Bibliometric analysis of undergraduates' research essays, sources and citation patterns at University of Medical Sciences, Ondo City, Nigeria.

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Abstract

Undergraduates' citation pattern is an important aspect of their information literacy and research skills. In this study, we investigated the citation pattern of undergraduates at the foremost Nigerian medical university, the University of Medical Sciences, Ondo City, Nigeria. A bibliometric ex-post-facto analysis was adopted to analyse 113 undergraduate research essays from five departments at the University. The findings show dominant utilisation of journal articles by the undergraduates, with less consultation of other source types, despite showing a high rate of literature citation in the essays. The study concludes that the University library and similar medical libraries need to work on improving undergraduates' information literacy skills to impart to them knowledge on literature sources, retrieval and referencing.

Keywords: bibliometric, undergraduates, information literacy, citation analysis

Introduction

Globally, attention is gathering around the credibility of citations from the literature consulted when undergraduates write research project essays. The up-to-dateness, originality, quality and reputations of the sources through which undergraduates derive their research literature and research data are becoming of interest as one of the ways to evaluate their research abilities and competencies. The credibility of citations in undergraduate research essays has become worrisome in many African countries. Sources consulted are sometimes not credible, error-prone, unreliable, inconsistent and untrue. This is why many undergraduate project findings on the continent are undervalued, shallow, not respected and impracticable in the real world. In Nigeria, undergraduates are increasingly being introduced to research roles as part of the requirements for the award of their Bachelor's degrees to make them globally competitive and keep them abreast of the research directions the world is facing in their respective fields, with the motive of making them problem solvers in the ever-changing world.

Citation is a crucial aspect of research output (Anyaegbu et al, 2016). It facilitates reference to published or unpublished works. Thomson (2014) defines citations as the references that researchers append to their papers to explicitly show earlier work consulted to conduct their investigations. Such references normally contain important bibliographic details such as the author of the work cited, the title of the work, imprint and date of publication. A citation serves as both a signpost and an acknowledgement (Hunter and College, 2014).

As a signpost, citation signals the location of the work being referenced, and as an acknowledgement, it reveals the indebtedness of the researcher to the cited work. A citation can appear in different formats: within the text (in-text) at the bottom of the page (footnotes), or at the end of the paper (endnotes). The mechanics of citing are complicated and vary depending on the discipline or institution involved. On the other hand, citation analysis is a branch of information science in which Researchers study the way articles in a scholarly field are accessed and referenced by others (Meho, 2007).

According to Regents (2015), citation analysis is the study of the impact and assumed quality of an article, an author, or an institution based on the number of times

the article or author has been cited by others. Citation analysis is used to find out how much impact a particular article has had, by showing which other authors based some work upon it or cited it as an example within their own papers. It is also used to find out more about a field or topic and to determine how much impact a particular author has had by looking at the total number of citations. Citation analysis is performed by counting how many times either a paper or researcher is cited by others, and it is now applied as one of the metrics to plan library services and evaluate the usage of library collection by the students. Consequently, this study focused on the citation analysis of undergraduate research essays submitted from 2018 to 2020 at the University of Medical Sciences (UNIMED), Ondo city, Nigeria.

Review of Related Literature

Citation analysis is a subdivision of citation studies which was defined by Mosher (1984 as cited in Leiding 2005) as being "any specific methodologies that use source citations or references drawn from the scholarly apparatus of articles and books as the basis for manipulation, research, and study". Researchers like Magrill and St. Clair (1990); Davis and Cohen (2001); Davis (2002, 2003); and Heller-Ross (2002) have used citation analysis to look at undergraduate behaviour. Attempts are also being made to relate citation analysis of bibliographies to information literacy competencies.

Edzan (2008) quoting leiding (2005) observed that in a freshman English programme at Northern Illinois University, Hovde (2000) performed a bibliometric analysis of 109 student research paper bibliographies to assess the students' behaviour in terms of skills and resources addressed in instruction sessions. When analysing the papers, she looked at types of works cited, origin of citation and characteristics of cited journal titles. She is of the opinion that the bibliography of a student's research paper allows for "a flexible, non-invasive, time-efficient assessment forum in which one can quantify actual student behaviour (as opposed to self-reported process or attitude) involving library products and resources".

Davis at Cornell University had developed and applied an approach to study the effect of the Internet on undergraduate citation behaviour. He analysed students' bibliographies and categorise them to determine whether bibliographies have become

more or less scholarly. Davis conducted three studies from 1996 to 2001 that were comparative citation analysis of bibliographies of undergraduate term papers.

The first study (Davis and Cohen, 2001) was conducted with Cohen on papers submitted in 1996 and 1999 for a freshman micro economics class at Cornell University. They classified the citations as book, journal, magazine, newspaper, Web or others. Journals are defined as "scholarly periodicals that contain primary research or substantial policy analysis" and magazines as "non scholarly periodicals that report primarily news, industry information, and events". All print sources are coded as such even if they have been accessed electronically. Web resources were identified as electronic only and only if these resources have no print equivalent. An Internet resource is categorised as such if there is a URL and/or the reference indicator WWW or Internet or online.

Research in the contemporary world has become a tool for development and scientific means to unravel and solve numerous problems that mankind are faced with. Quality of any research work is congruent to quality sources of bodies of literature the researcher(s) consulted in the cause of his/her research work.AN essential part of research papers, particularly in the sciences, is the list of references pointing to prior publications. As Ziman observes, "a scientific paper does not stand alone; it is embedded in the 'literature 'of the subject.'" A reference is an acknowledgement that one document gives to another; a citation is an acknowledgement that one document receives from another. In general, a citation implies a relationship between a part or the whole of the cited document and a part or the whole of the citing document.

Research Questions

1. What sources of information did UNIMED undergraduates cite in their research project essays 2018 to 2020?

2. What is the rate of literature citation in UNIMED undergraduate research essays from 2018 to 2020?

3. What is the volume of single and multiple authorship citations in UNIMED undergraduate research essays from 2018 to 2020?

Methodology

This study is a bibliometric ex-post facto analysis of completed undergraduate research essays at the University of Medical Sciences (UNIMED), Ondo City, Nigeria. Undergraduate research essays from two faculties (Faculties of Science and Basic Medical Sciences) were purposively selected for this study because they have research essays dated up to 2018. 113 undergraduate research projects were identified from five Departments: Mathematics and Physics (in Faculty of Science); Anatomy, Biochemistry and Physiology (in Faculty of Basic Medical Sciences).

Data were extracted from the title pages and reference lists of each of the research essays and dissertation examined. Data extracted included the year the materials were submitted, type of information source cited, recency of materials cited, and types of authorship of cited literature. Types of material cited were categorised as; journals, books, conference proceedings, reports (including working papers, research paper, annual reports, and technical reports), theses and dissertations, web resources, government documents and miscellaneous (which includes yearbook, newspapers, manuals, bulletins, guide, newsletters, etc). The data extracted were analysed using descriptive statistics, including includes frequency and percentages, mean and standard deviations.

Results and Discussion of Findings

Research Question 1: What sources of information did UNIMED undergraduates cite in their research essays from 2018 to 2020?

As shown in Figure 1, journal consultation was the highest among the undergraduates in the Faculty of Science at UNIMED. The result revealed that the usage of books other information bearing materials for undergraduate research purposes were not at the same level as journal consultation among the final-year undergraduates in the Faculty of Science. For instance, in the Department of Mathematics, only 13 (about 22.8% of total citations) books were cited, while a total of 44 (about 77.2% of total citation) journals were cited in the cause of writing their research essays in the Department of Mathematics. Similar percentages were recorded from undergraduate research essays in the Physics Department where there were 732 book citations and 2,478 journal citations.

This finding depicts high reliance on academic journals for research purposes among undergraduates in the Faculty of Science at the University of Medical Sciences, Ondo. This further supports the fact that researchers' first port-of-call is the primary source of information, which is usually academic journals (research by-products), and buttress the importance of citation as a crucial aspect of research output (Anyaegbu et al, 2016).

Results from the citation analysis of undergraduate research essays at the Faculty of Basic Medical Sciences (Figure 2), UNIMED revealed that undergraduates in the Department of Anatomy cited 2,156 journal articles, those from the Department of Biochemistry cited 2,497 journal articles, while those from Physiology Department cited 2,312 journal articles, representing 65.2%, 90.5% and 88% of the total citations respectively. The results also reveal copious dependence on journal articles, despite coming from a different faculty and could be a pointer to the students' level of information literacy skills. This is related to the submission of Heller-Ross (2002) that citation analysis of bibliographies relates to information literacy competencies

Research question 2: What is the rate of literature citation in UNIMED undergraduate research essays from 2018 to 2020?

As noted by Anyaegbu et al (2016), citation is a crucial aspect of research outputs, the findings of the citation analysis in this study revealed a higher mean citation number per research report among students from Biochemistry Department when compared to other departments, as shown in Table 1. However, the high standard variation recorded in the citation analysis across the departments depicts high dispersion of the citation counts from the average (Table 2). This depicts varying levels of information literacy skills among the student population and indicates the need for the library to engage in information literacy training that will ensure all students have the skills to access and cite literature appropriately in their research reports. The citation analysis by Swart (2019) among South African graduate thesis revealed similar average number of citations.

Research Question 3: What is the volume of single and multiple authorship citations in UNIMED undergraduate research essays from 2018 to 2020?

From the citation analysis in this study (as shown in Figure 3), and in the years under review (2018-2020), Department of Anatomy undergraduate research essays submitted by the students revealed that 467 total single authors were cited, while 1, 417 multiple authors were cited. Research essays from the Department of Physics had the highest multiple authorship citation counts (2703), while those from Biochemistry Department had the highest single authorship citation counts (836). The mean citation count by authorship, shown in Table 3, showed that, on average, most students cited literature with multiple authors more than those with single authors. This confirms an earlier report that the authority of authors cited and the way articles in a scholarly field are cited and accessed reveals the credibility of any research work (Meho, 2007).

Conclusion

Citation analysis is a potent tool to understand undergraduate students' behaviour in the use of library resources for research. The findings of this show low information literacy skills among the undergraduates and the need for the library to take this up. The situation may be similar in other developing countries; thus, this study implicates the need for libraries in these climes to analyse the theses and research essays submitted by their students to design library activities and in collection management decisions. Libraries should be involved in literature review courses for undergraduates to impart literature access, use and referencing skills to the students.

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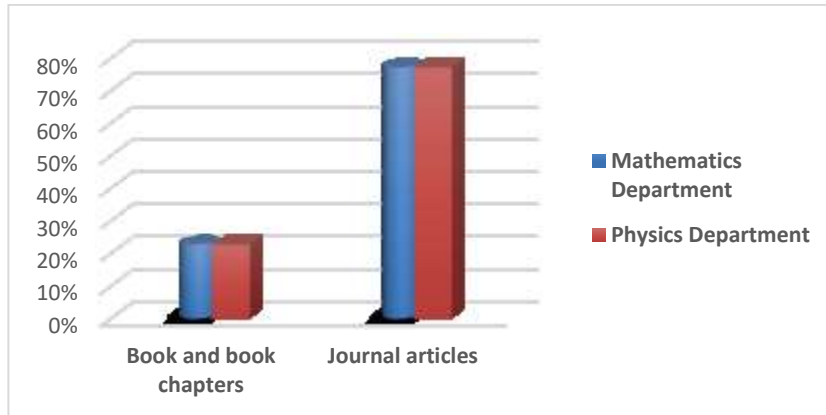
Figures

Figure 1: Information sources cited by UNIMED undergraduates in research project report from 2018 to 2020 at the Faculty of Science
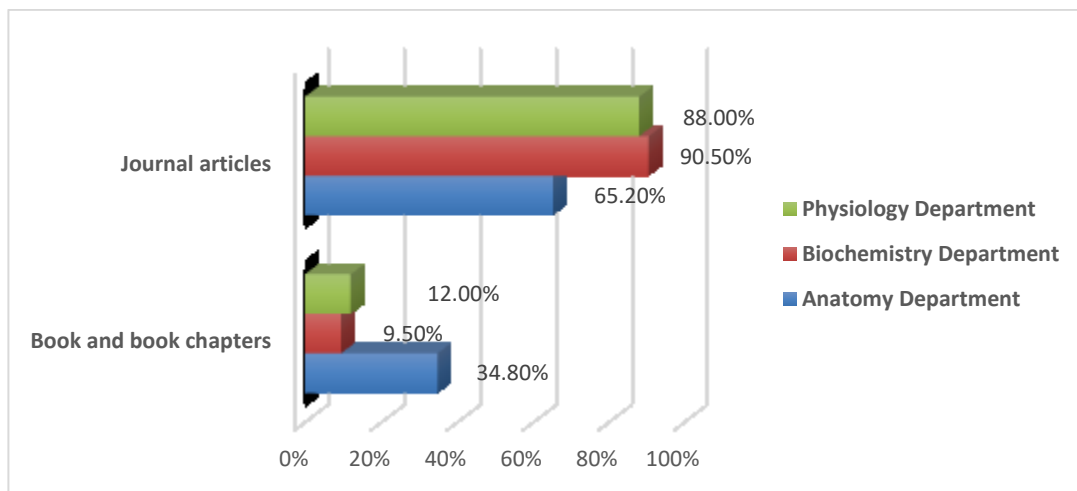

Figure 2: Information sources cited by undergraduates in research essays from Faculty of Basic Medical Sciences, UNIMED
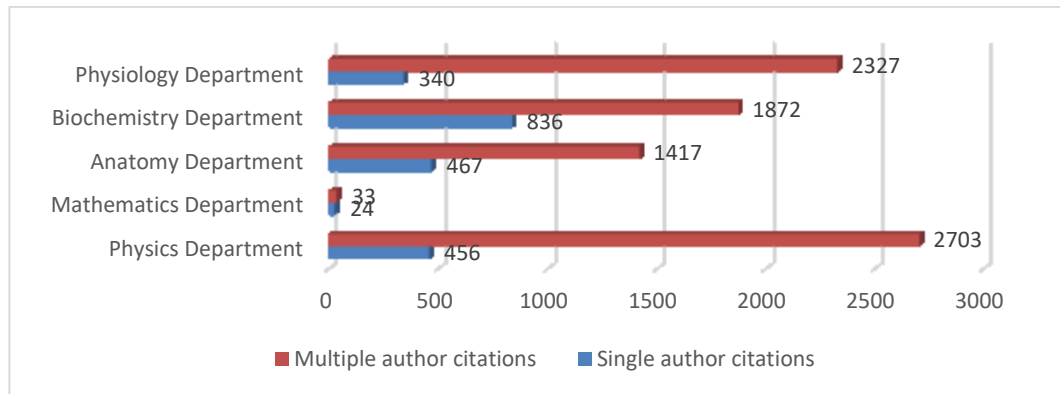
Figure 3: Total number of single and multiple author literature cited in undergraduate research essays

Tables

Table 1: total number of citations in each undergraduate research essays from FoS and FBMS from 2018 to 2020

	Mathematics Department	Physics Department	Anatomy Department	Biochemistry Department	Physiology Department
1.	16	75	18	100	123
2.	11	215	110	137	60
3.	15	121	48	115	134
4.	15	47	36	98	55
5.	-	126	65	112	43
6.	-	105	72	219	162
7.	-	45	77	80	56
8.	-	183	20	156	17
9.	-	159	82	113	178
10.	-	109	124	69	66
11.	-	330	61	95	151
12.	-	165	101	160	167
13.	-	208	73	142	139
14.	-	85	51	124	139
15.	-	52	61	123	149
16.	-	120	102	36	132
17.	-	58	31	128	129
18.	-	80	35	80	127
19.	-	116	123	80	135
20.	-	34	160	120	56
21.	-	119	75	112	66
22.	-	78	109	99	58
23.	-	81	79	94	134
24.	-	68	56	75	46
25.	-	98	58	-	143

26.	-	108	57	-	43
27.	-	54	18	-	-
28.	-	70	-	-	-
29.	-	50	-	-	-
Total	**57**	**3159**	**1884**	**2667**	**2708**

Table 2: Average number of citations in undergraduate research essays at FoS and FBMS from 2018 – 2018

Department	No of thesis	Minimum citations	Maximum citations	Mean	S.D.
Anatomy	26	18	160	72.46	34.49
Physiology	26	17	178	104.15	48.33
Biochemistry	24	36	219	111.13	36.70
Mathematics	4	11	16	14.25	2.22
Physics	29	34	330	108.93	64.16

Table 3: mean citation of literature with single and multiple authors

Department	Mean authorship citation	
	Single author citations	Multiple author citations
Mathematics	6	8.25
Physics	15.72	93.21
Anatomy	17.96	54.5
Biochemistry	32.15	72.0
Physiology	14.17	96.96