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Legal Awareness: Issues in Computing Ethics

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Abstract

The most pedagogically sound method of teaching ethics in computing has long been debated among educationalists. No single method has been identified as the best method despite extensive debate or various pedagogical approaches. It is argued that ethics in computing should be taught as a complete unit of study and yet by others, that ethics should be dispersed across all units of study within a course. The issues discussed in this paper relate to the connections between legal and ethical perceptions of students who are studying computing. The paper also presents an alternate method of increasing computing students' ethical awareness.

Keywords

Ethics, Legal, Computing, Information Technology, Education

INTRODUCTION

The main aim of this paper is to explore student attitudes to legal and ethical computing issues. It explores the relationships between the ethical sensitivity and legal awareness of respondents from various demographic backgrounds who are currently undertaking studies in computing. It is not known if ethical beliefs and attitudes can be taught or whether it is life experiences that cement these standards. Bok (1988) posed the question “Can higher education foster higher morals?” Although this question is not answered in this paper, it provides a starting point to investigate ways to provide an increase in the ethical (moral) sensitivity of computing students in higher education. There have been numerous studies in countries other than Australia that examine the ethical attitudes of students providing useful comparative material and a sound base for the study described in this paper.

There is a great depth and breadth of literature investigating and recommending pedagogical frameworks for teaching ethical principles in computing curricula (Cohen and Cornwell 1989; Couger 1989; Khazanchi 1994; Chaney and Simon 1994; David, Anderson and Lawrimore 1990). A noticeable omission from these studies is the lack of reference to the legal awareness of the respondents whose ethical perceptions were explored. Studies by Gregor and Whymark (1992) and Coldwell (1990) examined student attitudes to legal issues in various computing scenarios but it is difficult to find studies that examine both ethical and legal issues. Studies by Harris and Weaver (1994) and Wood (1993) included an option for respondents to answer "illegal" when presented with statements about computing ethics. Their studies presumed that an action can only be ethical, unethical or illegal. The study described in this paper allowed respondents the freedom to perceive computing statements as ethical and legal, ethical but illegal, unethical but legal, or unethical and illegal.

A considerable amount of literature acknowledges that the educational experience can impact on the development of students' awareness of ethical issues by presenting students with a wide variety of ethical computer experiences. Empirical evidence presented by Cohen and Cornwell (1989) showed that students demonstrate more ethical sensitivity shortly after being challenged by ethical questions and discussions. Few studies have looked into the long-term effects of little or no exposure to ethical situations, therefore results purporting to demonstrate that ethical awareness is raised through exposure to ethical issues need to be interpreted with caution. Analysis from this study presents an alternative pedagogical approach for increasing ethical awareness in computing students.

METHODOLOGY

A survey of 405 students with ages ranging from 16 to 66 who were studying computing at Senior High Schools, TAFE colleges or Universities in North-Eastern Australia was conducted. The survey items were based on statements made by Forcht (1991) and Langford (1995). Forcht (1991) believed that the three parameters that govern peoples’ lives are laws, morals and ethics. Langford (1995) stated that professional computer scientists should develop an awareness of their own individual values influenced by knowledge of law, professional codes of ethics and experience. It is well within the scope of the educationalist to provide students with the necessary

knowledge of computing law and professional codes of ethics, but they are only able to provide part of the required experience of dealing with ethical computing issues.

169 university students, 155 TAFE students and 81 senior high school students were presented with a set of 26 statements about various issues in computing. The questionnaire, which contained groups of statements that were related to each other, was based on a questionnaire used by Cohen and Cornwell (1989). Respondents were asked to answer the 14 groups of questions twice. The first section asked them to respond based on their perception of the legality of the statements, being given only three choices "illegal" "legal" or "unsure". The second section asked them to rate the ethicality of the same set of statements. Responses to the ethics section were presented as a continuous scale which was converted to a 5-point Likert type scale for analysis.

ANALYSIS RESULTS

Analysis of the responses to the 26 statements provided some important insight into the relationships between ethical perceptions and legal awareness. Cross-tabulations and correlations were used to examine students' perceptions and to identify the relationships between legal and ethical perceptions and gauge the significance of the correlations. Table 1 shows the results of the cross-tabulation analyses.

	ETHICALITY					LEGALITY		
Statement	**Highly Unethical**	**Unethical**	**Neither**	**Ethical**	**Highly Ethical**	**Illegal**	**Unsure**	**Legal**
Q1a Copy software - education use	20.0%	24.7%	35.8%	13.8%	5.7%	67.1%	11.9%	21.0%
Q1b Copy software for evaluation	14.8%	18.0%	31.2%	24.9%	11.1%	55.8%	16.5%	27.7%
Q2 Private use of work computer	17.5%	23.7%	39.8%	14.6%	4.4%	35.3%	28.3%	36.4%
Q3a Break into computer - not alter	36.3%	25.2%	21.2%	11.4%	5.9%	68.6%	15.1%	16.3%
Q3b Break into computer - alter	75.1%	11.4%	7.9%	3.0%	2.6%	89.4%	8.1%	2.5%
Q4 Give copy of work to another	55.3%	17.5%	15.6%	5.9%	5.7%	69.1%	11.9%	19.0%
Q5a Plagiarise from Internet	36.0%	31.6%	23.5%	5.9%	3.0%	63.5%	19.0%	17.5%
Q5b Plagiarise from other source	43.0%	32.3%	18.8%	4.2%	1.7%	74.6%	15.8%	9.6%
Q6 Sell business records	75.8%	10.6%	8.1%	3.5%	2.0%	78.0%	11.9%	10.1%
Q7 Divert funds between jobs	57.5%	22.0%	16.0%	3.5%	1.0%	77.6%	16.5%	5.9%
Q8a Copy programs -use elsewhere	48.2%	27.4%	16.5%	6.4%	1.5%	77.5%	13.1%	9.4%
Q8b Alter programs to sell to another establishment	63.7%	18.0%	12.8%	3.5%	2.0%	81.0%	11.6%	7.4%
Q9a Use business computer ... to run own programs	19.5%	26.9%	37.5%	12.6%	3.5%	45.2%	22.2%	32.6%
Q9b ... for personal benefit	32.6%	30.4%	25.9%	6.9%	4.2%	56.5%	18.8%	24.7%
Q10a Use business software ... for assignments	13.6%	16.3%	33.3%	23.5%	13.3%	35.1%	19.8%	45.1%
Q10b ... for personal use	24.1%	27.5%	28.3%	11.4%	8.7%	55.6%	18.1%	26.3%
Q11 Play games on work comp.	11.9%	20.5%	35.3%	21.7%	10.6%	28.9%	18.5%	52.6%
Q12a Monitor usage without employee knowledge	50.4%	24.2%	17.5%	4.4%	3.5%	47.7%	15.8%	36.5%
Q12b Monitor email ... without employee knowledge	60.2%	20.5%	12.6%	4.2%	2.5%	62.5%	12.8%	24.7%
Q12c ... with employee knowledge	16.5%	21.5%	27.4%	20.0%	14.6%	15.3%	14.3%	70.4%
Q13a Hand-over program ... no warning about errors	65.2%	20.6%	9.7%	2.5%	2.0%	60.6%	14.6%	24.8%
Q13b ... warn customer of errors	19.5%	27.2%	30.4%	17.0%	5.9%	16.5%	19.5%	64.0%
Q14a Sell a program with bugs ... to gain market share	65.6%	19.8%	9.4%	3.5%	1.7%	55.2%	17.1%	27.7%
Q14b ... not thoroughly tested	50.9%	28.1%	14.6%	4.7%	1.7%	44.2%	20.2%	35.6%
Q14c ... provide free fixes later	25.6%	22.8%	30.0%	16.6%	5.0%	25.6%	18.9%	55.5%
Q14d ... fix later for small charge	38.2%	26.9%	23.5%	8.9%	2.5%	36.0%	22.7%	41.3%

Table 1: List of statements showing Ethics and Legal responses

The cross-tabulations show that there were a number of computing issues where awareness of the legality of the issue is unclear. For example responses to questions 2, 9a, 10a, 12a, 14b and 14d, showed that less than 50% of respondents were able to agree as to the legality of a statement. There were a number of statements where response anomalies occurred (questions 1a, 1b, 10b, 12a, 14b and 14d). Q1a, 1b, 10b were ranked “illegal” by

the majority of respondents yet the majority of respondents also ranked them as "neither ethical nor unethical". Respondents were undecided about the legality of statements 12a, 14b and 14d, yet the majority of respondents ranked these as "highly unethical".

Correlation analysis, which examines the relationships between variables, showed that the relationship between legal and ethics for every statement is highly significant. The positive correlation between all of the responses indicated that respondents who rated statements as illegal were also likely to rate that statement as unethical.

Differences between Sectors

An analysis of variance (ANOVA) was used to find differences in means for both legal and ethics statements. After differences were found, Dunnett's T3 test was used to perform post hoc multiple comparison tests. There were only a few questions that showed significant differences between sectors (shown in Table 2).

Ethics	Mean H.S.	Mean TAFE	Mean Uni	Sig. Diff.
Q4	2.54*	1.73	1.76	.000
Q5a	2.38*	1.85	1.72	.000
Q5b	2.46*	2.03	2.01	.003
Q10a	3.43*	3.00	3.00	.015
Q10b	3.06*	2.37	2.50	.000
Q12a	2.09*	1.94	1.72	.031
Q12b	2.11*	1.74	1.49	.000

Legal	Mean H.S.	Mean TAFE	Mean Uni	Sig. Diff.
Q4	1.81*	1.47	1.37	.000
Q5a	1.52*	1.37	1.25	.007
Q10a	2.42*	2.07	1.98	.001
Q13a	1.38*	1.70	1.71	.009
Q13b	2.21*	2.53	2.55	.002
Q14a	1.35*	1.79	1.86	.000
Q14b	1.64*	1.82	2.13	.000
Q14c	1.88*	2.45	2.38	.000
Q14d	1.67*	2.15	2.14	.000

Table 2: Significant differences* between sectors

DISCUSSION

The correlation analysis showed a significant linear relationship between a student's awareness of the legality of statements and their perception of the ethicality of the statements. A number of issues arose when looking at the results shown in Table 1.

- Statements that have a direct affect on the respondent's use of computer software are not perceived as unethical as other statements, even though they are perceived as illegal (Q1a, 1b and 10b).
- Statements that are perceived as illegal, that do not concern personal use of software, are also perceived as unethical.
- Where respondents are unsure of the legality of a statement, they also tend to be unsure of its ethicality (Q2, 9a, and 10a). There were three statements where the majority of respondents agreed about the ethicality of a statement but were unsure of the legality of the statement (Q12a, 14b and 14d). This could be explained by lack of education about the legal aspects of the topic areas.

Significant differences were found in ethics responses received from senior high school students and both the other sectors (Q4, 5a, 5b, 10a, 10b). These results indicate that senior high school students do not regard copying assignments, plagiarism, and using business software as unethical as students from TAFE and university. Q12a and 12b showed significant differences between high school and university students. There is little evidence to explain this result other than the lack of computing work experience (mean = 0.97 yrs) of the senior high school students. Factors such as age, life experience, greater exposure to ethics education and ethical situations in computing, which differentiate high school students from TAFE and University students could explain these differences.

The legal responses showed different results to the ethics responses. University students rated Q4, 5a and 10a as less legal than TAFE or high school students. This result is predictable due to the significant linear relationship previously explained between legal and ethical perceptions. High school students rated Q13a, 13b, 14a, 14b, 14c, and 14d less legal than the other sectors. This mixed result requires further investigation. Lack of computing and programming experience on the part of the high school students could explain their different responses to the legality of selling programs with errors.

These findings in this study concur with those of Gregor and Whymark (1992) who state that students discriminate between different types of hacking. This study shows that computing students discriminate between all types of computing issues as shown in Table 1. This is particularly evident in Q1a, 1b, 3a, 3b, 14a, 14b, 14c and 14d where similar statements were presented regarding the same topic.

CONCLUSION

Results of the analysis indicate that the greater the student's awareness of the legality of computing issues then the greater is their perception of the ethicality of computing issues. Informed discussion about the criminal implications of various computing issues is important when ethics discussions are conducted in computing courses.

The research reported in this paper is continuing. Further research will be conducted by examining the impact of specific curriculum items on legal issues associated with computing and then assessing this against the student's ethical awareness.

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