Ethical Perception of Computer Science Students

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Abstract: Ethics is the conscience or moral principles guiding the actions of an individual. Computer Science students are trained to see issues as black and white based on the binary concept and theory. In real life there are however situations that are not clearly defined and require principles to solve. This study seeks to determine the ethical level of computer science students using general scenarios. A survey was administered to students using an online portal after two hours virtual lecture on ethics in research. The responses indicated that Computer Science students are ethical most of the time. This is a positive outcome that can be reinforced with ethics training. It is recommended that computer ethics be introduced into the curriculum of Computer Science students in light of new technologies being developed. The teaching of computer ethics should include local scenarios, lingua franca and multidisciplinary knowledge.

Keywords: ethics, virtual teaching, curriculum, information technology

Introduction:

The frequent introduction of newer technological tools as replacement for traditional tools in places of learning has been a source of concern to most people. Some activities in places of learning include test assessment, report writing, research findings and publications etc. In trying to effectively carry out any of these academic activities using these tools, it is important to pay attention to ethical consideration especially in critical extraction of dataset for system development involving safety, health, decision making, legal, classification tasks, and assessment for both private and public usages. Students of Computer Science and computer users needs to undergo ethical study to prevent or know how best to navigate concerns involving ethical issues in face of information usage involving big data, ChatGPT and the internet at large. Computer ethics as defined by (Moor, 1985) deals with the evaluation method, societal factors affecting computing tools and the subsequent production and justification of guide for its ethical usage. These technological tools come with its vices such as open plagiarism, digital theft, and other ethical concerns. The study of Atrey et al., (2009), also implied that technological exposure, though a gift, can also bring about academic woes and other aspect of life. Oyewale (2017) notes that many students from Nigerians universities have fallen prey to ethical vices in technological usage, which was traced to lack of exposure in the Nigerian context. Ethics are learnt from all works of life, including schools, organizations, environment and even traditional settings like homes. This makes ethics a set of intuitive-protocols that serve as a guide for procedure to follow in certain situations, event or systems. Ethics protocols tend to follow a wider set of moral and informal stance, unlike societal rules where an act may be considered unlawful but ethical or unethical but lawful (Resnik, 2020). Ethics are found in all forms of discipline including law, computer, business, economics etc, with the person studying it known as ethicist. An example will be "computer ethicist", which is a person that focuses on the study of computer protocols. As observed by Stavrakakis et al (2021), computer ethics is a stand-alone academic specialty, stemming from the numerous and bespoke ethical issues surrounding usage of its tools. As a result of constant increase in societal encroachment of computer technologies, the calls for more ethical guides has being on an exponential rise. Ogunlere and Adebayo (2015), notes that various research scholars of computing professional bodies have made public various set of ethical guides for the computer study. Examples includes computing ethics, information ethics, ICT ethic and ethics of information systems (Stahl et al., 2016) Himawan et al (2020) and Stavrakakis et al (2021), laid emphasis on the need for observation and introduction of ethical conduct in Computer Science curriculum. The introduction of ethical procedures in early computer studies of young minds and computer users, will serve as a building foundation for doing things rightly and correctly. Agunloye (2019) opines that for responsible, respectable and successful research, academics must show a foundational sense of moral right, that helps promote scholarly integrity. As a result of the ever increasing technological advancement, leading to more inclusivity in computer usage, it is safe to say computer is now been used by every member of the society, and as such, the need to introduce ethical ethos around its usage cannot be over emphasized. Ethical considerations in computer science help in proper formation of research problems, solutions and implementations. It also focuses on safety, usability, ergonomics, privacy, responsible usage, representation, religion amongst others (Weiner, 1950) and (Bynum, 2000). It is important to note that ethical protocol varies from region to region, sector to sector etc, thus, the need for a grass root ethical tutelage. With literal ease of information extraction

being afforded by various technological tools, it is evident that computer science will eventually be felt in all fields of education, there is therefore need to do a data analysis on the ethical competence of computer science student.

The remaining part of this study is divided into related works, methods employed, result discussions, conclusion and references.

Related Works

The publications from Helsinki Declaration, Belmort Report, and the Human Use of Beings (Weiner, 1950) etc have always been the standard for research ethics. With constant exposure resulting from developmental strides in computer science, more concerns are being opened for immediate address. Language models like ChatGpt and other information extraction tools couple with rise of various computing application which are continuously being explored by students, calls for a rise in ethical concerns. The following part of this work depicts literature search exploring the need for ethical awareness amongst computer science student in Nigerian university.

Oyewale (2017) did a descriptive survey on awareness and perception of Computer ethics by undergraduates of a Nigerian University, using a sample size of 292 on a 12,894 population set. Research findings from this study indicates that ethical awareness level amongst these students is high but economic challenges makes adhering to these ethical values impractical. Ukamaka (2023) examined the theory surrounding ethics found in places of education in Nigeria, with focus on ethical exposure on staff, and students of Namdi Azikiwe Univsersity.

In conclusion, the paper highlighted the benefits of complying with laid down ethical procedures when both learners and staffers are committed to its workings.

Okafor (2011), observed the ethical conduct of 426 business administration students from four tertiary schools. The t-test ANOVA tool was used to do statistical analysis of result. Findings from this work show that in general, business students are middling ethical with female students being ethically complaint than male students. Results also indicates that year one students are more ethically complaint than other level students, including the finalist Hughes et al (2020), worked on global and local agendas of computing ethics education. The paper considered ethical values beyond the traditional Belmort and Helsinki document on ethics. The major focus is on various professional perspective of politics and culture, which it emphasized the necessity for adaptation of cultural dimensions.

Ngonso (2022), examined Obiora's Educational ethics in relation to higher institutions in Nigeria. The focus is on managerial roles of nationally owned educational bodies like National Universities Commission (NUC), National Board for Technical Education (NBTE), National Commission for Colleges of Education (NCCE), and Tertiary Education Trust Fund (TETFund) to the Nigeria educational system. The study concluded with identification of ethical limitations in tertiary schools, with privatization of higher institutions as possible ways of mitigating these lapses.

Omoniyi et al (2021), worked on surveying the impact of learning ethics in research of computing sciences. Result from this work indicates that the majority of post graduate student have a sense of ethical ethos, with 40.9% showing no ethical interest.

Agunloye (2019), explores the application and effects of ethical values surrounding research and scholarship enthusiast as obtained in the 2018 Common Rule for Institutional Review Board. The study outlined international ethical guidelines in research and scholarship, while also detailing possible current and future implications for academic integrity.

Stavrakakis et al (2021) presents a survey of computer science faculty and related fields, with special attention on learning practices for computer science ethics for schools. The survey consists of respondents from over 60 higher institutions spanning across 23 European countries. The survey consist of questions ranging from why/how computer science ethics is taught or not taught, expertise of ethic handlers and the scope of ethics curriculum used.

Ogunlere and Adebayo (2015), explored the ethical guide of four computing and engineering professional bodies. It discusses the roles of the ethical codes these professional bodies' offers to academics in terms of strategy, practical and professionalization, in a bid to create ethical awareness for computer professional bodies.

Himawan et al (2020), identified possible rationales and aspects of research ethic violation by researchers in research publication. It further exposed researchers to possible ways of mitigating ethical violations, with aim of increasing the ethical awareness level amongst research community.

Parveen and Showkat (2017), explored the various facets of ethical research ethos for research scholars in Indian. More insight on what is considered right and wrong from the point of a research scholar, with regards to intended research subjects and the global community were explored. The paper was concluded with

recommendations to create an ethical review board for research matters at departmental levels of all university across the country.

Methodology

This study used the descriptive approach in this study. The population consists of all students in the Department of Computer Science at University of Ibadan. The sample was however purposively selected from students in the 400 level non-graduating class and graduating class of the academic master's of science. The participants were exposed to two classes of one hour each on ethics in research methods using a videoconferencing platform. The students were then examined using a Google Form as part of the continuous assessment for the course on Friday 13 January 2023 at 9pm West Africa Time (WAT). The continuous assessment had twenty questions and an additional ten questions on ethics that were not graded but required to be answered. The ten questions on ethics were acquired from Scribd.com. The responses were then analyzed using the Google Data Studio. The metrics provided for evaluating the ethics of respondents was the score. The options for the ten questions on ethics had weights ranging from 1 to 4. The summation of the weights for each option selected by the respondents led to a score. The score is rated as shown in Table 1.

Table 1: Rating of Scores

Score	Ethics
12 or below	Highly ethical
13 – 20	Ethical most of the time
21 – 30	Struggles with ethics
31 or above	Needs an ethics overhaul

Results and Discussion

The results from the analysis done used the demographics, level of study, and achievement score on the quiz.

Table 2: Demographics of Respondents

	Undergraduate	Masters	TOTAL
Female	16	33	49
Male	63	46	119
TOTAL	79	79	158

In Table 2 there are more male than female respondents. Computer Science is a STEM-based programme that has more male participants. The percentage of women (31%) should however be acknowledged as an improvement on previous publicly available data on female participation in STEM-based programmes.

Table 3: Number of responses per options

	A	B	C	D	TOTAL
1	3	7	6	142	158
2	26	49	4	79	158
3	17	5	5	131	158
4	8	27	30	93	158
5	123	6	27	2	158
6	10	15	87	46	158
7	12	38	4	104	158
8	5	144	5	4	158
9	35	31	34	58	158
10	79	15	52	12	158

The highlighted cells in Table 3 show the best ethical response to the questions. The responses in Row 2, 4, 5 and 9 indicate that majority of the respondents had a different opinion. Even though the 10-question quiz on ethics is not directly focused on computing, the responses given by the participants indicated their ethics. The questions in the quiz follow the case-based approach indicated for computer ethics education (Kert et al, 2012)

In question 1, the focus is on personal gain with immediate and future solutions proposed. Participants preferring an immediate solution (options a and d) are 92% while 8% settled for a future solution (options b and

c). This question relates to the impact of computing ethics that states 'Avoid harm to others and be honest and trustworthy' (Altrey et al, 2009).

Acknowledging the contribution of others to an idea is an ethical challenge faced at work all the time. In question 2, the options given are to acknowledge the compliments (option a), brag about your competence (option c) or mention that the idea came from someone else (options b and d). The responses indicate that 81% prefer to acknowledge the originator of the idea.

The scenario painted in question 3 may not be familiar to all the participants because they do not own vehicles or do not drive vehicles. The options provided are ignore (option c), collect data and report (options a, b and d). The participants (83%) preferred to collect data and report (option d). This bias to collect data may be from their training as Computer Scientists. The reporting option of a non-emergency police number indicates that the participant wants no additional burden. The scenario in question 4 focused on privacy issues, access to information and organizational knowledge. The options presented are ignore (option a), access the document (option b) or return the file (options c and d). 59% of the participants chose to return the file without reading, while only 17% will look at the contents. The ethical solution was to look at the file (option b). Question 5 is similar to question 1, because it refers to personal gain. The options are return the extra (option a), consume the extra (option b) and share the extra (options c and d). The responses indicate that 78% would return the extra. Option c which is the most ethical solution compensates a coworker for a loss that occurred from the same process. The choice of option a assumes that the receptionist will keep the extra and that the vending company will fix the issue. The assumptions may not work if it is not included in the terms of agreement.

The financial scenario of question 6 has been faced by everyone at one time or the other. A large number (87) of the participants chose option c which was to buy a legal product. The other options (a and b) give a personal advantage with lower cost and reporting the seller of stolen goods (option d).

Question 7 is a resource and fund-raising scenario that is general to all workplace or social groups including student clubs. 66% of the participants chose that no extra amount should be expended over what has been contributed. This is a reasonable decision because option a involves misuse of office property, option b occurs after the event and option c is a misuse of the funds generated. In question 8, a financial scenario is presented with options to claim the money (option a), return the money to the owner (option b), compensate someone (options a and c) or ignore (option d). Most of the participants (91%) decided to do the ethically right thing which was to return it to the owner. The focus of question 9 is relationship and conflict of interest. The options presented fall into two categories: continued income from one or both parties and termination of income from both parties. 37% of the participants believe it is good to terminate services to both parties (option d) while 22% support a discussion with the couple so that they decide who stays and who leaves (option a). The preference for termination shows that participants want to avoid biases, manipulation and future complications. The issue of relationships and perceptions is also the focus of question 10. The options provided allow avoidance (option b), inclusion (option d), report (option a) and confrontation (option c). The popular choice by the participants was option a - to report anonymously, while confrontation (option c) was the next best choice. This suggests that participants would take action but the type of action is determined by other factors.

Table 4: Students rating from responses based on Level

Score	Undergraduate	Postgraduate	Number of participants
12 or below	7	9	16
13 – 20	66	49	115
21 – 30	6	19	25
31 or above	0	2	2
TOTAL	79	79	158

The results in Table 4 show that 9% of the undergraduate participants are 'highly ethical.' Majority of the undergraduate (84%) are 'ethical most of the time'; while 8% 'struggle with ethics'. None of the undergraduates require an ethics overhaul. The postgraduate students however show a spread of ethical values such as 62% being 'ethical most of the times' and 3% need 'an ethics overhaul.'

Table 5: Students rating from responses based on Gender

Score	Male	Female	Number of participants
12 or below	14	2	16
13 – 20	74	41	115
21 – 30	20	5	25
30 or above	1	1	2
TOTAL	119	49	158

In Table 5, the number of participants who are highly ethical is low, but those who are ethical most of the time are in the majority. The female participants have a better ethical performance overall at 87% while the male participants have 74% performance. The need for an 'ethics overhaul' applied to both male and female participants.

Discussion

The participation of undergraduate and postgraduate students in the survey was done to determine where ethical training should be focused on for computer science students. The need for ethical training has been supported by many leaders in Nigeria (Njoku, 2022). The negative long term impact of not teaching ethics was emphasized.

The student responses in Table 3 infer that unethical acts or views are held by students. This view is supported by the work of Ikechi and Akanwa (2012). They identified unethical practises in the Nigerian educational system. At the university level some of these unethical practises included cultism, drug abuse, campus prostitution, sexual harassment, sale of academic handout, late commencement of lectures, non-enforcement of class attendance for students and admission fraud. Ajayi and Adeniji (2009) identified laxity in home control and parental supervision, school factor, teacher factor, societal factor, technological factors and government influence as the major causes of unethical behaviour.

The level of the students also had an impact on their ethics as shown in Table 4. The undergraduate students had better ethical rating than postgraduate students. In the work of Okafor (2011), the first year business students had better ethical behaviour than final year business students. It is suspected that postgraduate students have had to compromise their ethics in order to gain economic advantage. The undergraduate students are still sponsored by their parents and are yet to face the economic and political consequences of their ethical practises. The need ethics overhaul was applicable to only X% of the respondents, but if students with scores from 21 and above are included, the percentage would rise to X%. An ethics overhaul can only be done through an education program. Ogundele and Opeifa (2004) are of the opinion that ethics education is required to sustain our social and economic system in Nigeria.

The results in Table 5 indicated that female students had a better ethical disposition. The work of Okafor (2011) supports this stating that "female business students' exhibit better ethical behaviour than their male counterparts."

Conclusion

In this study a standard ethics quiz was administered to Computer Science students using an online platform. The students had been exposed to a class on ethics in research methods. The results indicated that most of the students have the right ethics and would do the right thing when faced with difficult personal and corporate situations. There are however some students that require ethical training. It is suggested that the computer science curriculum be adjusted to include an ethics course that would serve to prepare the students for personal and new technologies such as artificial intelligence, blockchain and cloud computing.

Acknowledgments

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