The College was established by referendum in 1965 and opened September 1967. Harper College is now one of the nation's premier community colleges and one of the largest, serving more than 40,000 students annually in Chicago's northwest suburbs. The College's academic programs prepare students for rewarding careers and for transfer to four-year universities.

Advancing Undergraduate Research at Community Colleges

Judith Marwick
Provost
Willian Rainey Harper College

The national college completion agenda has placed a spotlight on community colleges that they had not previously enjoyed. The United States is developing a greater awareness of the important role that community colleges play in our nation's future. The national completion agenda grew from the realization that in the 21st century gainful employment will require a postsecondary credential. It is clear that community colleges are essential to achieving the national goal of five million more college graduates by 2020.

This greater awareness of the value of community college education is a great opportunity for this sector of American education, but it is also a tremendous challenge. How will we do our part to ensure that America has a highly educated workforce able to compete in a global economy? Many initiatives are under way, data are being collected, and effective practices are being shared at conferences and in publications. At William Rainey Harper College in Palatine, Illinois, we know that we must graduate an additional 10,604 graduates in the next ten years to do our part. We are reviewing all of our practices and processes, and we are piloting many new initiatives to see what will help students succeed. One initiative that has proven very successful is undergraduate research.

I first encountered the idea of undergraduate research at community colleges seven years ago when I attended a workshop sponsored by the Council on Undergraduate Research (CUR). Since community colleges are teaching rather than research institutions, I had never given research much thought, but I left the workshop intrigued. Chemistry faculty at Harper College were also intrigued and subsequently joined with other Chicago-area community colleges to carry out a National Science Foundation grant to support undergraduate research.

The results have been significant. Seventy-four Harper students have participated in undergraduate research in chemistry. The average number of credit hours in which these students enroll is 60 and their average GPA is 3.47. The Harper graduation rate is also nine percentage points higher for students involved with undergraduate research than it is for non-participants.

The NSF grant ended several years ago, but Harper has continued its undergraduate research program in chemistry at a cost of about $25,000 per year. As a community college provost managing a tight budget, I find that this cost is more than justified by the benefits to the students and that it is offset by participants' likelihood of enrolling in additional courses at the college. In fact, I am interested in expanding undergraduate research into other disciplines.

CUR has developed the *Characteristics of Excellence in Undergraduate Research* (*COEUR*) document to aid institutions wishing to develop excellent undergraduate research programs. This document can provide guidance to community college administrators as they consider initiating an undergraduate research program at their institutions.

First, it is important that undergraduate research be seen as part of the institutional mission. Students are more likely to persist and achieve their academic goals if they are engaged personally with someone at the college, whether through a student activity, club, or with a professor. Such a program thus directly fits with the mission of student success and completion. It also serves to link research, information literacy, and both written and oral communication skills into a holistic picture. These are general education skills needed for any career. Further, undergraduate research can provide a career focus for undecided students and help them see a clear career path for their academic goals. All of these benefits clearly fit with the community college mission.

Administrative support is essential to almost any successful initiative, and undergraduate research is no different. While faculty commitment is paramount, without administrative support for funding, time, space, and travel for both students and faculty members, an undergraduate research program cannot reach its full potential. Grant funding may be sought to provide dollars for start-up costs such as needed instrumentation or studio supplies.

Adequate library resources are needed for literature reviews as freshmen and sophomores undertake all of the components of authentic research. Faculty members need support to travel to conferences to collaborate with colleagues and engage in scholarly discourse. Students should also have opportunities to present their research outcomes at poster sessions and conferences. Visiting with Harper students at one such poster session was an experience that solidified my support and commitment to undergraduate research. As I viewed the posters and inquired about the research, all the students I spoke with eagerly and clearly described their hypotheses, their methods, and the results of their research. I was impressed by the quality of their work and their ability to explain what they had accomplished. I walked away knowng that undergraduate research was important for Harper College's commitment to help more students achieve their academic goals.

Recognition and compensation for those faculty who spend time and energy to mentor students is necessary, to encourage others and to validate the important outcomes of this work. We have found that faculty members engaged in undergraduate research often improve the curriculum in their traditional college courses with strategies learned while mentoring research students. The experience keeps faculty fresh in their disciplines and improves their professional development.

Undergraduate research opportunities can also provide a wonderful marketing opportunity for community colleges as they highlight the advantages for students able to work one-on-one with an expert in a field of study. Students apply to Harper's research program and are chosen by professors, based not on their academic accomplishments but rather based on their interest and willingness to commit 10 hours per week to research for one year. This program is an example of community colleges truly providing the best in freshman and sophomore education.

Community colleges are teaching institutions. Undergraduate research is teaching, and teaching is research. Although it may at first seem non-traditional, an undergraduate research program can be an important component of the community college mission. It can provide focus to students' academic goals and lead to program completion, career opportunities, and advanced degrees. The *COEUR* publication provides a roadmap that can be used by community colleges to create a quality research program that will benefit the institution, the faculty, and most importantly, students.

Characteristics of Excellence in Undergraduate Research at Different Institutions

Janet Stocks
Associate Academic Dean
Baldwin-Wallace College

Undergraduate research programs come in a lot of different shapes and sizes. My involvement with the world of undergraduate research began in 1998 when I became director of the Undergraduate Research Office at Carnegie Mellon University. I had the luxury of being a full-time director with a full-time support staff person, a significant annual operating budget, and a good deal of support both from the administration and the faculty. One of my early challenges in this position, however, was convincing the university's development office of the impact of undergraduate research experiences on students when I couldn't answer basic questions such as what percentage of Carnegie Mellon graduates had participated in UR. (If you talk with most directors of undergraduate research, they'll tell you all the reasons why this is not an easy question to answer). I eventually won over the development staff by giving them compelling stories of individual students who were doing amazing things and who were obviously impacted by the experience. As a result, I was able to substantially increase our endowed funds.

For the past five years I've been at a very different institution—Baldwin-Wallace College, a primarily undergraduate institution with far fewer resources. I currently direct its undergraduate research program, but it is one of several duties I have as the associate academic dean. I have a part-time support staff person (who supports all the projects in which I am involved), a student worker, and a fairly small annual operating budget. Yet we have a vibrant undergraduate research program, with activity in most disciplines on campus and very strong support from both the administration and the faculty.

Making the transition from a resource-rich to a relatively resource-limited institution, from Carnegie Research I university to a primarily undergraduate institution was a bit of a challenge. Fortunately for me, I had been very involved in both CUR and NCUR before I made the transition, so I had a large network of colleagues to help me think about how to manage in my new environment. It also really helped that I didn't have to convince my new boss, the college's dean, of the value of undergraduate research. She was already on board enough to have invested in an institutional membership in CUR.

The *Characteristics of Excellence in Undergraduate Research* (*COEUR*) document is an excellent tool for those who find themselves with responsibilities for undergraduate research, but who do not yet have experience in the arena or networks to turn to. It is also a great tool for those of us moving to new environments because it reminds us of the basics and of the range of activities and opportunities that make up a robust UR program.

In our current economic times, this document can be useful in helping us see all the ways in which we can build programs even when there aren't a lot of new resources available. While a "fully developed" UR program requires a substantial operating budget, there is much that can be done to build capacity that doesn't cost much at all. For example, a campus can:

- Develop a mission statement for UR and make sure it is aligned with the institutional mission statement
- Conduct an inventory of the range of UR activities taking place on campus and communicate these activities to the campus community
- Profile the work of students and faculty using existing publications such as the alumni magazine
- Offer workshops to students on a range of topics, such as ethics in research, presenting research, and finding and applying for UR opportunities external to the campus
- Develop course numbers so that UR can be noted on students' transcripts
- Host an annual symposium to celebrate the excellent undergraduate research taking place on your campus

One needn't stop there. Getting a campus's faculty and administrators involved with CUR is helpful if they are not already engaged. CUR opens the way to involvement with higher education professionals who are passionate about undergraduate education and who are generous with their wisdom—a network of people who can help individuals and campuses through any undergraduate research transitions in which they are involved.

Characteristics of Excellence in Undergraduate Research

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Cooperative Learning and Assessment of Ethics Sessions in a Summer Undergraduate Research Program

In 2010, the U.S. National Science Foundation (NSF) began requiring instruction in research integrity for all students, including undergraduates, who are supported on NSF research grants. Since then, administrators of undergraduate research programs have taken increased interest in providing instruction in research ethics and, specifically, in the responsible conduct of research (RCR).

In social-science programs, advanced undergraduates typically learn about responsible conduct of research in a course on research methods (Punch 2013; Ware and Brewer 2013). In engineering programs, undergraduates learn about professional ethics instead of the responsible conduct of research (Alfredo and Hart 2011). In the natural sciences, little is known about the instruction that undergraduates typically receive in appropriate research practices (Heitman and Bulger 2005), although some instructors have taken the initiative in integrating coverage of responsible research conduct into undergraduate courses and curricula (Fisher and Levinger 2008).

Undergraduate programs in computer science have generally included significant attention to ethical issues in the discipline. Since 1987, the guidelines of the Computer Sciences Accreditation Board have required undergraduate programs in computer science to provide a substantial amount of instruction on social, ethical, and legal issues in computing (Huff and Martin 1995). Curriculum recommendations developed by the Association for Computing Machinery and the Computer Society of the Institute of Electrical and Electronics Engineers have also emphasized instruction in social, ethical, and professional issues (Tucker 1991). These accreditation guidelines and curricular recommendations have significantly influenced the content of all computer science programs. By 1995, about 300 courses on computer ethics were offered in the United States (Crawford 1995). In a random survey of 700 computer science programs in 2005, out of 251 respondents, 172 programs included instruction in computer ethics in required courses (Spradling et al. 2008).

Standard textbooks on ethics in computing (for example, Johnson 2009; Quinn 2005; Tavani 2004) address issues in professional ethics and social ethics, including intellectual property, privacy of individual data on the Internet, malicious software, software risks, and hacking. They neglect ethical issues in computing research, however (Wright 2006).

In this article, we describe the design and assessment of sessions on research ethics and computer ethics in a summer research program for undergraduates. We collected assessment data at the beginning and end of the summer program.

Ethics Sessions

In the summers of 2009, 2010, 2011, and 2012, the Information Trust Institute at the University of Illinois at Urbana-Champaign hosted a summer undergraduate research program focused on reliable and secure computing. This eight- to ten-week program was supported by a grant from the NSF Research Experiences for Undergraduates (REU) Sites program. Most students were majoring in computer science, computer engineering, or another technical discipline. The number of summer students varied from 21 to 26. Each summer, ten domestic students were supported by this NSF grant, a few domestic students were supported through a different REU site grant, and the remaining students, who were international, were supported by other funds.

Each summer's format included six weekly sessions on ethics in the responsible conduct of research (RCR) and in the development and use of information technology. The sessions addressed topics such as authorship standards, plagiarism, mentoring relationships, conflict of interest, privacy of personal data, professional responsibility for software quality, accuracy of computational models, and the social impacts of computers. We chose these topics for their relevance to the students' research projects. We omitted standard RCR topics that were not relevant to these students, such as the responsibilities of peer reviewers and the protection of human and animal subjects. Even the traditional RCR topics of fabrication, falsification, and data management were not relevant for many projects that involved the development of software or the mathematical analysis of algorithms.

To address the ethical topics we focused on, we selected fictional but realistic short cases (scenarios) from a variety of sources (Table 1).

Table 1: Ethics Cases Used in 2009 Summer Program

Week	Topics	Cases and sources
1	Authorship, plagiarism	"Case 1" (Penslar 1995, 31-32); "The Charlie West Case" (Bebeau 1995, 30-31)
2	Mentoring, conflict of interest	"A Question of Mentoring Bias" (Online Ethics Center for Engineering and Science 2006a); "The Endless Dissertation" (Online Ethics Center for Engineering and Science 2006b); "A Conflict of Commitment" (Committee on Science, Engineering and Public Policy 2009, 45)
3	Professional responsibility, software quality, confidentiality of intellectual property	"Software Risks" (Anderson et al. 1993, 102-104); two short cases (see text)
4	Privacy	"Privacy" (Anderson et al. 1993, 100); "Using an Internet Search Engine to Locate a Friend" (Tavani 2004, 137-138); "Toysmart.com" (Tavani 2004, 145); Loyalty Cards [Discussion Questions 40, 41] (Quinn 2005, 238)
5	Social impacts of computers	"Data Mining at the XYZ Bank" (Tavani 2004, 132); "Hacker Ethic" (Tavani 2004, 158); Anonymity in a Political Election [Discussion Question 3] (Tavani 2004, 172); Violent Computer Games [Exercise 10.23] (Baase 2003, 433); Internet Filtering [Exercise 10.29] (Baase 2003, 434)
6	Ethics in computational modeling	"A Sonar Story" (Kijowski 2011, 90-92); "Looking for the Bright Side" (Kijowski 2011, 93-94); "Low Impact" (Kijowski 2011, 96-98)

For example, the following are two short cases that author Loui wrote and used in the third week of the summer program:

> In the early 1980s, Atomic Energy of Canada Limited (AECL) manufactured and sold a cancer radiation treatment machine called the Therac-25, which relied on computer software to control its operation. Between 1985 and 1987, the Therac-25 caused the deaths of three patients and serious injuries to three others. Who was responsible for the accidents? The operators who administered the massive radiation overdoses, which produced severe burns? The software developers who wrote and tested the control software? The manufacturer, AECL? A non-AECL system engineer who noticed the absence of backup hardware safety mechanisms?
>
> You designed the embedded system software for the engines that Galactic Motors hopes to use in future all-electric automobiles. Six months ago, you left Galactic for a managerial position with Forge Motor Company, a direct competitor. After a restructuring, however, Forge's vice president asks you to lead a design team to develop the control software for Forge's planned electric autos. The vice president hints that Forge is interested in the design concepts that you previously developed at Galactic Motors. How should you respond? For what reasons?

During the first summer program, we noticed that some of the students' research projects raised questions about individual privacy. To make the privacy issues immediately relevant to students, in 2010, 2011, and 2012, we replaced one of the privacy cases by short cases involving the privacy of human subjects in Internet-based research on social networking:

> A Facebook user has consented to participating as a subject in your research study of social networking. She reveals information not only about herself and her friends, but also her friends' friends. Under what circumstances can you publish research results about their social interactions?
>
> You are collecting a large amount of data from a social networking site. As you collect the data, you scrupulously replace actual names with numerical codes. Nevertheless, from the anonymous data, it is possible to infer the identities of individuals associated with their data. Under what circumstances can you publish your study?

In 2011 and 2012, we replaced the session on ethics in computational modeling by a showing and discussion of the 36-minute movie *Henry's Daughters*. This movie highlights ethical issues in a dramatized case in which engineers design an intelligent transportation system with autonomous vehicles (Loui et al. 2010). In ethics presentations for other REU site programs in the summers of 2013 and 2014, after the Information Trust Institute's REU grant had ended, we replaced some of the cases with short videos developed at the University of Nebraska—Lincoln (National Center for Professional and Research Ethics 2014). Each of these videos is less than four minutes long. We substituted the video cases for text cases because we expected that students would find video cases more interesting and memorable. Our expectations were confirmed in the program-evaluation surveys at the end of each summer (not reported here).

The ethics sessions used active learning methods, specifically, collaborative and cooperative learning (Barkley, Major, and Cross 2005; Millis and Cottell 1997). We chose active learning through small-group discussion because, as McKeachie and Svinicki have said, “Discussion methods are superior to lectures in student retention of information after the end of a course; in transfer of knowledge to new situations; in development of problem solving, thinking, or attitude change; and in motivation for further learning” (McKeachie and Svinicki 2006, 58).

After a lunch provided by the program, in each 60-minute ethics session the students were randomly divided into small groups of four to six students. Each group simultaneously read and discussed the same case for about ten minutes. Then author Loui led a discussion of this case with the entire cohort. He asked different groups to respond to questions about the case for about ten minutes. The questions usually asked students to identify the ethical issues and to suggest what the characters in the case should do next, for what reasons. Then the session moved on to another case, again with simultaneous discussions in small groups followed by a discussion with the entire cohort. One session was organized differently: Each small group took responsibility for reading and answering questions about one of five cases dealing with the social impacts of computers. For the first ten minutes, all five groups read and discussed their case simultaneously. Then Loui interacted with each group in turn to discuss that case, while other groups listened.

At the beginning of the first ethics session of the summer program, we presented a general approach to ethical problems (Figure 1) that was inspired by the seven-step guide for ethical decision making developed by Davis (1997). Our general approach uses everyday language because, with limited time in a summer REU program, students need guidance in thinking about ethics issues without having to learn philosophical jargon (Schachter 2003).

Each student received a copy of the booklet *On Being a Scientist* (Committee on Science, Engineering and Public Policy 2009), which provides a basic overview of responsible conduct of research, the Association for Computing Machinery code of ethics (ACM 2014), and a book chapter on ethics for computing professionals (Johnson and Miller 2004). Students were not tested on these readings, however, and they were not assigned any other ethics homework.

Figure 1. A General Approach to Ethical Problems

1. Identify the affected parties, their interests (rights, expectations, desires), and their responsibilities. Determine what additional information is needed.
2. Consider alternative actions by the main actors, and imagine possible consequences.
3. Evaluate actions and consequences according to basic ethical values—honesty, fairness, trust, civility, respect, kindness, etc. —or the following tests:
   - **Harm test:** Do the benefits outweigh the harms, short term and long term?
   - **Reversibility test:** Would this choice still look good if I traded places?
   - **Common practice test:** What if everyone behaved in this way?
   - **Legality test:** Would this choice violate a law or a policy of my employer?
   - **Colleague test:** What would professional colleagues say?
   - **Wise relative test:** What would my wise old aunt or uncle do?
   - **Mirror test:** Would I feel proud of myself when I look into the mirror?
   - **Publicity test:** How would this choice look on the front page of a newspaper?

As learning outcomes, through the ethics sessions, we expected students to learn to identify the ethical problems or dilemmas, recognize the people affected and understand their perspectives, identify a comprehensive list of actions, and provide a justified action to resolve the ethical problem or dilemma.

Assessment

To assess the effectiveness of the ethics sessions in 2009 and 2010, we adopted the two-case method of Kraus (2008). We administered initial and final assessments, in which students analyzed two short cases. Case A highlighted ethical issues in information technology, and case B raised ethical issues in conducting research. The texts of these cases appear in the appendix.

One group of half the students received case A for the initial assessment at the beginning of the summer and case B for the final assessment at the end of the summer. The other group of students received case B initially and case A at the end. The domestic students and international students were equally divided between the two groups.

For each assessment, students were expected to take 30 to 60 minutes, working individually, without consulting any references. There was no limit on the lengths of students’ responses. Students typed their responses into text documents and sent the documents to one of the summer-program coordinators, who removed identifying information before printing the responses.

The learning outcomes were assessed by the rubric shown in Table 2, which follows our general approach to ethical problems shown above; Sindelar et al. (2003) developed a similar rubric for scoring student responses to ethics cases. To state the problem and check the facts, students had to identify the ethical issues in the case. To identify relevant factors, students had to identify who were the persons affected by the case. To develop a list of options and test the options, students had to identify the actions that the characters in the case could take. To make a choice, students had to justify their chosen action with appropriate reasons.

The students' responses from 2009 were scored by one author (Loui) using a rubric similar to the one in Table 2.

Table 2. Scoring Rubric for Assessment Case Responses

	Fair (1 pt)	Good (2 pts)	Excellent (3 pts)
Ethical Issues	Identified at least 1 ethical issue relevant to the case	Identified at least 2 ethical issues relevant to the case	Identified at least 3 ethical issues relevant to the case
Who is affected by this case?	Considered 1 or more affected parties mentioned in case without their perspectives	Considered 1, 2 or 3 affected parties mentioned in case and their perspectives	Considered at least 4 affected parties (or at least 3 affected parties, including at least 1 party not mentioned in the case) and their perspectives
Actions	Identified 1 or 2 practical actions to be executed	Identified 3 practical actions to be executed	Made a comprehensive list of at least 4 practical actions to be executed
What actions should they choose and why?	Provided a solution without argumentation	Provided a reasonable, realistic solution with argumentation	Provided a thorough, reasonable, realistic solution with argumentation and discussion of drawbacks, which led to a consensus

There was one minor difference in the rubrics used in 2009 and 2010. The 2009 rubric scores ranged from zero to two, whereas the 2010 rubric scores ranged from one to three. This difference was accounted for in the analysis of the 2009 data below by transforming the scores to correspond to the scores in the 2010 rubric.

Both authors scored the 2010 students' responses using the following procedure. We independently scored students' responses using a common rubric. There were four questions in the assessment pertaining to the case. The student's answer to each question was scored from one to three points. We compared our scores and discussed differences. After discussion and reconciliation, the combined scores differed by at most one point. We aggregated our independent scores to obtain a cumulative score for each student. As a result, a student could have obtained a maximum score of 24 points. Only after scoring did we learn which responses were initial assessments and which were final assessments.

In the summer of 2009, we had initial and final responses for seventeen students. In the summer of 2010, we had initial and final responses for eight students.

Because the numbers of students were small in both 2009 and 2010, we used the Mann-Whitney U test for independent samples to analyze the differences between the initial and final responses. The Mann-Whitney U test was appropriate because the data did not pass the Shapiro-Wilk normality test or a test of homoscedasticity. We aggregated the 2009 and 2010 data by case. Using the aggregated data, we compared the initial scores for case A with the final scores with case A; we used the same approach for case B. As noted above, the maximum score for any particular student, scored on the rubric shown in Table 2, was 24.

As shown in Table 3, the Mann-Whitney U test for independent samples signed-ranks showed that 2009 and 2010 case A initial scores (median: 16.5) did not differ significantly from the case A final scores (median: 18), $Z = 0.05$, $p = 0.98$. That is, in the two summers, we found no significant differences between the initial and final scores for case A. As shown in Table 3, the Mann-Whitney U test for independent samples signed-ranks showed that 2009 and 2010 case B initial scores (median: 16) did not differ significantly from the case B final scores (median: 16), $Z = 0.35$, $p = 0.74$. That is, in the two summers, we found no significant differences between the initial and final scores for case B.

Table 3. Results of Cases A & B

	Ranks			Test Statistics[a]	
	n	Mean Rank	Sum of Ranks		pre-post
Scores on Case A					
Initial Ranks	14	12.9	181	Mann-Whitney U	78
Final Ranks	11	13.1	144	Wilcoxon W	144
Total	25			*Z*	0.05
				p (2-tailed)	0.98
Scores on Case B					
Initial Ranks	11	12.4	136.5	Mann-Whitney U	70.5
Final Ranks	14	13.5	188.5	Wilcoxon W	188.5
Total	25			*Z*	-0.35
				p (2-tailed)	0.74

*a. Grouping variable: Initial Scores

We suspect that there was essentially no difference in the initial and final scores because the content of the ethics sessions was not formally reinforced outside of the sessions through additional academic work. In addition, the ethics sessions might not have added significantly to the knowledge and skills of the students who had previously taken computer ethics courses that were required in their undergraduate computer science programs. On the post-test, the students may not have been motivated to complete the assessment to the best of their abilities. At the end of the summer, because the students may have focused on finishing their projects, they may have put only minimum effort into the post-test. For example, several students who earned low scores (less than half the possible points) on the post-test submitted one-line answers. Finally, our intended learning outcomes may have been too ambitious, and thus the assessment task was too difficult. As a consequence, students might have been unable to demonstrate what they had learned.

If the undergraduate research program had continued for additional summers, we could have either increased the attention to ethics, through homework and other academic activities, or reduced our expectations for learning outcomes. In addition, to complement the quantitative analysis, we could have conducted a detailed qualitative analysis of the students' responses to the assessment cases. With a qualitative analysis, we could have classified the different ways in which students thought about ethical issues, identified their conceptual difficulties, found strengths and deficiencies in their case responses, and described how their ethical reasoning developed over the course of the summer.

Conclusions

We have described how we integrated a series of sessions on ethics into a summer undergraduate research program at the Information Trust Institute (ITI). Other undergraduate research programs can implement a similar series of sessions that highlight ethics issues relevant to the programs' themes, using a cooperative learning pedagogy. As in the ITI sessions, students can learn about these issues by discussing short cases in small groups. Relevant cases can be found online at the Online Ethics Center for Engineering and Science (http://onlineethics.org) and at the National Center for Professional and Research Ethics (http://nationalethicscenter.org).

We believe that our assessment method can also be applied broadly. This method uses two short cases as pre- and post-tests. Students' responses to the cases are scored according to a simple common rubric. Using this assessment method, undergraduate research programs can assess the effectiveness of their series of ethics sessions in achieving the intended learning outcomes. As our experience suggests, however, even when the ethics sessions are taught with appropriate pedagogies, and when the assessments are aligned with the learning objectives, students might not demonstrate improved skills in analyzing ethics cases.

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Appendix:

Case A

Analyze the case below *individually*. Do not consult other students. Do not consult any references.

At Colossus Corporation, vice president Kelly Kim has become concerned about the productivity of Colossus's office workers. According to personnel evaluation reports that Kelly has read, too many workers spend too much time using the Internet during office hours for personal tasks such as shopping on amazon.com and playing online games such as *World of Warcraft*. Kelly also worries that the office workers might divulge Colossus's proprietary information when they interact with customers.

Kelly asks Chris Patel, a software engineer in Colossus's information technology department, to monitor the Web accesses and the information transmitted by the office workers. To analyze this voluminous amount of data, Chris recommends that Colossus purchase a data mining program from Chris's domestic partner Robin Finelli. An independent software contractor, Robin had developed this program while previously employed by Banana Computers, without the awareness of anyone at Banana Computers.

Please answer all of the following questions. There is no limit on the length of your response; use as much space as you wish.

- What ethical issues does this case raise?
- Who is affected by this case? What are their perspectives on the case?
- What actions might the characters consider to resolve the ethical issues?
- Among these actions, which should the characters choose? For what reasons?

Case B

Analyze the case below individually. Do not consult other students. Do not consult any references.

The executive editor of the *Journal of Wondrous Technology Research* asks Professor Randy Gonzales to review a manuscript from the laboratory of Professor Morgan Nelson. Examining the manuscript, Randy discovers that although the theoretical ideas are novel and promising, the manuscript has numerous flaws: the literature review is incomplete, the description of the experimental method is internally inconsistent, the illustrations lack labels, and the statistical analysis is incorrect. Randy plans to refer the manuscript to a third-year doctoral student, Dana Wong, to enable Dana to learn from the manuscript's mistakes, and to give Dana experience in reviewing a manuscript, an important professional duty. In addition, Randy thinks that two theoretical ideas in the Nelson manuscript might help Dana overcome some obstacles that have blocked Dana's research progress for the last three months. One idea indicates that Dana's current approach is likely to be fruitless, and a second idea suggests a different path for Dana to take. Randy had previously speculated that the theoretical ideas might be true.

Please answer all of the following questions. There is no limit on the length of your response; use as much space as you wish.

- What ethical issues does this case raise?
- Who is affected by this case? What are their perspectives on the case?
- What actions might the characters consider to resolve the ethical issues?
- Among these actions, which should the characters choose? For what reasons?

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