EFFECT OF PLAGIARISM DETECTION SOFTWARE AWARENESS ON SCIENCE EDUCATION STUDENTS RESEARCH PROJECT QUALITY IN FEDERAL UNIVERSITY OTUOKE

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Abstract
This study investigates the effect of plagiarism detection software awareness on the quality of research projects among science education students at Federal University Otuoke. The study utilized a quasi-experimental design with a pretest-posttest approach, involving a population of 745 science education students and a sample size of 107 final-year students from Physics and Chemistry education programs. Data were collected using a plagiarism detection checklist (PDCL) and analyzed using difference-in-differences analysis and z-tests. Results showed a significant improvement in research quality after raising awareness about plagiarism detection software, with a mean difference of 23.25 in research scores. The null hypothesis of no mean difference in research quality before and after awareness was rejected. However, no significant gender difference in research quality was found. The findings suggest that increasing awareness of plagiarism detection tools enhances the originality and quality of student research outputs.

Keywords: Plagiarism Detection Software, Academic Integrity, Research Quality, Science Education, Awareness Promotion

Introduction

In academic research, plagiarism has become an increasingly prevalent issue, leading to a decline in the quality and integrity of scholarly work. As such war against plagiarism should be one battle every member of the University community should be interested in fighting (Anih, 2019). The reason is that from inception, the major aim of setting up the University is to produce people who are critical thinkers. So that through critical thinking discoveries and inventions are made (Sindisiwe, 2012), however, plagiarism destroys critical thinking as well as analytic skills in students and/ or writers (Anih, 2019). Plagiarism is the act of taking another person's writing, conversation, song, or even idea and passing it off as your own. This includes information from web pages, books, songs, television shows, email messages, interviews, articles, artworks, or any other medium (Noreen Reale Falcone Library, 2023). Thus, plagiarism is against creativity. Creativity is the ability to develop or generate something original and unique.

In other words, plagiarism is, by definition, imitation, which is the opposite of creativity; it also limits the thought, research, and critical thinking involved in developing an original research project or report. Writing original research report can offer numerous benefits, both for the writer and for the broader academic or professional community. Research project /report writing is a valuable and rewarding experience for both personal and professional development. It contributes immensely to the advancement of knowledge in one's field. A research project/report presents an original idea, or purpose statement, about a topic and develops that idea with information gathered from a variety of sources (University of Minnesota, 2015). Conducting research project has these benefits; it gives one the opportunity to share ones' findings, as well as contributes to the advancement of knowledge in ones' field of specialization (Rajat, 2023). Furthermore, writing a quality research project can help improve one's' writing skills, including clarity, organization, and the ability to communicate complex ideas effectively. Above all, successfully completing a research project/report can boost ones' confidence and one's abilities as a researcher and writer. It shows that one is capable of tackling complex projects and producing high-quality work (ACHS alumni Melissa Abbott, 2021).

The above listed benefits therefore explain why in the Faculty of Education hand book for Science Education Departments (FOE-SED) (which comprises of Biology, chemistry, Physics and Integrated sciences) of Enugu state University of science and Technology. It was observed that research project which has a course code of EDU 499, has a credit load of 4 units (FOE-SED, 2019). This 4 unit appears to be the highest of all the units allocated to a single course. This therefore goes a long way to explaining the importance attached to

research projects or report by universities around the world as well as in Nigerian universities. For instance, according to the University of Lagos Research Ethics Policy Handbook (2022), the conduct of research is a core organizational value intrinsic to the University of Lagos mission of adding value to humanity through the creation and dissemination of knowledge. The University unequivocally subscribes to the concept that the conduct of research is a key aspect of scholarship. Also, Mewar University Nigeria (MIU) believes that universities should engage in innovative research projects to support their local community. For this reason, the University management of MIU decided to allocate 15% of Endowment funds annually for research and development to enhance research competencies of all stakeholders involved.

University of Port Harcourt Research Committee as well stated that they shall encourage, emphasize and sustain a culture of Departmental / Faculty Research and Seminars to provide avenues that promotes the conceptualization of research ideas among other values. (UniPortDRMPS, 2011). Nevertheless, in as much as the universities are keen on research, these universities still insist that breaches in research ethics such as plagiarism, falsification of data, abuse of confidentiality, which is a violation of research regulations must be avoided (Onwujekwe, 2014).

However, avoiding plagiarism is not an easy task; this is due to the fact that Plagiarism occurs in different types and many at times being committed unknowingly. Many authors have different number of types of plagiarism, Kramer (2022) proposed seven types, Fiona (2024), proposed seventeen types, however Turnitin (2012) provided a more precise and concise types of plagiarism, although similar to the others mentioned but more suitable for the purpose of this research. Types of plagiarism according to Turnitin includes, clone, this is an act of submitting another's work, word-for-word, as one's own. Ctrl+C, this is a written piece that contains significant portions of text from a single source without alterations. Find+Replace, this is the act of changing keywords and phrases but retaining the essential content of the source in a paper. Remix an act of paraphrasing from other sources and making the content fit together seamlessly. Recycle this is the act of borrowing generously from one's own previous work without citation; to self-plagiarize. Hybrid, this the act of combining perfectly cited sources with copied passages—without citation—in one paper. Mishap, here the paper that represents a mix of copied material from several different sources without proper citation.

404error: this is a written piece that includes citations to non-existent or inaccurate information about sources, In Aggregator type of plagiarism, the culprit has a proper citation, but the paper contains almost no original work. Re-Tweet, here the paper includes proper citation, but relies too closely on the text's original wording and/or structure. All the above mentioned types of plagiarism have varying consequences based on the severity of the offense (Tegan, 2024). As earlier stated most at times all these above types of plagiarism are committed unknowingly.

Unknowingly in the sense that many a times students commit plagiarism even without being aware that they are plagiarizing or that repeating ones writing without referencing is plagiarizing oneself, which usually occurs where the student submits the same (or substantially the same) paper for two courses without taking permission from the lecturers (Unilag, 2017). This type of plagiarisms widespread and increasing among university students nowadays (Jerome, Nkik & Osinulu, 2016). This issue of plagiarism is becoming increasingly prevalent, due to the rise of digital resources making it easier for individuals to access and reproduce others' work. In all sincerity, the most effective way to avoid being accused of (or inadvertently committing) plagiarism is to understand everything that it is and how to properly credit every author whose work you cite in your own writing. At this point it becomes pertinent to note that the creation of awareness is very paramount (Kramer, 2022).

The reason being that although plagiarism detection software has been developed to combat this problem, the lack of awareness among students regarding its existence and functionalities remains a significant concern. Awareness is the knowledge and understanding that something is happening or exists (Noah, 2019). Zineb (2016) stated that awareness can be seen as the ability to perceive, to feel, or to be conscious of events, objects, thoughts, emotions, or sensory patterns. In this level of consciousness, sense data can be confirmed by an observer without necessarily implying understanding. it is the state or quality of being aware of something. More broadly, awareness in the words of McKenna (2019) encompasses the concept or quality of being conscious as it applies to people on one hand, to technologies on the other, and to a combination of aware people and aware technologies. Awareness has somehow been alleged to be related to gender when it comes to plagiarism.

A study on the gender effect on awareness of plagiarism among postgraduate students in Nigerian universities was examined. The findings revealed that while 12.4% of males reported low level of plagiarism awareness no females did. These findings imply that females are better aware of plagiarism than males (Jerome et al., 2016). However, contrary to the above assertion, in another study conducted by Ahmad, Abedin, Irma, Paramasivam and Mustapha (2022) their results which were also consistent with the Mann Whitney U tests result, stated that being aware of plagiarism and attitudes towards plagiarism cannot be associated with gender. Consequently, higher learning institutions ought to educate all students regardless of gender to prevent plagiarism from occurring. It is therefore pertinent that creating awareness of plagiarism among students should go beyond gender and move towards main issue which according to McKenna (2019) has to do with creating awareness among people that plagiarism detection which previously was being detected manually, now employ technology in the nature of plagiarism detection software to apprehend culprits faster.

Various plagiarism detection software tools have been developed to help educators and researchers identify instances of copied content. Some of these plagiarism detecting software include Turnitin, Grammarly, Paper Rater (Paper Rater.com), Pro Writing Aid, Copy leaks, Plagiarism Checker, Dupli Checker, PlagScan, Quetext,Plagiarism Detecto, WhiteSmok. Scan etc. These software employ sophisticated algorithms to compare submitted documents against a vast database of academic and online sources, flagging potential matches for further review. By employing sophisticated algorithms, these tools can identify similarities between the submitted work and existing sources, highlighting potential instances of plagiarism. Despite the widespread availability and utilization of plagiarism detection software, its effectiveness in preventing academic misconduct is contingent upon users' awareness (Trust-radius, 2024).

Research suggests that students' lack of awareness of these tools can lead to unintentional plagiarism, thereby compromising the quality and originality of their research. Therefore, promoting awareness of plagiarism detection software among students is imperative in upholding academic standards and fostering a culture of academic integrity (Roberts, et al., 2007). It is against this backdrop that the researcher is embarking on this research study titled, effect of plagiarism detection software awareness on the quality of research project/ report of science education students, faculty of education in federal university Otuoke.

Statement of the problem

Ignorance of the law is not an excuse to its punishment. Plagiarism is academic theft. There is a prevalence of plagiarism cases among students, particularly due to a lack of awareness or understanding of plagiarism detection software tools. The problem statement revolves around the detrimental impact of lacking awareness on student research quality, leading to the submission of plagiarized work and compromising academic integrity. As suggested, plagiarism undermines the credibility of research and devalues the original contributions of scholars, making it imperative to address this issue effectively. This study therefore, focused on the effect of plagiarism detection software awareness on the quality of research project/ report of science education students, faculty of education in federal university Otuoke. The choice of Federal University Otuoke (FUO), spurt from the fact that the University Otuoke offered the researcher a more conducive environment for quality research. Again, the FUO unique academic environment, technological resources, faculty expertise, diverse student population, commitment to academic integrity, and institutional support make it an ideal setting for this study.

Purpose of the Study

Generally, this study aims to investigate the impact of raising students' awareness of plagiarism detection software on the quality of their research project. Specifically, the study sought to ascertain

1. How raising awareness of plagiarism detection software tools among students affects the quality of their research output.
2. The mean difference between the quality of research output among students before and after plagiarism detection software awareness.

Research Questions

1. What is the impact of raising awareness of plagiarism detection software tools among students on the quality of their research output?
2. What is the mean difference between the quality of research output among students before and after plagiarism detection software awareness?

Research Hypotheses

Anih A.A.

H0₁: There is no mean difference in the quality of research output among final year science education students before and after raising awareness of plagiarism detection software

H₀₂: There is no significant mean difference in the quality of research output between the male and female final year science education students before and after raising awareness of plagiarism detection software.

Research Methods

A Pretest-Posttest type Quasi-experimental design was implemented in the study. As stated by Muhammad (2024), this particular design involves assessing the dependent variable(s) before and after an intervention or event, excluding a control group. While useful in gauging the effects of an intervention or event, this design lacks control over external factors that may influence the outcomes. The research focused on 745 students enrolled in the science education department at the Faculty of Education, Federal University Otuoke (Ado 2024). A sample of 107 intact class students in their final year (51 in Physics education and 56 in chemistry) was chosen from the science education cohort. The selection of final year students was based on their participation in research seminars and project assignments. Data collection utilized a plagiarism detection checklist referred to as the Plagiarism Detection Checklist (PDCL), developed by the researcher and validated by three experts, exhibiting a reliability index of .82 as estimated by the Kuder-Richardson 20 (K-20) formula.

An initial assessment in the form of an assignment on a simple topic was distributed to the final year students in both Physics and chemistry programs, with a submission deadline set by the researcher at two weeks. The purpose was to evaluate the quality of their research output before introducing awareness regarding plagiarism detection tools. A total of 103 students, representing 95.5% of the sample, submitted their assignments. These assignments were then examined for various forms of plagiarism, and grades were assigned based on the severity of plagiarism detected. Subsequently, a posttest was administered to evaluate the research quality after the awareness session.

The efficacy of enhancing awareness on research quality was assessed by comparing the pretest and posttest outcomes. To derive scores for both assessments, a grading scale derived from Eric (2022) was employed. This scale involved assigning scores of 60 marks and above for plagiarism-free submissions, 59-50 marks for Mild plagiarism instances (such as Aggregator, Re-Tweet, or Accidental plagiarism), 49-40 marks for Moderate plagiarism cases (like Recycle, Self-plagiarism, Remix, Patchwork plagiarism, Mishap, 404error, or Source-based plagiarism), and 39-0 marks for Severe plagiarism instances (including clone, complete plagiarism, Ctrl+c, direct plagiarisms, find + replace, Paraphrasing plagiarism). These deductions were based on the nature of plagiarism identified among the final year science education students.

Research questions were analyzed through the application of difference-in-differences analysis, as well as means, and standard deviations of the research quality scores. Note, the first assignment was given by the researcher with the help of two research assistants, pre-test and after which another assignment of the same nature and magnitude was given to serve as post-test. Also, two different programmes (Physics and Chemistry Education Students) were used. The purpose of using these two groups was to indeed remove every prejudice or equivocation that may after the credibility of the result and the efficacy of the intervention –which is creation of awareness. As earlier stated, the purpose all these measures were primarily to determine the changes in the quality of their assignment due to the intervention. Difference-in-differences analysis in as earlier stated was used in the comparing pre-test and post-test scores collected before and after the intervention. This analytical approach enables researchers to ascertain the effectiveness of a specific intervention on the target population over time (Eric, 2022). The null hypotheses underwent evaluation through the utilization Paired z-test to determine if there is a significant difference in the means of the two sets. The rejection of the null hypothesis was contingent upon the probability value being equal to or less than the predetermined significance level of 0.05 ($P \leq 0.05$); otherwise, it was upheld.

Results

Research Question 1: What is the impact of raising awareness of plagiarism detection software tools among students on the quality of their research output?

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Table 1:

Final year Science Education students	Pre-test	Post-test	Difference
Chemistry	31.7	55.8	24.1
Physics	29.3	51.7	22.4
Differences	2.4	4.1	1.7

From the table 1, it was observed that the final year class provides a treatment effect of an average 1.7 increase. In other words, raising awareness among the final year students yield an increase on the quality of their research output**. *(See Appendix 1 for the raw data set)*

Research Question 2 What is the mean difference between the quality of research output among students before and after plagiarism detection software awareness?

Table 2

Item	Total n	Total Score	$\bar{X}$	SD	Mean Difference
Pre-test-Mean (Before)	103	3273	30.58	9.42	23.25
Post-Test Mean (After)		5760	53.83	8.74	

A mean difference of 23.25 shows an improvement after the awareness. See Appendix 1 to see how the scores were obtained

Hypothesis 1: There is no mean difference in the quality of research output among students before and after raising awareness of plagiarism detection software.

Table 3

item	n	X	SD	Z-cal	Z-crit	Decision
Pre-test-Mean (Before)	103	30.58	9.42	18.75	1.6449	Rejected
Post-Test Mean (After)		53.83	8.74			

From the Table 3, the Z_{cal} which is 18.75 is greater than Z_{crt} which 1.6449 at 0.05 level of significance difference. There is significant difference and the null hypothesis was therefore rejected.

Hypothesis 2 There is no significant mean difference in the quality of research output between the male and female students before and after raising awareness of plagiarism detection software.

Table 4

Item	$\bar{X}$	N	SD	Z-cal	Z-crit	Decision
Male	33.8	49	4.58	0.57	1.644	
Female	53.3	54	4.27			Not Significant

In Table 4, the Z-cal which is 0.57 is less than the Z-critical of 0.644. There is therefore no significant mean difference in the quality of research output between the male and female students before and after raising awareness of plagiarism detection software, thus the null hypothesis is not rejected.

Anih A.A.

Discussion

Several previous studies have indicated that various factors have the potential to impact the quality of student research. Among these factors, awareness and recognition of plagiarism detection software has emerged as a critical determinant. Students who lacked awareness of these tools unintentionally submitted plagiarized work, thereby jeopardizing the integrity of their research. Analysis of the submissions revealed that outliers were predominantly from the physics program (refer to Appendix 1). Although their numbers were limited, the researcher carefully addressed their potential influence on the results by utilizing a difference of differences analysis method, known for its resilience to outliers. This approach was employed to ensure that the outcomes of the research remained strong, dependable, and truly reflective of the data's essence.

The data presented in Table 1 aligns with the findings of Jonnathan, Markus and Stephan (2023), who highlighted in their own study that the group unaware of plagiarism checks exhibited lower performance compared to the group that was informed about such checks. By raising awareness about plagiarism detection software, educational institutions can empower students to generate superior quality research and maintain academic integrity standards. This observation is supported by the mean difference illustrated in Table 1 and is consistent with the discoveries of Berrezueta, Paulsen and Krusche (2023), indicating that early exposure to plagiarism prevention strategies enhances student performance, emphasizing the motivating role of awareness in fostering independent learning.

Essentially, educating students on the significance of proper referencing and originality can foster a culture of academic honesty and research excellence. Analysis of Table 2 demonstrated a mean difference of 23.25 in favor of research question 2. These results substantiated the rejection of null hypothesis 1, which posited no mean difference in research quality among students before and after awareness of plagiarism detection software. The outcomes of Table 2 clearly depicted a notable enhancement in research quality among final year science education students following the awareness campaign. This finding further corroborates Shelley's (2014) assertion that by imparting knowledge and awareness regarding plagiarism detection tools, educational institutions can promote a culture of academic integrity and ethical scholarship.

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The second hypothesis in Table 4, suggesting no significant mean difference in research quality between male and female students before and after awareness of plagiarism detection software, was not refuted. This decision was based on the Z-cal value of 0.57 being less than the Z-crit. value of 1.644, aligning with Ahmad et al.'s (2022) findings, which were also consistent with the results of the Mann Whitney U tests. Their study concluded that awareness of plagiarism and attitudes towards it cannot be linked to gender. Hence, it is imperative to enhance understanding regarding the functionalities and advantages of plagiarism detection software tools among individuals of all genders, with the primary aim of fostering academic integrity and moral scholarly conduct among students regardless of their sex.

Conclusion

The results of this study clearly demonstrate that awareness of plagiarism detection software has a notable influence on the caliber and quality of student research. The outcomes suggest that students who possessed understanding of the presence and utility of such tools generated authentic and well-investigated content in contrast to those lacking such knowledge. To summarize, the study's findings propose a substantial correlation between familiarity with plagiarism detection software and the excellence of students' academic inquiries. Individuals uninformed about these tools tend to produce plagiarized material, highlighting the necessity for enhanced education and instruction on academic honesty and appropriate citation methodologies.

Recommendations

Based on the findings, the following are hereby recommended thus

- that education on plagiarism detection tools should be integrated into the academic curriculum to enhance research integrity.
- institutions should invest in promoting awareness of these tools among students to prevent academic dishonesty and improve the overall quality of research outputs.
- Moving forward, further research is needed to explore the effectiveness of various strategies for raising awareness and promoting ethical research practices among students in different academic settings.

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APPENDIX 1
THE DATA FOR THE PRE-TEST AND POST-TEST
KEY: SAMPLE SIZE: 103 (Male 47, Female 56)

	PHYSICS		CHEMISTRY	
	M	F	M	F
	22	26	27	30

	PHYSICS					CHEMISTRY			
S/N	PRE-TEST		POST-TEST		S/N	PRE-TEST		POST-TEST	
	M	F	M	F		M	F	M	F
1.	20	27	55	48	1.	20	42	39	60
2.	08	28	58	53	2.	28	23	37	61
3.	27	22	81	33	3.	15	39	22	39
4.	25	33	49	38	4.	30	41	43	43
5.	38	39	63	40	5.	38	33	40	66
6.	35	37	45	50	6.	43	41	55	58
7.	11	22	42	63	7.	35	30	50	73
8.	31	28	52	48	8.	34	41	49	52
9.	08	25	50	57	9.	17	40	38	73
10.	22	41	44	48	10.	32	43	50	52
11.	40	21	41	40	11.	23	39	48	49
12.	32	38	48	42	12.	41	37	65	60
13.	30	42	37	50	13.	31	53	58	68
14.	37	17	44	41	14.	38	47	67	57
15.	52	37	56	39	15.	44	36	73	78
16.	26	42	36	63	16.	29	49	52	49
17.	31	17	39	42	17.	29	18	49	69
18.	06	31	32	43	18.	34	36	50	58
19.	26	10	42	55	19.	30	28	46	71
20.	26	43	65	69	20.	38	43	57	44
21.	23	40	75	42	21.	15	31	53	66
22.	12	51	35	72	22.	25	32	44	70
23.		30		61	23.	30	39	58	39
24.		09		48	24.	33	36	57	42
25.		41		55	25.	38	41	68	55
26.		43		63	26.	33	36	62	58
27.					27.	34	31	59	45
28.					28.		39		60
29.					29.		16		58
30.					30.				64
31.					31.				68