International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Use of Technology and Occupational Health Exposures Encountered by Academics in Institutions of Higher Learning - An Exploratory Study

Kennedy A. Osakwe[1], Kunle Ola[2], Pete Omotosho[1]

[1]PhD, MAIOH, COH, FIIRSM, FRSPH, Senior Lecturer & Program Manager, PCPM, RMIT University, VIC 3000, Melbourne, Australia
Corresponding Author E-mail: *kennedy.osakwe[at]rmit.edu.au*

[2]Thomas More Law School, Australian Catholic University, Level 7, 486 Albert Street, East Melbourne Vic 3002, Australia

[3] RMIT University, School of Property, Construction and Project Management, 124 La Trobe St, Melbourne VIC 3000, Australia

Abstract: ***The confluence of increasing number of students in institutions of higher learning, virtualization of teaching and learning and technology revolution will predispose the academics to witness prolonged period of workplace exposures with potentials for occupational health impacts. Method: A cross sectional survey of academics in institutions of higher learning across three continents using questionnaire design on survey monkey. Finding: Heavy manual processing of task during pre-pandemic era. Increasing use of technology aids in grading of script, teaching and research in pandemic period. Increasing health effects including headache, visual discomfort, neck and shoulder pain, low back pain, dizziness and repetitive strain injury. Conclusion: As modernization and globalization spread across sectors, academia should brace up for technology revolution but should mobilize controls to mitigate impact of exposure to technology aid.***

Keywords: Automated Essay Scoring, health impacts, pain, exposure

1. Introduction

Globally, the institution of higher learning (IHL) has oscillated across different pedagogical era and traditions. Theocharis posit that a contemporary opinion on higher education infers its functions to be a digital knowledge-based society pedestalled on technology [1]. Nonetheless, the advent of new technologies such as the use of 'Automated Essay Scoring (AES)' system, data analytics software, cloud computing, Artificial Intelligence and more, has changed the traditional model of higher education [2].As argued by Theocharis, the IHL, is the last enclave for knowledge and skill acquisition as corroborated by Brennan and Tow [3], [4] who both maintained that IHL nurtures and adapt the values of students; transmits technical and commercial skills; and adapt students to a fast changing technological orientation. The IHL can be referred to as all formal education-certificate awarding institutions above secondary school level. This certificate awarding institution can be a university, Polytechnique, ornon technique such as college of education and college of agriculture. A university can be defined as an institution conferred with the responsibility of awarding degree certificates to the students [5] especially in the area of research. There are different academic careers in the university which includes working as a lecturer, academic counselor and working at the administrative unit of the university. The position of a teacher in post-secondary school education is usually considered an academic profession because they are those that impart the required knowledge in different fields. Though, some universities employ lecturers with master's degree in relevant field joined with post graduate degree in education, but in many schools, full time lecturing requires obtaining doctorate degree in relevant field.

The impact of information computer technology (ICT) tool in teaching and learning has been identified with many benefits such as easy lesson delivery, video demonstrations of lessons among others; however, modern technology has imposed challenges on academics in various ways. Some of the challenges includes poor network and access to computer network connection; limited technical support from the school management; lack of adequate staff training on the use of computer; lack of competence in the use of ICT by lecturers, and insufficient period for lesson delivery using the ICT tool [6]. Other ICT-related challenges in teaching and learning includes security issues, understanding computer jargons, technophobia, lack of resources, cost of ICT equipment, students misguided use of the technology among other challenges too numerous to mention. It is worthy of note that proper adoption of modern technology facilitates effective and efficient lesson delivery in universities in many areas such as lesson delivery, demonstrations for better understanding, taking class attendance, marking of students test and exam works as well as essay scoring. The conundrum of remote learning caused by COVID 19 pandemic opened the pandora box of unpreparedness of the academia to embrace current realities in technology. Anecdotal sources revealed a pitiable experience of academics in rising to the challenge. This study examined the impact of using ICT tools in academic activities and its associated health and safety impacts in academia.

2. Material and Method

A cross sectional survey of academics in universities across three continents using questionnaire design in Likert format on survey monkey. Links to questionnaire were sent to 20 academics lecturing in universities across Australia, Africa and Europe via electronic mails. Questionnaire was supplemented with participant information and consent form for participants to initialize their consent. The questionnaire was design using inputs from literature scoping review previously undertaken by the authors [7] and anecdotal sources. While the questionnaire obtained respondent age, gender, employment status and locations; it further sought to know participants views on their comfort level with the use of ICT solutions, number of markings undertaken, time spent on grading activities, types of commonly undertaken academic activities and bodily effects experienced. Statistical analysis of data was done using basic statistical indices (frequency, percentages and P-value).

3. Results

Table 1: Age of respondents

S/N	Age Category	Frequency	Percentage (P≤ 0.001)
1.	Under 18	0	0.00%
2.	18 – 24 years	1	6.25%
3.	25 – 34 years	2	12.50%
4.	35 – 44 years	4	25.00%
5.	45 – 54 years	4	25.00%
6.	Over 55 years	5	31.25%

P≤ 0.001 shows that the data was of high statistical significance, therefore valid.

In Table 1 there were no respondents below the age of 18years, respondents within the age bracket of 35 -44 years and 45 – 54 years are of equal proportions which sums to 50% of the total respondents.

Table 2: Gender of respondents

S/N	Gender	Frequency	Percentage (P≤ 0.001)
1.	Male	8	50%
2.	Female	8	50%
3.	Mixed	0	0%
4.	Prefer not to say	0	0%
5.	Other (specify)	0	0%

P≤ 0.001 shows that the data was of high statistical significance, therefore valid.

Respondents were either male or female where 50% are male and 50% are female.

Table 3: Employment status of respondents

S/N	Employment status	Frequency	Percentage (P≤ 0.001)
1.	Full time	11	68.75%
2.	Part time	1	6.25%
3.	Temporary	3	18.75%
4.	Consulting	1	6.25%
5.	Retired	0	0%

P≤ 0.001 shows that the data were of high statistical significance, therefore valid.

The results showed that 68.75% of respondents are on full time employment with their employers and it is the modal employment status. Also, 6.25% are on part-time employment and 18.75% are on temporary employment which could be in the form of adjunct lecturers, sabbatical professors, lecturers in special discipline, and teaching/ graduate assistant, most of which have permanent job elsewhere.

Table 4: Location of respondents

S/N	Location	Frequency	Percentage (P≤ 0.001)
1.	America	0	0.00%
2.	Europe	2	12.5%
3.	Africa	2	12.50%
4.	Asia	0	0.00%
5.	Australia	12	75.00%
6.	Other (specify)	0	0.00%
7	Prefer not to say	0	0.00%

P≤ 0.001 shows that the data was of high statistical significance, therefore valid.

The analysis of the locations of the respondents was based on their continents and it showed that the largest percentage of the respondents are from Australia with 75%, the remaining 25% were equally spread between Europe and Africa with 12.5% each.

Table 5: Respondents' comfort level with technology

S/N	Comfort level	Frequency	Percentage (P≤ 0.001)
1.	Not Comfortable	0	0.00%
2.	Not very comfortable	1	6.25%
3.	Comfortable	2	12.50%
4.	Somewhat comfortable	6	37.50%
5.	Very comfortable	7	43.75%

P≤ 0.001 shows that the data was of high statistical significance, therefore valid.

The results showed that 43.75% of the respondents are very comfortable with the use of technology for marking essay scripts. This 'very comfortable' percentage score is the modal response and it reveals that almost all the respondents are very comfortable with the use of technology. Very close to this is the 37.5% of the respondents that indicated a somewhat comfortable level with the use of technology while 12.50% indicated that they are just comfortable with the use of technology. Also, 6.25% were comfortable but not very comfortable when using technology in marking essay, and it might be due to their aversive inclination to the use of the technology and addiction to manual scoring system. However, none of the respondents was uncomfortable with the use of technology when marking essay scripts of their students.

Table 6: Number of Essay scripts marked

S/N	Number of scripts	Frequency	Percentage (P≤ 0.001)
1.	< 50	5	31.25%
2.	<100	9	56.25%
3.	<200	1	6.25%
4.	<500	1	6.25%
5.	>500	0	0.00%

P≤ 0.001 shows that the data was of high statistical significance, therefore valid.

More than half of the respondents mark more than 50 but less than 100 scripts with a percentage score of 56.25% at each time of assessment. Those that mark scripts that are 100 and above but less than 200 are 6.25% ditto those that

mark 200 and above but less than 500 scripts per essay assessment. Those that mark scripts of less than 50 are 31.25%. This result indicates that scripts that are marked per essay assessment are usually below 100 as shown in Figure 6 above.

Table 7: Average time for marking

S/N	Time spent	Frequency	Percentage (P≤ 0.001)
1.	< 5mins	0	0.00%
2.	< 10mins	3	18.75%
3.	< 30mins	10	62.50%
4.	< 60mins	1	6.25%
5.	> 60min	2	12.50%

P≤ 0.001 shows that the data was of high statistical significance, therefore valid.

Results showed that 10 out of the 16 respondents spend more than 10 minutes but less than 30 minutes which is the highest average time frame for marking each assessment by the respondents and it represents 62.5%.

Following this are the three respondents that indicated that they use more than 5 minutes but less than 10 minutes for marking each assessment representing 18.75% of the total responses. One (1) respondent indicated the use of less than 1 hour but more than 30 minutes for marking each assessment and it represents 6.25% which is the lowest responses apart for those that use less than 5 minutes that do not have any response at all. Two (2) respondents indicated that they use more than an average of 1 hour to for each assessment and it represents 12.5% of the total respondents.

Table 8: Types of manual marking employed

S/N	Manual marking type	Frequency	Percentage (P≤ 0.001)
1.	Paper-based	5	31.25%
2.	Electronic	6	37.50%
3.	Paper and Electronic	4	25.00%
4.	I do not practice manual marking	1	6.25%
5.	Not applicable	0	0.00%

P≤ 0.001 shows that the data was of high statistical significance, therefore valid.

Only 6.25%, that is, one (1) respondent do not practice manual marking of essay from the result of the analysis.

Table 9: Health and Safety effects experienced by academics

Health Implication	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Sum	Weighted Average	Rank
Visual Discomfort	4(25.00%)	2(12.50%)	3(18.75%)	3(18.75%)	4(25.00%)	16	3.06	1st
Neck and Shoulder pain	3(18.75%)	5(31.25%)	3(18.75%)	3(18.75%)	2(12.50%)	16	2.75	2nd
Headache	4(25.00%)	4(25.00%)	5(31.25%)	2(12.50%)	1(6.25%)	16	2.5	3rd
Low Back pain	5(31.25%)	6(37.50%)	0(0.00%)	3(18.75%)	2(12.50%)	16	2.44	4th
Dizziness	5(31.25%)	7(43.75%)	2(12.50%)	1(6.25%)	1(6.25%)	16	2.13	5th
Repetitive Strain injury	5(50.00%)	4(25.00%)	2(12.50%)	2(12.50%)	0(0.00%)	16	1.88	6th
Others	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0	0	7th

Table 9 showed that visual discomfort is the most common health complication from manual marking of essay with a mean score of 3.06 and highest number of strongly agree responses of 25%. This was followed by neck and shoulder pain in the second position with a mean score of 2.75 and might be as a result of the uncomfortable movement of the arm and angle of position of the head during manual marking.

4. Discussion

Prolonged period of manual grading of script was found responsible for health effects among academics [8]. It is noteworthy that manual grading has become a silent booming industry in higher institutions with casual staff being the main beneficiary in the pre-pandemic period. However, interest in the use of electronic resources in grading and assessing student script has increased tremendously as against the pre-pandemic period of predominant use of manual grading, thus, substantiates the position of Valenti *et al.*[9] This increase is premised on the potential to reduce grading time and cost of manual grading. Use of electronic technologies will further increase understanding of the textual and cognitive features involved in the creation and comprehension of written texts, improve reading, writing and communication abilities [10]. Maughan opined that technology is finding prominent place in education and there is little doubt that the rapid emergence of new technologies has provided opportunities to improve the manner on which education is both delivered and assessed [11]. Conversely, some academics differ in the use of modern technology in grading student work with preference for the paper-based approach [12], [13]. Valenti *et al.* argued that the commonest problem encountered in the use of electronic essay grading is the absence of a good standard to calibrate human marks and of clear set of rules for selecting master texts [9]. While the argument rages, the common potential to both format of marking is the exposures inherent in the two system. Electronic and paper-based grading potentially exposes academics to the awkward ergonomic postures which could predispose graders to musculoskeletal health effects.

Academic activities such marking, teaching, correspondence, research, meetings, development of teaching materials was found to cause health challenges such as headache, visual discomfort, neck and shoulder pain, low back pain, dizziness and repetitive strain injury which corroborates outcome from similar research by Abirami and Kala [14]. Visual discomfort was found to be the commonest health effects experienced by academics from prolonged period of grading and reading especially when accompanied with straining of eyes [14]. Neck and shoulder pain were found to be the second common health effect among academics with a mean score of 2.75. This might be as a result of sustained awkward movement of the arm and angle of positioning of the head, neck and torso during manual marking.

This was supported in similar study by Olaitan et al [8] which was further validated in another similar study by Patovirta [14], in which pain in the neck, shoulder and calf muscle are commonly experienced by academics. Surprisingly, the least experienced health effect is the repetitive strain injury. Given the repetitive nature of manual and electronic grading, and typing using computer keyboard, it is rightly expected to cause repetitive strain injury among academics a [15] [16], [17], [18], [19], [20].

Strength and Weaknesses

The strength of this study lies in its cross-continental participation giving it external validity. As this study involved three academics with authors undertaking different roles including study design, literature review by the corresponding author; questionnaire design and administration, formatting, write up, review by other authors; it will afford the study solid internal validity. The limitation however lies in the availability of more participants in the study.

Further Work - Further work would be required to identify key technical capabilities an AES system should possess.

5. Conclusion

This study considered the health and safety impacts experienced by academics in different parts of the world. Academics were found to be comfortable with the use of technology when marking, however some still engage in manual method (paper-based) of essay assessment. These exposures have led to the health effects experienced by academics due to exposures at work. The most common health challenges from manual essay marking are visual discomfort and upper body joints related. Essay marking could be time consuming as majority of the respondents mark not more than 50 essay scripts in not less than 30 minutes. If essay assessment is to be automated, tools should be made available and while the transition is taking place, comparison should be constantly made with the manual method to monitor the advantage of the automated essay scoring. Security of the automated scoring system should be taken as priority and the it should be made adaptable for the users.

6. Ethical Statement

The authors declare that due diligence and compliance with high ethical standards was observed in the course of this study.

7. Conflict of Interest

The authors declare that they have no conflict of interest or funding for this project

References

[1] Kromydas T. Rethinking higher education and its relationship with social inequalities: past knowledge, present state and future potential. Palgrave Commun, 2017; 3: 1.

[2] Westerheijden DF., Stensaker B., Rosa MJ (ed). Quality assurance in higher education: Trends in regulation, translation and transformation. Springer, Dordrecht, NL, 2007.

[3] Brennan J (ed). The social role of the contemporary university: contradictions, boundaries and change. In: Ten Years on: changing education in a changing world.Center for Higher Education Research and Information, Open University Press, Maidenhead, UK, 2004: 23–54.

[4] Trow M (2000) From mass higher education to universal access: The American advantage. Minerva. 2000; 37(4):303–328

[5] Allen, M. The goals of universities. USA: The Society for Research into higher Education and Open University Press.1988.

[6] Simin, G., Thanusha, K., Logeswary, R. & Annreetha, A. (2021). Teaching and learning with ICT tools: issues and challenges from teachers' perceptions, Malaysian Online Journal of Educational Technology, 2021; 4(2), 38-57.

[7] Osakwe, KA., Ola, K & Omotosho, P. Contactless Academia – The Case for Automated Essay Scoring (AES) System in COVID 19 Pandemic. Current Journal of Applied Science and Technology, 2021; 40(4):17-29.

[8] Olaita, O. L., Talabi, A. E., Olumori, C. O. &Braimoh, K. T. (2013). Occupational stress coping strategies among lectures in Ilorin Metropolis, Nigeria. Journal of Physical Education and Sport Management. 2013; 5(4): 54 - 58

[9] Valenti, S., Neri, F. and Cucchiarelli, A. (2003). An overview of current research on automated essay grading. Journal of Information Technology Education. 2003; 2:319 – 330

[10] Hearst, M. (2000). The debate on automated essay grading. IEEE Intelligent Systems; 2000; 15(5):37

[11] Maughan, S. (2001) On-line teacher Support: a teachers' perspective. Cambridge International Examinations, Cambridge: University of Cambridge Local Examinations Syndicate. 2001. Internal report, not publicly available.

[12] Burstein, J., Kukick, K. Wolff, S., Lu, C. & Chodorow, M. (2001). Enriching automated essays coring using discourse marking. proceedings of the workshop on discourse relations and discourse marking, annual meeting of the association of computational linguistics, 2001; Canada: Montreal

[13] Shaw, S. Essay marking on-screen: Implication for assessment validity. E-Learning, 2008;5(3):256 -274

[14] Abirami, M. J. and Kala, R. (2018). Health implication of school teachers- A review. International Journal of Health Sciences and Research, 2018; 8(5):350 - 358

[15] Rietveld S., Beest I., & Kamphuis J.H. Stress-induced muscle effort as a cause of repetitive strain injury? Ergonomics, 2007; 50:12, 2049-2058.

[16] Powers, D., Kubota, M., Bentley, J. Farnum, M., Swartz, R. & Willard, A. E. (1998) Qualifying essay readers for an on-line scoring network. 1998. Princeton, NJ: Educational Testing Service.

[17] Thomas. P. (ed). The evaluation of electronic marking of examination. A Conference paper delivered at

ITiCSE, in Thessaloniki, Greece, on June 30 – July 2, 2003.

[18] Troley J., Dixon, P. & Olaniyan, O. Private and Public Schooling in Non-income areas of Lagos State, Nigeria: A Census and Comparative Survey. International Journal of Educational Research, 2006; 43(3), 125-146.

[19] Valenti, S., Cucchiarelli, A. & Panti, M. (2002). Computer based assessment systems evaluation via the ISO9126 quality model. Journal of Information Technology Education, 2002; 1 (3):157-175.

[20] WolfeJ.L., and Neuwirth, C.M. From the margins to the center: The future of annotation, Journal of Business and Technical Communication, 2001:15(3), 333-371.