



ISSN: 2814-1709

CURRENT TRENDS IN INFORMATION COMMUNICATION TECHNOLOGY RESEARCH  
JOURNAL

(Information Science Papers) Vol. 1, No. 2, December, 2022

## Web Search Training and Query Formulation Behaviour of Undergraduates of Kano State University of Science and Technology (KUST) Wudil, Kano State, Nigeria

Dahiru Salisu<sup>a\*</sup> Babalola, Yemisi T.<sup>b</sup>

<sup>a</sup>*Department of Library and Information Science, Faculty of Education, Yusuf Maitama Sule University, Kano State, Nigeria: [salisudahiru4@gmail.com](mailto:salisudahiru4@gmail.com)*

<sup>b</sup>*Professor, Department of Information Resources Management, School of Social and Management Sciences, Babcock University, Ilisan-Remo Ogun State, Nigeria e-mail: [babalolay@babcock.edu.ng](mailto:babalolay@babcock.edu.ng)*

### Abstract

The Web is predominant source of information upon which most university students depend for accomplishing their academic tasks. This study investigated the influence of web search training programme on query formulation behaviour of undergraduates of Kano State University of Science and Technology (KUST), Wudil, Kano State, Nigeria. The study was set to answer two research questions and tested a hypothesis. Quasi-experimental design of the pretest and posttest type was used for the study. All 20,679 undergraduates of KUST made up the target population. Convenience sampling technique was used to recruit only 35 students, who participated in a six weeks training programme and lab sessions. A structured and validated questionnaire was used for data collection at both pretest and posttest levels. Cronbach's alpha reliability coefficient for the constructs ranged 0.78 to 0.88. Two adapted search task tests were used to assess students' query formulation behaviour on the web before and after the training. Data were analyzed with descriptive statistics and t-test. Findings revealed that web search training had significant effect on the query formulation behaviour of participants ( $t_{(34)} = 17.680$ ;  $p < 0.05, \eta^2 = 0.857$ ). The study concluded that web search training is essential for all undergraduate students of KUST Wudil to enable them develop appropriate web search query formulation behaviour and also accomplish their academic search tasks. The study recommended that academic

## **librarians should include practical web search sessions in their use of library classes for freshmen.**

**Keywords:** Boolean logic, Query formulation behavior, Undergraduate students, Web Searching, Web search training

### **Introduction**

The Web is predominant source of information upon which university students depend for accomplishing their academic tasks. It serves as the tool for delivering and accessing quality teaching and learning materials, communicating and sharing research outputs, and accessing reference materials for accomplishing academic tasks. The benefits derived from the web made it prominent globally among people including university students. The study conducted by Oberiri and Timothy (2018) revealed that university students in Nigeria like their international counterparts prefer web resources over other sources of academic information, due to global trend in ICTs, flexibility of accessing devices, remote accessibility and availability of vast amount of information in form of text and graphics.

Success of information search on the web depends largely on the quality of search term formulated and executed by a web user. Search term also known as search query refers to keyword(s) connected with Boolean logic, arithmetic signs/modifiers, and or truncated with asterisk or question mark and sometimes enclosed in quotation marks; with which a web user queries a search engine. Method of query formulation or query formulation behaviour is the most important aspect of the web search behaviour upon which the success or otherwise of the search depend. Ahmad (2018) affirmed that the best query behaviour involves careful representation of the concepts with few, precise and appropriate keywords. Good query formulation behaviour eliminates all unnecessary words including articles and preposition that can lead to retrieval of unwanted search results. Good search behaviour leads to retrieval of relevant, accurate and up-to-date information. In contrast, too wordy, rough and unclear search term leads to retrieval of many irrelevant search results.

Success of information search on the web depends largely on the quality of search term formulated and executed by a web user. Search term also known as search query refers to keyword(s) connected with Boolean logic, arithmetic signs/modifiers, and or truncated with asterisk or question mark and sometimes enclosed in quotation marks; with which a web user queries a search engine. Method of query formulation or query formulation behaviour is the most important aspect of the web search behaviour upon which the success or otherwise of the search depend. Ahmad (2018) affirmed that the best query behaviour involves careful representation of the concepts with few, precise and appropriate keywords. Good query formulation behaviour eliminates all unnecessary words including articles and preposition that can lead to retrieval of unwanted search results. Good search behaviour leads to retrieval of relevant, accurate and up-to-date information. In contrast, too wordy, rough and unclear search term leads to retrieval of many irrelevant search results. Zucconet et al. cited in Choi (2017) argued that effective query formulation is a challenging task to university students, especially when they lack web search skills.

In spite of their reputation as digital natives; studies have shown that a lot of undergraduate students exhibit poor web search behaviour and also find it difficult to successfully retrieve information to accomplish complex academic tasks on the web (Dahiru, Ahmadu & Musa, 2019; Babalola & Dahiru, 2022). Alfred (2013) noted that many universities students in Africa are not acquainted with advanced search features obtainable in different search engines and those who use them use them imperfectly. Zucconet et al. cited in Choi (2017) argued that effective query formulation is a challenging task to university students, especially when they lack web search skills. Web searching skills is a key to formulation of effective search query and retrieval of relevant search result at relatively shorter and faster rate. Luca and Topi (2020) affirmed that web users with limited search skills fetch only handful information from the vast relevant information resources available on the web. This implies that users with limited web searching skills enjoy only an unpretentious subset of what web offers. Thus, for a web user to benefit fully from the available information resources on the surface web, he/she needs to acquire web searching skills by attending a formal web search training program. Interestingly, training on web use for undergraduates may be easily assume these tech-savvy youths naturally explore the internet, even though for mostly non-academic activities.

Web search training is an information literacy skills acquisition program designed to educate web users on how to use different search tools with the view to exploring the variety of information resources on the web and to evaluate the retrieved information for reliability, relevancy and accuracy. Web search training guides the trainee on how to translate their information needs into appropriate search terms and employ different tools and techniques to effectively search the web for information. The program also educates the trainees on how to evaluate search results. Such training can enhance students' ability to accomplish academic tasks such as assignments and research projects. These academic tasks are often complex in nature and their accomplishment is contingent on the information obtained from different information systems and sources, including the surface web.

These days, web becomes a critical source of information, upon which university students rely for accomplishing academic tasks. In spite of this, a study conducted by Babalola and Dahiru (2022) uncovered that undergraduate students displayed poor query formulation behaviour, leading to retrieval of irrelevant search results, mass failure in academic assignments and consequently affect their general academic performance. Perhaps, the poor query formulation behaviour demonstrated by the students was due to their failure to attend formal web search training programme.

The study carried out by Schweikhard, Hoberecht, Peterson and Randall in 2018 revealed that instructional tutorials organized by university libraries on information literacy in general and web search skills in particular, significantly increased the students' web searching skills and ability to retrieve relevant information for their complex academic tasks. Training on web search skills is essential for all tertiary institution students, considering the fact that most of their information search tasks are complex in nature, therefore the success of their searches depend upon their searching skills. While existing studies carried out on web query formulation behaviour in Nigeria adopted survey design only, and the studies carried out in developed countries adopted search log experiment, no quasi-experimental study seemed to have been carried out in Nigeria on the influence of web search training on the dependent variable.

Therefore, this study investigated the influence of web search training on query formulation behaviour of Kano State University of Science and Technology (KUST) Wudil.

### **Research Questions**

The study found answers to the following questions:

1. What is the query formulation behaviour of the participants at pre-training intervention period?
2. To what extent does the query formulation behaviour of the participants change after the training intervention?

### **Hypothesis**

H<sub>0</sub>: Web search training has no significance effect on the query formulation behaviour of the participating students

### **Literature Review**

The success of any web search depends on the search query formulated by a web user. Query implies the term or keyword input by a web user in the search bar of a search engine that conveys and communicates his/her information need (Manning, 2008 cited in Teufel, 2014). A search term can be a combination of a keyword/phrase and Boolean logic use to query the search engines. A Good query is made up of search terms- series of characters separated by a white space (Kinley, Tjondronegoro, Patridge & Edward, 2013). Keyword in this sense signifies a root or subset of the search term upon which the search engine works. The ability of students and other web searchers to choose and use the best combination of keywords in the search queries demonstrates his/her web search skill (Timmins & McCabe 2005).

Effective query contains more than one keyword or more than a word for specification (Hogen, Potthast, Beyer & Stein, 2012). Advanced search engines are designed with models that guide users while formulating their queries (Qumsiyeh, & Yiu-kai, 2013). Students with searching skills understand the key concepts from the academic task, and then come up with appropriate keywords to represent the concept (Ahmad, 2018). This implies that skilful students identify their information need(s) before coming up with the right keyword(s), which form the root of their search queries.

The success of any search task relies completely upon the ability of a web user to come-up with effective search query. Previous studies carried out in the field of information retrieval have uncovered different query formulation behaviour common among university students. The two different experimental researches conducted on “Web search behaviour of Internet experts and novices” at University of Freiburg, Germany by Holscher and Strube (2019) reported that few (34.5%) of skilful students use “AND” operator in their search query narrow their search result to only a web pages containing both the term before and after the operator; fewer (8.02%) of them use “OR” operator in their queries to broaden their search results to web pages containing both the term before and after the operator; and none of the participating students used “NOT” operator to narrow down their search result. The finding also reported that only 29% of skilful students (respondents) used pseudo-Boolean operators “+” in their queries. A search log study conducted at University of Pennsylvania, U.S.A on “web search trend” by Spink and Jansen (2004) reported an increase in use of Boolean operators (AND, OR, NOT) and arithmetic signs

(+, -) among the web users from 22% in 1997 to 28% in 1999. The study also reported that only 8% of web users used proximity search in their queries (from 1996-1999).

The findings of the survey conducted among postgraduate students in Tanzania titled “Web search behaviour of postgraduate students at Sokoine University of Agriculture, Tanzania” by Sa'id (2013) revealed that majority of the respondents (74.6%) used simple search strategies only, while few of them adopted search strategies such as phrase searching (26.8%), Boolean searching (20.8%), arithmetic signs/query modifiers (22.9%) and truncation (15.0%). The earlier research conducted by Lawandowski (2006) reported that half (50%) of the respondent were aware of Boolean operators (AND, OR & NOT); 59 % were aware of advanced search strategies, but only 14.0% of the respondents use the advanced search strategies and Boolean operators in their queries. This implies that large number of the study population are aware of the advanced search strategies based on query formulation, nevertheless, few use them in their queries.

The survey conducted in South Africa by Civilcharram, Hudghes and Maharaj (2015) titled “Uncovering web search tactics of South African Higher education students” reported that 42.5% of South African students and academic staff (respondents) used multiple keywords (two to above) to query the search engines, while 34.9% of them use single keyword to query the search engines. In Nigerian context, the survey conducted among university academics by Dahiru, Ahmadu and Musa (2019) titled “Web searching skills of academic staff of universities in Kano” revealed that 48% of the respondents used Boolean operators to narrow or broaden the scope of their searches; 42% of them use keywords only (without Boolean logic) to search the web; and only 30% of the respondent used library of Congress Subject Heading and truncation respectively.

Previous studies conducted established the direct connection between web search training and query formulation behaviour of the trainees. The finding of the research carried out in US by Hu, Lu and Joo (2014) revealed that participants who went through formal web search training (LIS Students) format their queries more (with respond rate of 17.7%) than their counterparts who underwent no web search training (with response rate of 15.6%). The finding also revealed that students with web search skills generalize their queries more (with response rate of 21.7%) than those with less skill (with 18.5% response rate). The study further reported that students, who underwent web search courses (LIS Students) make their queries more specific (with response rate of 35.9%) than their less skilled counterparts (with only 31.1% response rate). The study concluded that users with higher web search skills do not always reformulate their queries, unlike those with less skill, who spent more time modifying their search terms.

## **Methodology**

The study adopted single group quasi experimental design of pretest posttest type. All 20,679 undergraduates of the university under study made up the target population of the study. Convenient sampling technique was used to recruit only 35 students for participation in a six weeks training program and lab sessions. A structured and validated questionnaire was used for data collection at both pretest and posttest levels. Two adapted search task tests were used to assess students' search task accomplishment on the web before and after the training. Cronbach's alpha reliability coefficients for the constructs ranged 0.78 to 0.88. The data collection began by recruiting interesting students for participation into the experiment. The recruited students were assigned with a search task to be accomplished using search engine of their choice and a pre-training questionnaire was administered to the participants. Later, a six weeks long web search

training programme was conducted. In the last day of the training, participants assembled in the e-library unit of the university, where they were assigned yet another search task to be accomplished using search engine of their choice. At the end, another questionnaire (post-training questionnaire) was administered to the participants. A 100% return rate was achieved at post stages. The data related to the research questions were analyzed using frequency counts, simple percentages, mean and standard deviation, while the hypothesis was tested using t-test.

## Results

### Demographic Information of Participants

This section gives summary of the participants’ demographic information including their gender, age range, level of study as in Table 1

**Table 1: Demographic Information of Participants**

<b>Demographics</b>	<b>Classification</b>	<b>Frequency</b>	<b>Percentage</b>
Level of study	100 level	07	20.0%
	200 level	04	11.4%
	300 level	07	20.0%
	400 level	17	48.6%
	<b>Total</b>	<b>35</b>	<b>100.0%</b>
Gender	Male	28	80.0%
	Female	07	20.0%
	<b>Total</b>	<b>35</b>	<b>100.0%</b>
Age	16-25yrs	21	60.0%
	26-35yrs	13	37.1%
	36-45yrs	01	2.9%
	<b>Total</b>	<b>35</b>	<b>100.0%</b>

Table 1 reveals that majority of the respondents 17 (48.6%) were in 400 level; from the least end, only 04(11.4%) were from level 200. The large percentage of level 400 students could be connected to the fact that they need web searching skills to effectively accomplish their research projects. However, the finding suggests that participants were dispersed and selected across all the academic levels in Kano State University of Science and Technology, Wudil, Ninety-four percent 28 (80.0%) of the participants were males while females were represented by only 7(20.0%). This suggests that male undergraduates indicated a higher interest to participate in the intervention study than their female counterparts. This uneven ratio of male to female could be connected to the fact that the study was conducted in male dominated community, where female participate only in compulsory activities. Sixty percent (60.0%) of the participants were within the age bracket of 16-25 years while only 1(2.9%) were within the age range of 36-45 years. This is expected as undergraduate program in Nigeria and elsewhere in the world are usually dominated by teens.

**Research question one:** What is the query formulation behaviour of the participants at pre-training intervention period?

**Table 2: Query formulation behaviour of the participants at pre-intervention period**

Kindly rate the following statements as they reflect your query formulation behaviour	Strongly Agree (4)	Agree (3)	Disagree (2)	Strongly Disagree (1)	M	SD
I use keywords only to query the search engine during my search session	11(31.4%)	09(25.7%)	06(17.1%)	09(25.7%)	2.60	1.18
I use Boolean logic (AND, OR & NOT) in my search terms	02(5.7%)	04(11.4%)	11(31.4%)	18(51.4%)	1.70	0.89
I use truncation (*, ?) in my search terms	01(2.9%)	05(14.3%)	11(31.4%)	18(51.4%)	1.66	0.81
I use quotation marks (“ ...”) with my search terms	02(5.7%)	03(8.6%)	11(31.4%)	19(54.3%)	1.62	0.81
I use Arithmetic signs/ modifiers (+, -) in my search terms	01(2.9%)	03(8.6%)	10(28.6%)	21(60.0%)	1.53	0.75
			<b>Average mean</b>		<b>1.82</b>	<b>0.52</b>

**Source:** Researcher’s field survey

**Decision Rule:** 1.0-1.49 = Very poor; 1.50-2.49 = Poor; 2.50-3.49 = Good; 3.50-4.0= Very good

The result of Table 2 shows that query formulation behaviour of the participating students at pre-intervention period was poor, as indicated by the average weighted mean score of 1.82 on a four point Likert-type rating scale. Further analysis revealed that, before the intervention, majority of the participants 11(31.4%) and 9(25.7%) were with the habit of sticking to the use of keywords only as their search term as against 6(17.1%) and 9(25.7%) who had a contrary view. The table also revealed that few participants 2(5.7%) and 4(11.4%) use Boolean logic in their queries as against 11(31.4) and 18(51.4%) of them who had the habit of formulating their queries without the logics. The table also revealed that few participants 1(2.9%) and 5(14.3%) used truncation in their search terms as 11(31.4%) and 18(51.4%) held contrary practice. Moreover, the use of quotation mark around the phrase and arithmetic signs among the participants were also poor with the average mean of 1.62 and 1.53 respectively. This finding suggests the need for formal web search training to develop the query formulation behaviour of undergraduates of KUST, Wudil, to remain technologically relevant in the 21<sup>st</sup> century.

The result of Table 2 shows that query formulation behaviour of the participating students at pre-intervention period was poor, as indicated by the average weighted mean score of 1.82 on a four point Likert-type rating scale. Further analysis revealed that, before the intervention, majority of the participants 11(31.4%) and 9(25.7%) were with the habit of sticking to the use of keywords only as their search term as against 6(17.1%) and 9(25.7%) who had a contrary view. The table also revealed that few participants 2(5.7%) and 4(11.4%) use Boolean logic in their queries as against 11(31.4) and 18(51.4%) of them who had the habit of formulating their queries without the logics. The table also revealed that few participants 1(2.9%) and 5(14.3%) used truncation in

their search terms as 11(31.4%) and 18(51.4%) held contrary practice. Moreover, the use of quotation mark around the phrase and arithmetic signs among the participants were also poor with the average mean of 1.62 and 1.53 respectively. This finding suggests the need for formal web search training to develop the query formulation behaviour of undergraduates of KUST, Wudil, to remain technologically relevant in the 21<sup>st</sup> century.

Research Question 2: To what extent does the query formulation behaviour of the participants change after the training intervention?

**Table 3: Participants’ query formulation behaviour at post intervention period**

Kindly rate the following statements as they reflect your query formulation behaviour	<b>Strongly Agree (4)</b>	<b>Agree (3)</b>	<b>Disagree (2)</b>	<b>Strongly Disagree (1)</b>	<b>M</b>	<b>SD</b>
I use Boolean logic (AND, OR & NOT) in my search terms	11(31.4%)	13(37.1%)	09(25.7%)	02(5.7%)	2.94	0.91
I use quotation marks (“ ...”) with my search terms	13(37.1%)	13(37.1%)	04(11.4%)	05(14.3%)	2.92	1.05
I use Arithmetic signs/ modifiers (+, - ) in my search terms	11(31.4%)	09(25.7%)	13(37.1%)	02(5.7%)	2.81	0.98
I use keywords only to query the search engine during my search session	05(14.3%)	04(25.7%)	08(22.9%)	13(37.1%)	2.13	1.08
	<b>Average mean</b>				<b>2.63</b>	<b>0.50</b>

**Source: Field Survey 2022**

**Decision Rule:** 1.0-1.49 = Very poor; 1.50-2.49 = Poor; 2.50-3.49 = Good; 3.50-4.0= Very Good.

Participants were asked to rate their query formulation behaviour (on 4-Likert scale) after undergoing the training. The result in table 3 shows that the query formulation behaviour of the participants marked improved after the intervention as indicated by the average mean score of 2.63 as compared to the initial score of 1.82 (prior to the intervention). This shows an average gain of 0.81 on the measurement scale after the training on web searching skills. It appears that the training had positive effect on query formulation behaviour; however, the significant of this effect is captured in Table 4 of the hypotheses section.

**Test of Hypothesis**

**HO:** Web search training has no significant effect on query formulation behaviour of the participants

**Table 4: A t-test analysis of the effect of web search training on query formulation behaviour of the participants**



Query formulation behaviour	M	SD	Difference	T	eta squared statistic	df	p
Pretest level	1.82	0.52	0.81*	17.680	0.857	34	0.000
Posttest level	2.63	0.50					

**NOTE: The value for the difference column is the change in the pretest to the posttest mean scores. \*p<.05. To interpret the eta squared values the following guidelines were used (Cohen, 1988): .01=small effect, .06=moderate effect, .14=large effect.**

A t-test was conducted to evaluate the effect of the web search training on the query formulation behaviour of undergraduates of Kano University of Science and Technology, Wudil as in Table 4. The result shows that there is a significant effect of web search training on query formulation behaviour of the participants ( $t_{(34)} = 17.680$ ;  $p < 0.05$ ,  $\eta^2 = 0.857$ ). Therefore, null hypothesis which states that Web search training has no significant effect on query formulation behaviour of the participants is rejected. The intervention accounted for 85.7% of the variability in query formulation behaviour of the participants as indicated by the  $\eta^2$  value (0.857) in Table 4. The  $\eta^2$  value of 0.857 indicated a large effect size. This result shows that web search training is very vital to molding the query formulation behaviour of undergraduates of KUST, Wudil, Kano State, Nigeria.

## Discussion

Research question one sought to find the query formulation behaviour of the participants at pre-intervention period. The result shows that query formulation behaviour of the participating students was poor at pre-intervention period. Holscher and Strube (2019) reported that few (34.5%) students use “AND” operator in their search query narrow their search result to only a web pages containing both the term before and after the operator; fewer (8.02%) of them use “OR” operator in their queries to broaden their search results to web pages containing both the term before and after the operator; and none of the participating students used “NOT” operator to narrow down their search result.

Research question two sought to identify the changes in the query formulation behaviour of the participants after the web search training intervention. The result indicates that the query formulation behaviour of the participants marked improved after the intervention. This finding agrees with the result of the research carried out in US by Hu, et al (2014) which revealed that participants who went through formal web search training (LIS Students) format their queries more (with respond rate of 17.7%) than their counterparts who underwent no web search training (with response rate of 15.6%).

Finally, the result of the t-test showed a significant effect of web search training on query formulation behaviour of the participants. Thus, the research hypothesis which states that web search training has no significant effect on query formulation behaviour of the participants was rejected. This finding is in line with that of Aula (2019) which reported that formal web search training has significant influence on web search behaviour (including the query formulation behaviour) of university students.

## CONCLUSION

Web search training enhanced the query formulation behaviour of Undergraduates of KUST Wudil and their ability to retrieve relevant information that can be used for accomplishing their academic tasks. Therefore, practical web search training is imperative for undergraduates to come up with effective search terms that can lead to retrieval of relevant search results at relatively shorter period. This can also contribute a lot in academic successes of the students.

## RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Academic librarians should include practical web search sessions in their use of library classes for freshmen.
2. The National University Commission (NUC) should increase credit unit for use of library course to accommodate the practical web search sessions.
3. The National Universities Commission (NUC) should ensure that more practical oriented courses on web search training are incorporated into the library and information science programme to better prepare the future librarians and information professionals for effective service in this digital era.

## References

- Ahmad, S. (2018). Researching your topic online: Tips, tools and tricks for high impact result. *workshop organized by public affairs section, US Embassy* (pp. 1-12). Abuja: Rosa Park, American Center. Retrieved from <http://nigeria.usembassy.gov>
- Alfred, S. S. (2013). Web search behaviour of postgraduate students at Sokoine University of Agriculture, Tanzania. *Library Philosophy and Practice*, 1-16. Retrieved September 20, 2020, from <http://www.suaire.sua.ac.tz/handle/123456789/877>
- Aula, A. (2019). *Query Formation in Web Information Search*. Retrieved July 30, 2019, from Cireseel: [ciresee.x.st.psu.edu/viewdoc/download?doi=10.1.1.76.8657&rep=rep&types=pdf](http://ciresee.x.st.psu.edu/viewdoc/download?doi=10.1.1.76.8657&rep=rep&types=pdf)
- Babalola, Y. T. & Dahiru, S. (2022). Influence of Web Search Training on Web search Behaviour of Undergraduates of Yusuf Maitama Sule University, Kano. *Jewel Journal of Librarianship*, 17(1), 183-194. Retrieved April 30, 2022, from <https://www.jeweljournals.com>
- Choi, D. (2017). *A study of information seeking behaviour: Investigating exploratory behaviour in physical and online space*. Rutgers State University, Library & Information Studies. New Brunswick: Unpublished Dissertation. Retrieved June 23, 2021, from <https://rucore.libraries.rutgers.edu/retgers-library/55405/>
- Civilcharran, S., Hughes, M. & Maharaj, M.S. (2015). Uncovering web search tactics in South African higher education. *South African Journal of Information Management SAJIM*, 17(1), 644-648. doi:10.4102/sajim.v17i1.614
- Dahiru, S. Ahmadu, I. & Musa, A. (2019). Web searching skills of academic staff of universities in Kano. *Northwest Journal of Educational Studies*, 4(1), 37-47.

- Hogen, M., Potthast, M., Beyer, A. & Stein, B. (2012). Towards optimum query segmentation: indout without. *21st International Conference on Information and knowledge Management* (pp. 1015-1024). ACM Publisher. Retrieved November 22, 2020, from <https://doi.org/10.1145/2346761.2498>
- Holscher, C. Strube, G. (2017). Web search behaviour of Internet experts and newbies. *Journal of computer networks*, 33(1-6), 337-346. Retrieved February 24, 2020, from [https://doi.org/10.1016/31389-1286\(00\)00031-1](https://doi.org/10.1016/31389-1286(00)00031-1)
- Hu, R., Lu, K. Joo, S. (2014). Effects of Topic Familiarity and Search Skills on Query Reformulation Behaviour. *Journal of ASIST*, 2014(1), 1-6. Retrieved July 31, 2019, from <https://onlinelibrary.wiley.com/doi/pdf/10.1002/meet.14505001062>
- Kinley, K., Tjondronegoro, D., Partridge, H. & Edwards, S. (2013). Modeling User's Web Search Behaviour and their Cognitive Style. *American Society for Information Science and Technology*, 65(6), 1107-1128. doi:10.1002/assi.23053
- Lewandowskin, D. (2006). Web search engine and information retrieval. *Journal of information services and user*, 137-147.
- Lucas, W. & Topi, H. (2020). Training for web search will it get you in shape? *Journal of the Association for Information Science and Technology (JASIST)*. Retrieved October 7, 2020, from <https://core.ac.uk/display/20833109>
- Oberiri, D. A. & Timothy, O. I. (2018). University Students' usage of internet resources for research and learning: forms of access and perceptions of utility. *CellPress Journal*, online. Retrieved January 16, 2022, from [https://www.cell.com/heliyon/fulltext/S2405-8440\(18\)34928-4](https://www.cell.com/heliyon/fulltext/S2405-8440(18)34928-4)
- Qumsiyeh, R. & Yiu-kai, N. (2013). Assisting Web Search Using Query Suggestion based on word similarity measure and query modification patterns. *Journal of American Technology*, 14(17), 1141-1160. doi:10.1007/511280-013-0235-3
- Sa'id, A. S. (2013). Web search behaviour of postgraduate students at Sokoine University of Agriculture, Tanzania. *Journal of Library Philosophy and Praxtice (e-journal)*, 1-16.
- Schweikhard, J. A., Hoberecht, T., Peterson, A. & Randall, K. ( 2018). The impact of library tutorial on the information literacy skills of occupational therapy and physical therapy students in an evident-based practice course: A rubric assessment. *Journal of Medical Reference Services*, 37(1), 43-59. doi:10.1080/02763869.2018.1404388
- Teufel, S. (2014). *Introduction to Information Retrieval*. Cambridge: University of Cambridge.
- Timmins, F., McCabe, C. (2005, May). How to conduct an effective literatutture search. *Nursing StandardJournal*, 20(11), 41-47.