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Do higher education computing degree courses develop the level of moral judgement required from a profession?

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Abstract

Purpose – Higher education (HE) in the past has been found to have a positive effect on the moral development of students from a variety of disciplines, decreasing conventional and increasing post-conventional moral reasoning progressively at each level of study. This research aims to explore to what extent changes in moral judgement could be detected in students on computing degree courses, at three different stages of study, in order to establish if HE in the twenty-first century has a similar effect and what level of moral awareness computing graduates/practitioners exhibit.

Design/methodology/approach – The research takes the form of an exploratory case study which aimed to investigate the current situation in one institution. The defining issues test (DIT) questionnaire was used to gather data.

Findings – Results showed little difference in the level of post-conventional thinking between undergraduate students about to enter HE, final year undergraduates and students undertaking postgraduate studies.

Research limitations/implications – This research questions if IT students moral judgement skills are at a level that enables them to be considered professionals.

Practical implications – Recommendations are made for different teaching approaches to be adopted which place greater emphasis on relating learning outcomes to professional codes of conduct, and for computing professional bodies to take a more active role in defining components of courses they accredit.

Social implications – Given the ubiquitous nature of computers and society's high level of dependence on them it is argued that post-conventional thinking skills are essential for people intending to work with computer technology.

Originality/value – Although the DIT questionnaire is been used extensively, no other research has been found that has utilised it to analyse moral judgement levels of HE students within the same subject discipline, at different levels of study.

Keywords Profession, Ethics, Moral judgement, Computing, Defining issues test, Information technology, Professional

Paper type Research paper

Introduction

As early as the 1940s computer technology was recognised as having the ability to significantly change society and initial concerns were raised relating to the level of ethical awareness and behaviour that would be needed from people associated with its development and use in order to protect the general public (Wiener, 1950/1954). About 70 years later, ensuring high levels of ethical behaviour from the people who work with information technology (IT) has still to be successfully addressed. In an attempt to raise standards within the industry computing professional bodies[1] require professionalism



and ethics to be included as core parts of any higher education (HE) computing degree award[2] they accredit. However, HE institutions are allowed to deliver such content any way they choose which means that some computing awards scatter small elements of ethics and professionalism throughout their teaching, so the topics are taught but not assessed; while others have a specific module on the topic.

HE has in the past has been found to have a positive effect on the moral development of students from a variety of disciplines, decreasing conventional and increasing post conventional moral reasoning progressively at each level of study (Rest, 1979b; King and Mayhew, 2002, p. 268). This research explores to what extent changes in moral judgement could be detected in students on computing degree courses, at three different stages of study, in order to establish if HE in the twenty-first century has a similar effect and what level of moral awareness computing graduates/practitioners exhibit. The research takes the form of an exploratory case study which investigated students within one educational institution. Data were collected using the defining issues test (DIT) questionnaire which utilises Kohlberg's six stages of moral development to identify the moral reasoning stage of test subjects.

Professions

What specific characteristics make an occupation a profession has proved a fertile research topic for academics since the early twentieth century, resulting in various lists of traits based on examining the working practices of established professions such as law and medicine. However, no single list of traits is universally accepted as applicable to all occupations, although they all have in common the requirement for a professional body and a code of ethics (Ford and Gibbs, 1996, p. 50; Wilensky, 1964, p. 137; Pavalko, 1988, p. 26; Brint, 1994, p. 27). Computing professional codes have been criticised in the past for placing more emphasis on the profession than on external stakeholders (Gotterbarn, 1999, p. 87) and for lacking explicate moral principles relating to the social impact of computing (Anderson, 1992, p. 454). However, while ethical codes provide a normative model on which practitioners can base their behaviour, the implementation of such codes relies on an individual practitioners' ability to recognise an ethical dilemma and to apply a high level of moral judgement to the situation. Moral judgements are decisions relating to whether an action or inaction is good or bad generally based on a combination of emotion and reasoning, measured against a perceived standard of good (Green, 2002, p. 520; Hauser, 2006). Making moral judgements therefore involves first, identification of something as a moral issue; second, giving consideration to the way conflicts among parties can be settled, and third the ability to give a rationale for undertaking a course of action (Rest *et al.*, 1997, p. 5). Varying theories have been put forward to explain the development of moral reasoning skills, most notably those of Piaget (1932) who identified two major stages of cognitive development in children, and Kohlberg (1973) who extended Piaget's work to adults and identified six sequentially developed response stages to moral dilemmas. Kohlberg's six stages group under three levels, pre-conventional (Stages 1 and 2), which has an obedience and punishment orientation and focuses primarily on self; conventional (Stages 3 and 4), where the focus is on maintaining social norms and group acceptance; and post-conventional (Stages 5 and 6), where the rights of others and the sanctity of life are recognised (White, 1999, p. 2). The DIT questionnaire used in this research utilises Kohlberg's six stages of moral development to identify the moral reasoning stage of test subjects. The DIT has been

extensively tested and its reliability using Cronbach Alpha is high and has proved reliable in hundreds of studies, a conclusion supported by research which utilised 45,857 DITs (Rest *et al.*, 1999, pp. 644-59). The questionnaire comprises either five or six brief descriptions of moral dilemmas. After reading each dilemma the subject chooses one of three courses of action and then rates the importance of twelve statements relating to possible options that may have influenced their considerations in resolving the dilemma, finally they rank which they consider to be the four most important statements.

Literature review

Previous research in the USA used the DIT across a range of subjects to show that stages of moral judgement change with age and level of education (Owens, 2005, p. 5). HE in particular was found to have a positive effect on the moral development of students, decreasing conventional and increasing post conventional moral reasoning (Rest, 1979b; Pascarella and Terenzini, 1991; King and Mayhew, 2002, pp. 252-63). However, more recent studies in the UK (Clarkeburn, 2000, pp. 34-39; Jagger and Strain, 2007, p. 38) and Australia (Wimalasiri, 2001, p. 32) using the DIT have reported lower P and N2 scores than those found in the USA. In attempting to explain the difference in these results Wimalasiri (2001) questioned the usefulness of the DIT in an international context and a possible American bias but still considered it acceptable and reliable for use with different cultures which seems contradictory. While Clarkeburn (2000) argued that the changing nature of UK University cohorts, placed greater demands on students to work while they studied and this, coupled with the goal orientated teaching in many UK universities, resulted in environments which were not conducive to moral development. However, working part time should have brought students into contact with real life ethical dilemmas and given them experience of putting moral reasoning into action. Also it has been common practice in the USA for a long time for students to work in order to finance their studies, so it is difficult to know why either of these factors should have adversely affected UK results.

Many studies have utilised the DIT in an attempt to measure the success of educational intervention of various types but results have been varied with some showing a positive change in DIT scores after the delivery of targeted ethics teaching, and some no change or a decline (Staehr and Bryme, 2003, p. 233; Poneman, 1993, p. 207; Tennant, 2002, p. 2657; Woodward and Ashby, 2006, p. 6; Jagger, 2011, pp. 27-31). Most research of this type has administered the DIT questionnaire at the beginning and again at the end of a specific module covering professionalism and ethics, which probably explains the variable results as some groups of students may not have completed the form seriously a second time.

Research using the DIT and focusing specifically on the ethical attitudes of computing students has shown that computer science and information system students do not have the same ethical beliefs as experts (Athey, 1993, p. 359) and that information system professionals may be unable to recognise ethical dilemmas involving computers due to a conflict between their personal and professional use of computers (Gattiker and Kelley, 1999, pp. 248-9). While recent studies by Grant (2010, p. 238) and Jagger (2010, pp. 317-18) both identify low levels of moral sensitivity as contributing to students inability to recognise ethical issues. The conflict between personal and professional however is a common dilemma for many professions and the reason that ethical behaviour is considered such an important feature of professional work.

Therefore, if IT students cannot identify an ethical issue how can they be considered professionals under any definition of the term? Other research has shown female computing students measure honesty more highly than their male counterparts and that small group discussion was an effective method of teaching computer science students computer ethics (Vartiainen, 2003, p. 17); that there is very little difference in the ethical beliefs of undergraduate and graduate computing information students (McCarthy *et al.*, 2005, p. 68) and that third year computing students DIT scores improved after they had taken a module with a taught ethics component (Staeher and Bryme, 2003, p. 233).

Methodology

This research investigated two questions; first, to what extent does the moral judgement level of students taking courses within the School of Computing and Information Technology (SCIT) change at different levels of HE and second; does the level of post-conventional moral judgement shown by SCIT students indicate that they are capable of making moral judgements which benefit society? This research is essentially a descriptive case study as it utilises data collected from only one institution (Kane, 1990), a post 1992 university.

SCIT students from all IT awards and at three different levels of HE were asked to complete the DIT questionnaire. First year undergraduates completed it during their first week at university, before they attended any formal teaching sessions; final year undergraduate UK and overseas students before they started a dedicated ethics and professionalism module and post graduate (PG) students who should have been taught professionalism and ethics during their undergraduate studies, at the start of their PG course. Approximately half the PG students who completed the questionnaire were in full time work and returning to study on a part time basis. In order to achieve consistency in the manner the questionnaire was administered all groups were given basic instructions on how to complete the form but no discussion took place relating to the dilemmas or moral/ethical issues prior to completion.

After blanks and illegible scripts were removed there remained usable forms for 26 per cent of first year students; 33 per cent of final year UK students; 50 per cent final year overseas students and 8 per cent of PG students. The small percentage of fully completed PG students forms does mean that these figures have to be interpreted with care as they may not be truly representative of the PG cohort. The number of female respondents in all categories was low, reflecting the gender imbalance found in the subject area and making it impossible to analyse results by gender. Students taking part in this study came from a mix of cultural backgrounds.

For this research the five dilemma DIT questionnaire was used and the post-conventional index (P) and higher stage discriminating index (N2). The post-conventional (P) index represents the degree to which a participant attributes importance to principled or post-conventional moral thinking (Kohlberg's Stages 5 and 6). The higher the P score, the more use is shown of post-conventional thinking. The N2 score incorporates the preference for higher stage reasoning (Stages 5 and 6) and the rejection of lower stage reasoning (Stages 2 and 3). This scale therefore measures how discriminating a respondent is between choosing low and high stages by determining how consistently they select one stage and reject the other. Rating data is weighted in order for the N2 score to have the same mean and standard deviations as the P score, allowing for comparisons to be made (Woodward and Ashby, 2006, p. 5).

Results

Results from the three educational levels were expected to be diverse, in line with the ten point difference between educational levels found by Rest *et al.* (1999) however this did not prove to be the case (Table I). The P score showing level of post-conventional moral thinking for the three groups were all in the low twenties, with a difference of one to two points between educational levels. The N2 which combines rejection of lower level reasoning and level of post-conventional moral thinking show a similar low point difference between educational levels with a two point change for students after two years of study. There is a six point change between UK final year and PG students which shows that although the PG students have increased their rejection of lower level reasoning, that have still not significantly increased their level of post-conventional moral thinking and they achieve a lower N2 score than US college freshmen.

This study therefore shows that level of moral judgement in SCIT students has not been significantly affected by exposure to HE or by increased age. The largest N2 increase of six points between the UK final years and PG is four points less than the ten point score difference found between educational levels in the USA and the overall score for age groups and educational levels between USA and SCIT students varied greatly (Table I) with all three levels of SCIT students scoring points that were lower than US freshmen. It could be argued that the increase in N2 score between SCIT final year and PG students may be attributable to professional/ethical instruction in their undergraduate studies, or to an increased level of maturity as approximately half of the PG students taking part in the study were mature students returning to education on a part time basis. However, if the PG students undergraduate studies did include content relating to profession and ethics it would appear not to have had a significant or lasting effect on their level of moral judgement. Given the number of SCIT PG students in full time work it would also appear that work based computing environments may not encourage the development of moral judgement skills. Although this research had a low completion rate by PG students, a study by McCarthy *et al.* (2005, p. 68) also found only a slight difference in the ethical beliefs of undergraduate and postgraduate computing students, so a low completion rate may have had little effect on the result.

Interestingly the overseas, final year Sri Lankan top up students achieved the same P score but a higher N2 score than UK students of the same educational level, yet previous research using the DIT has shown that foreign born participants have lower P scores than those whose first language is English, something attributed to the DIT's heavy reliance on reading skills (Husted, 1978, p. 439). These results therefore raise a question

	Results from this study			N	Results from Rest <i>et al.</i> (1999) (in Owens (2005, p. 5))		
	P score average	SD	N2 score average		N2 score average	SD	
First year UK	21	11	20	69	Ninth grade	20.5	9.7
Final year UK	22	12	22	48	College Freshmen	30.6	14.4
Final year Sri Lanka	22	10	25	28	College seniors	40.4	13.6
PG UK	24	13	28	22	Graduate/professional school	53.3	11.5

Table I.

relating to the type of education Sri Lankan students received prior to starting their top up course and whether this covered ethics as certainly these students do not possess advanced English reading skills. This result seems to challenge previous research and suggests areas for further investigation. The UK results could be said to reflect the effect of the so-called sibling society that now operates in westernised counties where people focus on their own needs and are reluctant to accept any level of social responsibility (Bly, 1997). However, if this were the case then results from the USA and UK studies should be similar, which they are not. The results may therefore perhaps be better explained by underlying differences in educational systems.

Conclusion

The results of this research show that the moral judgement of IT students at the case study institution was low and that progression through HE and increased age had only a small effect on moral judgement levels. These results therefore appear not to agree with Rest (1979b), although by comparison his research covered a number of different disciplines and a larger number of test subjects. If the results of this study are accurate however, it seems likely the students that took part will enter the workforce without the level of moral judgement expected of a professional and may not be capable of making decisions that benefit society. One of the significant differences between a profession and an occupation is the level of moral judgement practitioners display when making decisions (Haidt, 2001) and a full profession needs to ensure that its practitioner's moral judgements are informed by reason, not social conditioning (Bebeau, 2002, p. 289).

The research results presented here are limited to only one institution and problems encountered with the distribution of questionnaires resulted in a low response rate from some of the student cohorts. However, given that one of the main aims of this research was to identify if a problem existed, this preliminary exploration has achieved that aim. Further, more rigorous research needs to be undertaken in order to confirm if computing students level of moral judgement is low across other institutions within the sector and longitudinal research to test the same cohort at each stage of their HE studies would also provide more specific data. The ethical and professional attitudes of staff teaching the students within an institution may also be a significant contributor to accelerating or decelerating students level of moral judgement development, and this is another area where investigation could take place.

Implications

Regardless of rationalisations that could be made to explain the difference between results from this study and US studies, the fact remains that students taking part in this research clearly show a lower than desirable level of moral judgement, which raises a number of questions that need addressing if this situation is to be rectified. First, do the requirements from computing professional bodies for the inclusion of content in accredited courses covering ethical and professional behaviour need to be more prescriptive or to form a prescribed percentage of each HE award? Should professional bodies consider providing some indication of the minimum level of moral judgement they hope students will achieve and review success at revalidation? Is there an acceptable level of moral judgement that should be reached by computing students before they are allowed to graduate or join a professional body?

Given the changes that have taken place within the UK education system, some students may not have encountered ethics or ethical discussion at any level before they reach university which perhaps means that more targeted educational intervention is required now than in the past. An approach designed around Rest and Narvaez's (1994, p. 203) four component model to stimulate moral sensitivity, moral judgement, moral motivation and moral character has already proved successful for dentistry where a combination of performance based teaching with real life situations which replicate professional interactions; reflective learning based on written responses to a number of subject specific case studies and a professional role orientation inventory utilised in interview simulations have successfully raised students moral awareness levels (Bebeau, 1993, p. 316). A similar approach could be used with computing students.

Other research has shown that computing students find it difficult to identify key stakeholders, which may relate to many computing jobs not requiring direct contact with stakeholders (Grant, 2010, p. 254). However, the ability to identify stakeholders should not be dependent on direct contact. An alternative model to Rest's known as Primes was developed specifically for computing students based on the premise that computing occupations were uniquely involved in developing artefacts for others. This model focuses on developing the skills required to recognise stakeholder needs and has four key skill components, each broken down into essential moral skills and recommendations for how these fit into educational pedagogy (Huff *et al.*, 2008a, 2008b, p. 304). The prime model has some overlap with Rest's four component model although Huff *et al.* criticise Rest for associating few concrete skills with his model. However, perhaps Rest realised that listing specific skills, just like listing professional traits, is to some extent pointless as they will never be universally accepted and the more prescriptive you make something, the less likely it is to be adopted. Also although the moral ecology of education currently appears to support list ticking by both staff and students, such an approach has been found to foster surface, not deep learning so should only be adopted with caution (Biggs and Telfer, 1987). Nonetheless the Prime model may prove a useful tool in course development, although it is difficult to see how concepts such as "be honourable", "show reverence" and "develop resilience" can be turned into learning outcomes which can be meaningfully assessed.

A more targeted professional development programme could be used throughout computing undergraduate studies based on the approaches outlined which would undoubtedly help to improve levels of moral judgement among graduates if accompanied by standardised assessment criteria. The need for standardisation and a generic approach dictate that the development of such materials should not be undertaken by individual institutions and needs the backing and clear involvement of the industries professional bodies. It also requires the recognition that profession is a generic, not subject specific concept. It may be true that different professions require different craft specific skills, but these are not what make a job a profession. The difference between an occupation and a profession relates solely to the behaviour, contribution and accountability of its practitioners to society as its stakeholders, not individual clients, something so far recognised by few academics, many of whom still appear to consider the ability to perform craft skills in a work situation the only real measurement of profession which has the effect of making it an ever changing and elusive goal.

Notes

1. Such as The Chartered Institute for IT (previously the BCS); Institute of Management and Information Systems, Association of Computing Machinery.
2. Computing degree awards in this context includes Computing; IT; Information Systems; Multimedia, etc. and is used as a generic, not specific term.

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