offer freshmen a computer ethics module in a larger course, taught by a computer science professor, using a variety of techniques including case studies and lecture. The module should cover a wide range of topics which include commercial software and viruses and worms. Faculty and staff would also be expected to demonstrate ethical computer use and to mention ethics outside the computer ethics module. The school or department should develop its own computing ethics policy and make it known to students. It is reasonable to expect students to behave more ethically after such exposure than they would otherwise.

Demographics had a minimal relationship to responses to the instrument, but the most significant differences were found between those who had discussed computer ethics with their colleagues and those who had not. Some significant differences in responses existed based on type of institution, whether the institution had an existing computer ethics policy, and attendance at classes or seminars on computer ethics. Gender, tenure, field of study, and years of experience were not found to have a significant relationship to responses.

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APPENDIX A

THE INSTRUMENT

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COMPUTER ETHICS SURVEY

Sylvia Clark Pulliam   Western Kentucky University
Computer Science Dept.   Bowling Green, KY   42101

** Please respond to the following demographic questions. **

Type of institution? Circle one.   Church-related   Public   Private
Approximate enrollment. ________________________

What is the name of your department? ____________________________
Your college or division within the institution? ____________________

Does your department offer a course in computer ethics or a module on computer ethics within a larger course? Circle one or more:
Course   Module   Neither
If so, is it required? Circle one.   No   Yes

Does your school or department currently have a computer ethics policy in place?   No   Yes

What is the approximate computer science enrollment per term? __________
Approximate number of computer science majors? ______________________

What is your gender? Circle one.   Female   Male

Are you tenured?   No   Yes

Highest earned degree?_______   Field of study?___________   Rank?________
Years experience teaching Computer Science?________   Age?______

How many courses do you typically teach during an academic year at each level?   Freshman____   Sophomore____   Junior____   Senior____   Grad____

Have you discussed computer ethics with your colleagues?   No   Yes
Have you attended classes or seminars on computer ethics?   No   Yes

****

** Part I **

1 Do you feel that computer ethics is a global problem?   No   Yes

2 Is computer ethics a problem at your institution?   No   Yes

3 Should a school or department develop and publish its own computing ethics policy?   No   Yes

4 Can ethical use of computers be taught?   No   Yes

5 Use the following scale to indicate the importance of including computer ethics as part of the curriculum at the following levels:
5 = Extreme importance   3 = Moderate importance   1 = No importance
4 = Great importance   2 = Slight importance
(a) in a college or university   5 4 3 2 1
(b) in high school (grades 9--12)   5 4 3 2 1
(c) in middle school (grades 7--8)   5 4 3 2 1
(d) in elementary school (grades 1--6)   5 4 3 2 1

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Please circle your response to questions 6 and 7, using the scale:

SA = Strongly Agree
A = Agree
	N=Neutral or
	No opinion
		D=Disagree
		SD=Strongly Disagree

6 We should teach computer ethics in a classroom setting.	SA A N D SD

7 Indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place among the following groups.

(a) Computer professionals in business and industry	SA A N D SD
(b) Individuals who use computers as part of their jobs	SA A N D SD
(c) Computer science students	SA A N D SD
(d) Other college and university students	SA A N D SD
(e) Computer science faculty	SA A N D SD
(f) Other faculty	SA A N D SD
(g) Computer clubs or local interest groups	SA A N D SD
(h) Operators of bulletin board systems	SA A N D SD

8 Please circle your response to indicate the extent that you feel each topic is an important ethical issue.

5 = Severe issue 4 = Substantial issue	3 = Moderate issue 2 = Minor issue	1 = Not an issue

(a) Effect of computers on socialization skills	5 4 3 2 1
(b) Databanks on suspected criminals	5 4 3 2 1
(c) Gender-related issues	5 4 3 2 1
(d) Minority issues	5 4 3 2 1
(e) Social responsibility	5 4 3 2 1
(f) Use of computers to commit crimes	5 4 3 2 1
(g) Copying commercial software	5 4 3 2 1
(h) Accessing confidential databanks	5 4 3 2 1
(i) Validity of data (GIGO)	5 4 3 2 1
(j) Reliability of software	5 4 3 2 1
(k) Teenage hackers	5 4 3 2 1
(l) Adult hackers	5 4 3 2 1
(m) Computer Aided Instruction	5 4 3 2 1
(n) Potential VDT health risks	5 4 3 2 1
(o) Boredom from routine	5 4 3 2 1
(p) On-the-job stress	5 4 3 2 1
(q) Worker displacement resulting from computers	5 4 3 2 1
(r) Employee loyalty	5 4 3 2 1
(s) "Whistle-blowing"	5 4 3 2 1
(t) Viruses and worms	5 4 3 2 1
(u) Monitoring electronic mail	5 4 3 2 1
(v) System security	5 4 3 2 1
(w) Networks	5 4 3 2 1
(x) Electronic transfer of funds	5 4 3 2 1
(y) Military applications	5 4 3 2 1

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9 Rank the following placements in the curriculum for teaching computer ethics at the college level, with 5 being the highest ranking and 1 being the lowest ranking. (Use each value once.)

(a) In a separate computer science course or courses _______
(b) As a separate module in a larger course _______
(c) Through personal example of faculty and staff _______
(d) Through references in regular computer science curriculum _______
(e) By encouraging students to take an ethics course in another department _______

****

** Part II **

Assume that you have been given the authority to design a computer ethics course to be taught at your institution. Indicate how you would agree or disagree with each statement

10 The school should ask faculty to discuss the topic in other courses as well. SA A N D SD

11 A computer ethics course should be required. SA A N D SD

12 A student would probably behave more ethically upon completion of such a course. SA A N D SD

13 Rank the following groups according to which you consider the most appropriate for teaching the computer ethics course, with 5 being the highest ranking and 1 the lowest. (Use each value once.)

(a) Computer science faculty _______
(b) Philosophy or religion faculty _______
(c) Sociology faculty _______
(d) Team of computer science and other faculty _______
(e) Ethicists _______

14 At what level should the course on computer ethics be offered?
Circle one or more. Freshman Sophomore Junior Senior

15 Rank the following teaching methods to use in teaching a computer ethics course, with 7 being the highest ranking and 1 the lowest. (Use each value once.)

(a) Lecture by instructor _______
(b) Class discussion of instructor-provided case studies _______
(c) Individual written assessment of instructor-provided case studies
(d) Written reports by students on individual research _______
(e) Oral reports by students on individual research _______
(f) Group projects _______
(g) Group reports _______

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16 Indicate the topics from the following list that you would like to see in the computer ethics course. If you answer Yes, please continue across and indicate what teaching method you believe would be the most appropriate for teaching that topic, using the code:

L for Lecture C for Case studies
S individual Student research G for Group project.

(a)	Effect of computers on socialization skills	No Yes ---> L C S G
(b)	Databanks on suspected criminals	No Yes ---> L C S G
(c)	Gender-related issues	No Yes ---> L C S G
(d)	Minority issues	No Yes ---> L C S G
(e)	Social responsibility	No Yes ---> L C S G
(f)	Use of computers to commit crimes	No Yes ---> L C S G
(g)	Copying commercial software	No Yes ---> L C S G
(h)	Accessing confidential databanks	No Yes ---> L C S G
(i)	Validity of data (GIGO)	No Yes ---> L C S G
(j)	Reliability of software	No Yes ---> L C S G
(k)	Teenage hackers	No Yes ---> L C S G
(l)	Adult hackers	No Yes ---> L C S G
(m)	Computer Aided Instruction	No Yes ---> L C S G
(n)	Potential VDT health risks	No Yes ---> L C S G
(o)	Boredom from routine	No Yes ---> L C S G
(p)	On-the-job stress	No Yes ---> L C S G
(q)	Worker displacement from computerization	No Yes ---> L C S G
(r)	Employee loyalty	No Yes ---> L C S G
(s)	"Whistle-blowing"	No Yes ---> L C S G
(t)	Viruses and worms	No Yes ---> L C S G
(u)	Monitoring electronic mail	No Yes ---> L C S G
(v)	System security	No Yes ---> L C S G
(w)	Networks	No Yes ---> L C S G
(x)	Elecronic transfer of funds	No Yes ---> L C S G
(y)	Military applications	No Yes ---> L C S G
(z)	Other ______________________________	L C S G

From this list, what do you consider the single most important ethical issue facing computer professionals today? Enter letter here (a-z).____

****

** Part III **

In your teaching of computer science, what unethical situations have you encountered?

If you offer a course or module on computer ethics, would you please describe this course and/or attach a copy of the course syllabus or outline?

Would you like to make any other comments concerning computer ethics? Attach another sheet, if needed.

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APPENDIX B

COMMENTS FROM RETURNED QUESTIONNAIRES

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PARTS I AND II

The following are comments from the survey to items in parts I and II on the questionnaire. The only item in these two parts that asked for a written response is instrument item 16z. All other comments were volunteered and written below the question or in the margin.

Item 1

Do you feel that computer ethics is a global problem? (Choices were No and Yes.)

Comment was:

Not global; maybe a problem in industrialized countries. I think it's not computer related, but a general problem of responsibility.

Item 2

Is computer ethics a problem at your institution? (Choices were No and Yes.)

Comments were:

Sometimes.

To date we have avoided the hacking, system security, and virus problems. Copying of assignmments is sometimes a problem.

Don't know.

Do not know.

Maybe.

Too broad a question.

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Item 3

Should a school or department develop and publish its own computing ethics policy? (Choices were No and Yes.)

Comments were:

But ACM [undecipherable word -- perhaps "regulates"] guidelines should/can be used.

Which one? Two different things. ["school or department" is boxed in.]

Item 4

Can ethical use of computers be taught? (Choices were No and Yes.)

Comments were:

You can try!

Over a lifetime with other ethics -- yes. I doubt the efficacy of a single, isolated course.

People can be made aware of certain connections/ consequences..., they can be influenced, but not taught.

Don't know.

But only if the proper personal code of ethics already exists.

Item 5

Indicate the importance of including computer ethics as part of the curriculum at the following levels: (Choices were 5 for extreme importance down to 1 for no importance for college or university, high school, middle school, and elementary school.)

Responses were:

The younger the better! College is almost too late.

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As need arises [with middle school and elementary school bracketed]

Item 6

We should teach computer ethics in a classroom setting. (Choices were Strongly Agree, Agree, Neutral or No opinion, Disagree, and Strongly Disagree.)

Comments were:

As opposed to what? Not teaching? Teaching it differently?

Integrate with other courses. Not a separate course.

Item 7

Indicate the extent to which you feel that ethically inappropriate computer practices are commonly taking place among the following groups. (Choices were Strongly Agree, Agree, Neutral or No opinion, Disagree, and Strongly Disagree for each of eight suggested groups.)

Comment was:

No idea [for computer clubs or local interest groups and operators of bulletin board systems]

Item 8

Indicate the extent that you feel each topic is an important ethical issue. (Choices were 5 for severe issue down to 1 for not an issue for each of 25 suggested topics.)

General comments were:

Some of these issues are not just computer science issues. But form a large part of our fabric of life.

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The marked topics seem to be not-related to computers. Anyway, that's the way I answered them. [Marked topics were gender-related issues, minority issues, social responsibility, boredom from routine, on-the-job stress, employee loyalty, and "whistle-blowing."]

(b) Databanks on suspected criminals

Comment was:

Key word! ["suspected" is circled. Several other people underlined the word but made no comment.]

(f) Use of computers to commit crimes.

Comment was:

This is not unethical, it's illegal.

(o) Boredom from routine

Comment was:

? What does this mean ?

(r) Employee loyalty

Comment was:

Interesting ... is there something like "employer loyalty"?

Item 9

Rank the following placements in the curriculum for teaching computer ethics at the college level, with 5 being the highest ranking and 1 being the lowest ranking. (Choices were 5 down to 1 for each of five suggested placements.)

(c) Through personal example of faculty and staff

Comment was:

This might not be visible enough.

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(e) By encouraging students to take an ethics course in another department

Comment was:

Should be there for everybody, not just CS students.

Part II. Assume that you have been given the authority to design a computer ethics course to be taught at your institution. Indicate how you would agree or disagree with each statement. (No response was expected here. This statement just set the stage for instrument items 10 through 17.)

Comment was:

What if I don't like to design such a course (See 7, 9)

Item 11

A computer ethics course should be required. (Choices were Strongly Agree, Agree, Neutral or No opinion, Disagree, and Strongly Disagree.)

Comment was:

For CS majors, at least.

Item 12

A student would probably behave more ethically upon completion of such a course. (Choices were Strongly Agree, Agree, Neutral or No opinion, Disagree, and Strongly Disagree.)

Comment was:

A 4 year program that demonstrates, discusses, expects ethical behavior in all aspects would be more effective than a single course.

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Item 13

Rank the following groups according to which you consider the most appropriate for teaching the computer ethics course, with 5 being the highest ranking and 1 the lowest. (Choices were 5 to 1 for each of 5 suggested groups.)

(d) Team of computer science and other faculty

Comment was:

Who? ? ["Other faculty" was circled.]

(e) Ethicists

Comment was:

If any are at a given school!

Item 14

At what level should the course on computer ethics be offered? (Choices were Freshman, Sophomore, Junior, and Senior.)

Comments were:

After taking a couple of computer related courses.

No separate course should be required.

None. "Might" at Freshman. ["Should" is circled.]

Item 15

Rank the following teaching methods to use in teaching a computer ethics course, with 7 being the highest ranking and 1 the lowest. (Choices were 7 to 1 for each of 7 suggested teaching methods: lecture by instructor, class discussion of instructor-provided case studies, individual written assessment of instructor-provided case studies, written reports by students on individual research, oral

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reports by students on individual research, group projects, and group reports.)

Comments were:

I think case studies are valuable. I marked (c) low because of ind written assign; I think students learn much from each other. [(C) was individual written assessment of instructor-provided case studies.]

A combination of b-g would be best. [B-g included all methods except lecture by instructor.]

No idea.

Item 16

Indicate the topics from the following list that you would like to see in the computer ethics course. If you answer Yes, please continue across and indicate what teaching method you believe would be the most appropriate for teaching that topic. (Choices were No and Yes, followed by Lecture, individual Student research, Case studies, and Group project.)

General comments were:

I'm really not an authority on what should be included in a course.

Pls note -- I'm not convinced that I'd even like to see a "course".

This should be enough for a 2-semester course ...

No course should be only one method. Any of these could be individual or group research. Case studies are valuable BUT everything should not be case studies. Lecture should be minimal. All these should be put

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together as the instructor sees fit. One instructor is likely to vary from semester to semester.

I have no idea. All of the above.

(z) Other (Choices were to fill in the blank or not.)

Responses, other than an empty blank, were:

Use of databases on individuals by government agencies & corporations

Eye, brain, and physical damages.

Computer-assisted job monitoring

Transborder Data Flow

Inappropriate use (Academic HW & SW for commercial use)

Item 17

(Item 17 is unnumbered, it follows item 16). From this list what do you consider the single most important ethical issue facing computer professionals today? (Choices were a to z, to identify one of the topics in item 16.)

Comments were:

Most of the topics can be viewed as a question of responsibility.

Why not let the students select?

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PART III

These questions all were open ended, expecting more than a single letter for response.

First Question

In your teaching of computer science, what unethical situations have you encountered?

Responses were:

A student copy his/her friend's programs.

Introduction of destructive viruses. Copying privately owned software.

Commercial software copying for training and personal use.

Copying commercial software.

Hackers, copying software.

Copying commercial software. Breaking into other user's computer account.

None

Cheating

Cheating, copying software

Use of others work as their own

Colleagues wanting/offering copies of proprietary software.

Breaking into accounts. Copying software. Inappropriate messages in mail. Writing worms, viruses, etc.

None as of yet, except copying software.

Copying of projects and homework.

Bootleg software. Security breaches on campus network.

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Copying commercial software.

Copying commercial software, copying programming assignments, raiding accounts of others, misuse of resources.

N/A

Violation of software copyright guidelines by faculty/students.

A student submitted a program that was developed by another.

Copying software.

g, i, t, u [These letters referred back to accessing confidential software, validity of data, viruses and worms, and system security in item 16.]

Students copying other student's programs

S.W. piracy

Nothing really peculiar to CS

Copying software. Cheating on assignments.

Copying software, student attempts to violate system security.

Breaking into accounts to copy homework. Tampering with other students' login files in a friendly manner, but one that would be unacceptable in a larger establishment.

Cheating

Plagiarism

Students copying other students programs, students reading other students files.

A student breaking into someone else's account.

Softare piracy.

Student copying software

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Copying assignments and programs

Copying of commercial software

Plagiarism on program assignments

Copying of assignments. Some copying of software.

Plagiarism

Program assignment copying

Copying of programs/homeworks. University rules of plagiarism apply and no new "computer-related" rule need to be [undecipherable word or words -- perhaps "incorporated"].

Students using other students' code.

Mostly copying of software.

f, g, h, j, l, p, t (refer to above list) [These topics from the list in item 16 are: use of computers to commit crimes, copying commercial software, accessing confidential databanks, reliability of software, adult hackers, on-the-job stress, and viruses and worms.]

None

Mail fraud, license infringement, death threats, and lots more.

Students trying to misuse the software.

Bringing by students software packages and encouraging me to install them on my own PC.

Copying other students' programs. Copying commercial software. We have had very little trouble with destruction of data or worms or viruses.

Improper withholding of documentation and/or relevant information

Students copying software

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Plagiarism (copying without giving credit).

Copying software, programs, hackers, viruses, software reliability, data validity.

Students attempting to copy software

Hackers and software stealing

Students cheating by copying others' code

Lack of respect for copyright material

Students copying software

Copy of programs assigned to students

Copying of commercial software

Copying of software

Copying SW; Plagiarizing homework (cooperative); Plagiarizing HW (parasitic); Theft of computer services (faculty & student); unauthorized type of use (commercial use of college system); vandalism of homework (by hacking); virus distribution; theft of HW.

Students copying programs

Illegal copying of commercial software

Software copying, work duplication

(1) Students copying commercial software (2) Students copying from other students

Copy commercial software

Copying software by students

1--copying S/W by faculty or students 2--Buying S/W that does NOT run reliably.

Copying commercial software. Copying other students' projects.

Common copying of programs -- Occasionally on the mainframe, some students have been harrassed.

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Copying software.

Copying programs.

Second Question

If you offer a course or module on computer ethics, would you please describe this course and/or attach a copy of the course syllabus or outline?

Three course outlines were submitted. They are included in Appendix C. Additional responses were:

Bi-mester lecture course

A colleague who teaches this course at my institution will send syllabus

No, but discuss the topic in different classes.

Intro to CIS -- one chapter deals with ethics.

Part of one semester seminar for CS students

N/A -- So far. I'm working on it.

Currently I'm introducing a variety of topics in the first 2 courses.

Copying software (copyrights). Privacy of databses. Networks -- passwords & other security measures.

N A

Define the problem. Show by analogy the hurt it inflicts on others. Try to implant the knowledge that it is wrong in the students consciousness.

The course would be highly student interactive with little or no lecture.

Biterm: discussion, oral/written reports

Database management

None. I did just finish a graduate level security course.

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Module outine: To discuss many sensitive issues facing professionals in the fields of computer science and data processing. Emphasis on violation including falsifying data, using a company computer for personal projects, taking advantage of a known vulnerability in a system to gain unauthorized access, obtaining data or records without permission, etc.

N/A

We have a course on computer security

Course syllabus is attached.

Cover the above material, might use [undecipherable word -- perhaps "video"], plus let the students search on campus for problems [that] exist among themselves.

N.A.

None

No

N/A

N/A

I do not teach this course. [The name of a person to contact at that school was provided.]

N/A

Computer literacy course. Use the chapter in the text chosen for the course.

N.A.

No, I do not offer such a course.

Different ethical issues by case study.

3 lectures within an elementary -- intro to computers -- WP dBASE Lotus, etc.

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Computer Science seminar (1 cr). Software engineering (3 cr). [Course numbers were also given.]

A course in computer ethics should address most issues listed under item 16.

Third Question

Would you like to make any other comments concerning computer ethics? Attach another sheet, if needed.

Responses were:

No

N/A

No

Individuals should have to be notified whenever personal/financial other information is transfered from one organization to another.

I have a difficult time with Question 16. Teaching methods should be at the discretion of the instructor. For example, I advocate group work and cases as the most effective means of teaching/learning. Others disagree.

I am not sure that moral and ethical behavior can (or should) be "Compartmentalized" into "computer ethics", "business ethics", "professional ethics", "personal ethics", etc. Appropriate, acceptable behavior does not change from one context to another.

I would prefer NOT to see a course in this area, there is too much material that I feel is more important--Ethics is ethics and just because one uses a computer shouldn't require special education!

This questionnaire misses the point. Computer ethics are no different than "general" ethics. Children should

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learn ethics and moral values from the day they are born. Later when they start using comptuers they should apply the ethics/morals that they have been taught all their life (e.g. respect for other people's privacy, do not steal, do not vandalize, do not lie, etc). For almost every unethical computer practice there is a corresponding universlly agreed on unethical example from some other aspect of life.

I think I have problems with the term "computer ethics." I guess I understood your definition of it as implying rules and standards as not declared/intended by law. If you include the aspects of conduct already governed by law, then the question of "computer ethics" changes to the question of respecting the law. The term ethics (for me) deals mostly with situations which cannot be governed by law. If a man attempts to pressure a woman to have an abortion by trying to make her feel guilty, unworthy ... then that's unethical on his part, but not illegal. If the president of the U.S. officially lives in a motel in Texas to avoid the state income tax for Maine, then that's unethical but not illegal. It would be nice if we could instill a sense of responsibility for his/her behavior in everyone. I think that it is worthwhile to try. I would not particularly single out computer ethics, except for the fact that computers are widely accessible and powerful. So there is some reason to try to sensitize people to the potential difficult situations they might have to face. But the same can be said for other

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professions, such as journalism, media professionals, politicians, lawyers, ...

Need to be looked over very carefully. Western countries found out about pollution after few decades, but still we haven't been careful about computer related matters. Good luck.

I personally feel that such a course is not necessary. General teaching of social ethics should [undecipherable word -- perhaps "percolate"] to computers as to any other field. By discussing case studies, it may only make it easier for unethical people to cheat and or abuse the system. Something is ethically wrong for its own sake and transcends the bounds of any particular field of study or use.

The answers are too far from the questions. I almost surely got some in the wrong place. I would suggest using . . . to make sure people are on the right line.

It is important. It should be emphasized in a variety of courses with practical examples and group discussions.

We talk about ethics in the Introduction to Computer Programming and the Software Engineering course. I have no interest in including an ethics course in our curriculum. Also, when students and faculty are assigned computer accounts, they are given a handout on appropriate computer usage. I also teach a module on computer security in my System Administration course.

No

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I believe it can be taught but believe that ethics is something you are born with and nurture by your associations with ethical people.

This is hard to teach to students who only want answers like 42 or "Douglas Adams" and whose prime reaction is "will this be on the test?" !

I feel the future will be shaped by responsible -- or irresponsible -- use of electronic data. All adults need to be aware of the dangers.

Additional Comment

One person surveyed declined to fill out the questionnaire, but submitted the following response:

I haven't thought about many of the questions on your survey, but I can give you an overview that might be of some interest to you.

When we first discussed CSAB accreditation the feeling was strongly that while "ethics" was OK we would not displace a "real course" from our curriculum for such a course. We decided to claim we did ethics "across the curriculum". When CSAB wouldn't buy it, (our finals didn't show the "across the curriculum"), we added a course and required it. The course was to be about legal and ethical questions. The first time it was given the emphasis appeared to me to be on the computer science professionals responsibility to design software in the user's interest, even if the user was not able to discuss that interest. My impression is that the course is drifting toward software

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engineering, and the emphasis is not really on "ethics" as you define it.

It would be overly simplistic to say that our ethics course is one we didn't want and we are modifying it to not really be an ethics course, It would be fair to say that it is difficult for many computer professionals to rank ethics high on the list of student needs.

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APPENDIX C

COURSE OUTLINES

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The following course outlines were submitted with responses to the survey. In the interest of protecting anonymity, references to schools and individual instructors have been removed. The outlines have been transcribed in order to improve legibility, maintain proper margins, and provide anonymity.

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SPRING 1992 CS3

CSC 306 ETHICS AND THE COMPUTER PROFESSIONAL

Course Description: Prerequisite: CSC 209. Programmer's responsibility and the law, social implications of computing, testing, data encryption, and an introduction to proving correctness of algorithms.

Textbooki: Computer Ethics by Forester and Morrison

Instructors: [3 names are given here]

Goals:
1. To teach social implications of computing.
2. To help the student understand his responsibilities and liabilities as a computer professional.
3. To teach the laws regarding copyright of software.
4. To introduce the student to some scientific methods of arriving at test cases.
5. To give the student some experience in presenting oral presentations.
6. To help the students improve their writing skills.

Syllabus:
1. Ethics and technical issues in the social control of human behavior (4 hours)
2. Torts and liability (12 hours)
   a. negligence and liability
   b. an intro. to software design review
   c. strict liability
   d. an intro. to proving correctness of algorithms
3. Information and privacy (12 hours)
   a. ownership of information
   b. access and control of access to information
   c. data encryption and trap doors
   d. individual rights and privacy
4. Technology and social change (3 hours)
   a. automation
   b. "smart" humans and "smart" machines
   c. an intro. to white box testing

Assignments/test/grading:
1. (20%) Two oral presentations
   One will be a design review presented to a small group and the other will be a summary of an article you have read. The last one will be a 5 min. presentation to the class. The first will be done by appointment outside of class.
2. (30%) Written assignment
3. (30%) Two tests during the semester
4. (20%) Final exam

90-100: A 80-89: B 70-79: C 60-69: D Below 60: F

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Notes:

1. Failure is mandatory for students with unexcused absences for more than 10% of the regularly scheduled class meetings. The instructor may excuse an absence only when the student presents an adequate and/or documented reason within a reasonable amount of time. Such reasons usually include circumstances beyond the student's control, such as personal illness, critical illness or death in the immediate facily, or participation in university-sponsored activities. In extraordinary circumstances, this policy may be waived for individuals at the discretion of the instructor.

2. Anyone caught cheating in the course will be assigned a course grade of 'F'.

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CSC 301 - Ethics and Law Seminar

Text: none

Prerequisite: CSC 232 or permission of the instructor.

A survey of the ethical and legal issues in the field of computing. Class sessions will consist primarily of discussion and/or the reading of position papers or reports by students.

Grading

Each week, students will be responsible for preparing a report or a position paper. These projects are to be prepared using a word-processing program and printed out on a computer printer. Usually these will be presented orally in class and discussed. Letter grades will be assigned to each project based on grammar, spelling, clarity, and evidence of careful thinking. For reports that are presented orally, the quality of the presentation will also be used in determining the grade.

Reports and papers are due at the beginning of class. Projects brought in after the start of class but before the end of class will receive a one-letter-grade penalty. No projects will be accepted after class has been dismisssed. A student absent from class is still responsible for making sure that the report or position paper is delivered to the professor before the start of class (or at the very least before the end of class).

A final exam will be held 1:00-3:00 p.m. on May 4 and will be comprehensive. It will count the same as one of the reports or position papers.

The semester grade will be the average of all the report/paper and final exam grades (using the A = 4 pts. scale).

Attendance Policy

A student absent more than five times will receive a grade of "N" (no credit). A student is absent if they are not present when attendance is taken.

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Computer Science 250 -- Social Implications of Computing
2:15 MWF Course Policy Spring, 1992

Prerequisite: CS241 Hours Credit: 1.5
Text: *Computer Ethics* by Tom Forester and Perry Morrison
Also Required: Outside reading

Catalog Description:
A survey course on the role of computing in society, designed primarily for computer science majors and minors. Discusses current topics related to the use of computing and associated trends.

Course Objectives:
To provide to computer science students an understanding of the relationship between computers and all facets of society. To make the students aware of legal and ethical implications of computer applications. To explore the role of a wide spectrum of computer hardware and software.

Topics:
We will cover the following topics during the course. Each student will be required to turn in and present a report on one topic listed below. The written report should be at least four pages in length, with the oral report approximately 10 minutes. Most days, we will hear two reports and I will present some additional material on that topic. Classroom discussion on the topic will follow. The projected dates for presentation are given below. The written report is due at the same time that the oral report is presented and must be prepared using a word processing program or some other productivity software package. Each report should contain some objective material, as well as a view to both positive and negative implications of the issue. These implications could be quoted from another source or your own interpretation of facts (or a combination), but you should identify which it is.

(1)	Computing trends		
	a)	Networks	Thu., Jan. 16
	b)	Microcomputing from the user's perspective	Tue., Jan. 21
	c)	Telecommunications	Tue., Jan. 21
	d)	Human-computer interaction	Thu., Jan. 23
	e)	Parallel processing	Thu., Jan. 23
	f)	Computing careers	Fri., Jan. 24
	g)	Minority and gender issues	Fri., Jan. 24
(2)	Professional issues		
	a)	Software piracy	Thu., Jan. 30
	b)	Professionalism	Thu., Jan. 30
	c)	Ethical conduct	Tue., Feb. 4
	d)	Security	Tue., Feb. 4
	e)	"Hacking"	Thu., Feb. 6
	f)	Computer-aided crime	Thu., Feb. 6
	g)	Privacy	Fri., Feb. 7
	h)	Social responsibilty	Fri., Feb. 7

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(3) Impact of computing on selected segments of society

a)	Office	Thu., Feb. 13
b)	Education	Thu., Feb. 13
c)	Manufacturing	Tue., Feb. 18
d)	Law	Tue., Feb. 18
e)	Government	Thu., Feb. 20
f)	Medicine	Thu., Feb. 20
g)	Professional computer scientist	Fri., Feb. 21
h)	Law enforcement	Fri., Feb. 21
i)	Agriculture	Tue., Feb. 25
j	Military	Tue., Feb. 25

There will be a 30 minute quiz at the end of each category, currently scheduled for Tuesday, Jan. 28, Tuesday, Feb. 11, and Thursday, Feb. 27. We will also discuss other topics during the remainder of these class periods. Classroom activities may vary from day to day, and other assignments may be given during the semester.

Plagiarism or cheating will not be tolerated. Anyone who is actively involved in plagiarism or cheating (giving and/or receiving help) will automatically be subject to failing the course. Anyone who is passively involved in cheating (observing those who are actively involved without reporting them) is subject to failing that test or assignment.

Semester grades will be based on the following formula:

20% Oral reports -- 2
20% Written reports -- 2
25% Quizzes -- 3
20% Classroom participation -- every day
15% Final Exam -- During class,
Thursday, March 5, 1992

You must have a passing average in each area to pass the course. Please note the importance of your reports and classroom participation. Your professor reserves the right to make additional assignments, which would be part of your oral and written report grade.

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